GIG HARBOR
The Maritime City

Climate Vulnerability Assessment

PREPARED BY CASCADIA CONSULTING GROUP

Table of Contents

FUNDED BY WASHINGTON'S CLIMATE COMMITMENT ACT

The Gig Harbor Climate Element is supported with funding from Washington's Climate Commitment Act. The CCA supports Washington's climate action efforts by putting cap-and-invest dollars to work reducing climate pollution, creating jobs, and improving public health. Information about the CCA is available at www.climate.wa.gov.

Overview

The City of Gig Harbor (the City) is including a **climate element (CE)** in its 2025 Comprehensive Plan update process, which integrates climate resilience and greenhouse gas (GHG) emissions reduction goals and policies into the City's long-term planning framework. The CE will build on commitments made in the current Comprehensive Plan to provide consistent, clear, and actionable guidance on GHG emissions reduction and resilience actions, while serving as the foundation for ongoing climate action planning. **Climate change** refers to the long-term shifting of weather patterns and environmental conditions and is primarily caused by human activity, particularly burning fossil fuels, which produces greenhouse gas emissions.

To inform the development of policies under the CE, the City contracted with Cascadia Consulting Group (Cascadia) to conduct a climate vulnerability assessment (CVA) of four key sectors in the City. This CVA identifies key climate impacts projected for the City and evaluates the City's vulnerability to these impacts.

This report is organized into the following sections:

- **Overview:** Introduces the comprehensive planning context in Washington (WA) and describes the overarching goals of developing and adopting a CE.
- **Climate Impacts Summary:** Provides a brief overview of key climate impacts for the City. See Appendix A for the full Climate Impacts Assessment.
- **Methodology:** Describes the approach used for assessing climate risks and vulnerabilities.
- **Climate Vulnerability Assessment:** Summarizes key findings from the assessment of climate impacts on key sectors.
    - Sector 1 Health & Well-being: Includes public health and emergency management.
    - Sector 2 Economy: Includes local industries and businesses and community and cultural resources.
    - Sector 3: Open Space: Includes shorelines, parks and trails.
    - Sector 4 Infrastructure: Includes water resources and transportation.
- **Appendix A: Climate Impacts Summary**: Provides an overview of the climate impacts pertinent to the City, highlighting impacts and hazards of greatest concern.
- **Appendix B: Climate Sensitive Populations:** Provides an in-depth description of climate-sensitive populations in the City.
- **Appendices C through I**: Contain key maps used to evaluate vulnerability of assets to climate impacts.

Legislative Context and Background

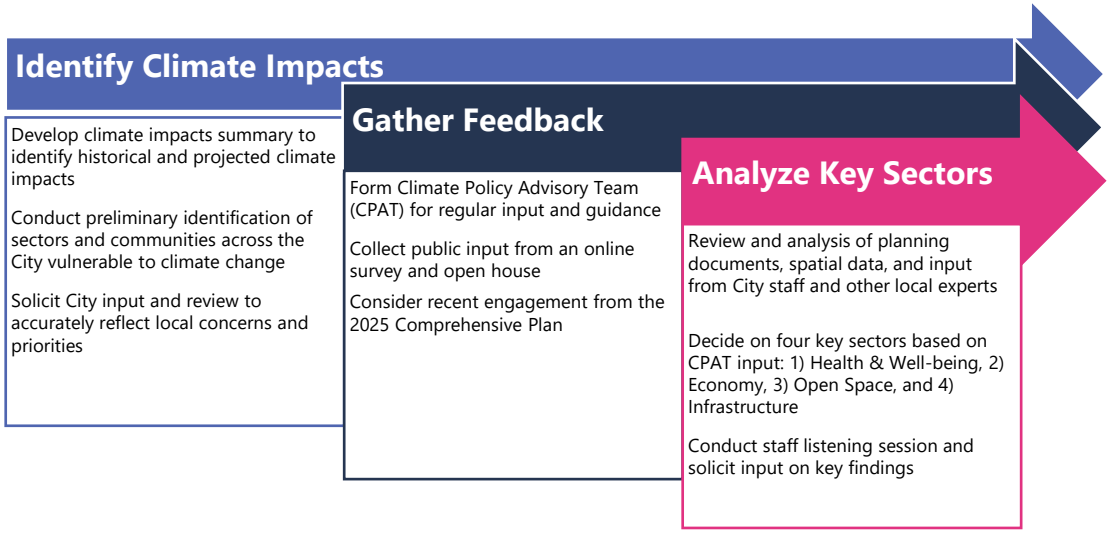
The Washington Growth Management Act (GMA) was amended in 2023 under Washington **House Bill (HB) 1181**, requiring cities and counties to integrate climate policies into their comprehensive plan updates.[1] Jurisdictions must adopt climate policies through a framework consistent with the Washington State Department of Commerce's (Commerce) Climate Element Planning Guidance (Washington Department of Commerce, 2023). Commerce's framework offers a flexible approach for jurisdictions to incorporate the latest available climate science, assess local impacts, and consider resilience policy options. This climate vulnerability assessment mirrors Commerce's "Climate Element Workbook" Step 3 Tasks 1.1, 1.2, and 1.3, with the goal of exploring how expected changes in the climate could exacerbate natural hazards (e.g., droughts, floods, etc.) and impact critical assets and sectors (e.g., ecosystems, infrastructure, public health, etc.).

For the City of Gig Harbor, these required policy changes must meet both climate element sub-elements: the resilience sub-element and the greenhouse gas reduction sub-element. In other words, the City's climate element must address climate impacts and increase resilience across local sectors and reduce GHG emissions.

Climate Vulnerability Assessment Process Overview

The CVA followed a general process, outlined in Figure 1. The process began with identifying and summarizing climate impacts, followed by collecting and incorporating public feedback. Then, the planning team conducted a vulnerability analysis of key sectors.

Figure 1: Climate vulnerability assessment planning process



[1] Under the GMA, climate resilience policies are required for all jurisdictions updating their comprehensive plans. GHG emissions reduction policies are only required for 11 of the fastest growing jurisdictions..

Identify Climate Impacts

The first step in the CVA process was to develop the climate impacts summary, which identifies historical and projected climate impacts, in support of the climate policy development for the CE. Cascadia also used desktop research and state and federal mapping tools to identify preliminary sectors and communities across the City that are vulnerable to climate change.

Cascadia then sought review and feedback from the Climate Policy Advisory Team (CPAT) and City staff to ensure that the climate impacts summary is comprehensive and accurately reflects local concerns and priorities. The CPAT is made up of City staff, elected officials, and residents who are knowledgeable about the specific climate impacts and key populations identified in this summary. Their input was crucial for informing the CVA and policy development, ensuring that the policies identified are robust and responsive to the climate challenges identified.

Gather Feedback

The City then gathered public input via a public survey that included several climate vulnerability-related questions, an open house with the community at-large, and regular feedback throughout the CVA and CE development processes from the CPAT.

Analyze Key Sectors

Cascadia then reviewed planning documents, gathered and analyzed spatial data, and interviewed City staff and other local experts to analyze the climate vulnerability of four key sectors: Health and Well-being, Economy, Ecosystems, and Infrastructure.

Climate Impacts Summary

The City is projected to face a number of climate-related challenges in the coming decades. These projections are based on observed trends and future climate modeling. Understanding how climate change is likely to affect the City is a key step toward building a more resilient community and shaping policies that protect residents, infrastructure, and natural resources.

Without strong efforts to reduce greenhouse gas emissions both regionally and globally, the City can expect to experience the following impacts:

- Sea Level Rise: Higher sea levels, with notably higher water levels during king tides and heavy rain events.
- Extreme Heat: Higher annual average temperatures, with especially high temperature increases during the summer months.
- Drought: Declining summer precipitation and reduced snowpack in the mountains leading to more frequent, longer, and severe regional droughts.
- Extreme Precipitation and Flooding: Increased flooding due to more frequent and intense extreme precipitation events.
- Wildfire and Smoke: Increased wildfire activity in surrounding areas due to extreme heat and heighted drought, resulting in greater smoke exposure and poor air quality.

See *Appendix A: Climate Impacts* Assessment for a full summary of these impacts.

Methodology

Summary of Sources

Cascadia used a variety of established and peer-reviewed resources relevant to the City to identify observed and projected climate trends that currently affect the City or will in the future (Table 1 and **Error! Reference source not found.**). When City-scale data was not available, Cascadia relied on Pierce County-scale climate impact data, as cited throughout this CVA.

Table 1: Key Planning Documents

Planning Documents	Source
Stormwater Management Program (2024)	City of Gig Harbor
Complete Updated SMP (2022)	City of Gig Harbor
Climate Action Plan	City of Gig Harbor
Urban Forestry Management Plan	City of Gig Harbor
Region 5 All Hazard Mitigation Plan 2020-2025 Edition (Draft Chapters)	City of Gig Harbor
Comprehensive Plan Draft Chapters • Land Use • Parks, Recreation, and Open Space • Economic Development • Capital Facilities • Transportation	City of Gig Harbor
Climate Vulnerability Assessment (2023)	Pierce County

Table 2: Key climate data sources

Climate Data	Source
Climate Mapping for a Resilient Washington	University of Washington's Climate Impacts Group
National Centers for Environmental Information	NOAA
Climate Summary	Washington State
Northwest Chapter	5th National Climate Assessment

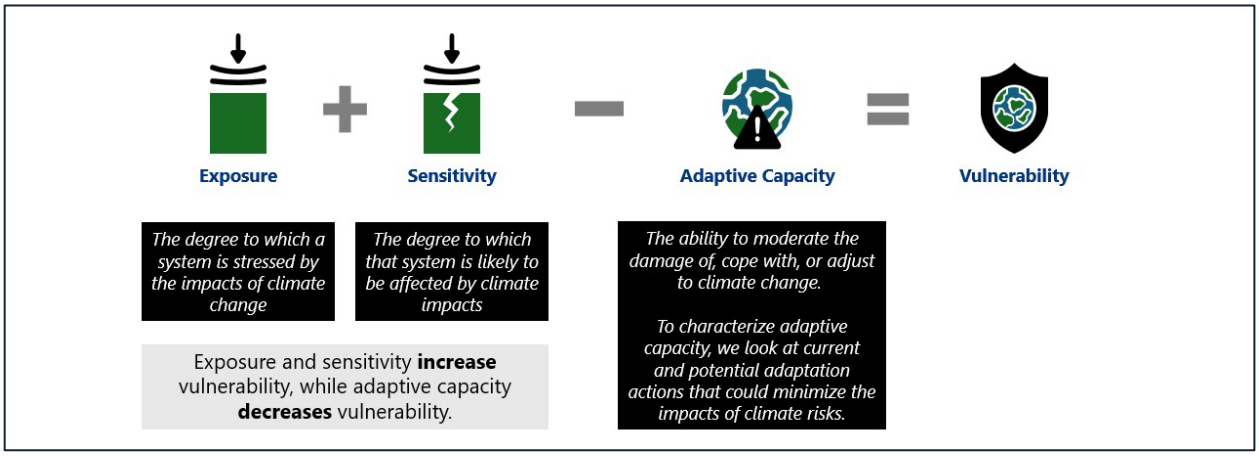
Other relevant studies and datasets are in the Bibliography, which contains the full list of research articles and other resources cited.

Climate Vulnerability Framework

Cascadia used a climate vulnerability framework to ground the vulnerability analysis used for all sectors and all climate risks.

Figure 2 illustrates the framework and key terminology used for this CVA.

Figure 2: Climate vulnerability framework



This assessment evaluates climate risk across four sectors and seven distinct subsectors, using desktop research, feedback from the CPAT, and a community survey (Table 3).

Table 3: Vulnerability assessment sectors and subsectors

Sectors	Subsectors
Health and Well-being	• Public Health • Emergency Response
Economy	• Local Industries and Businesses • Community and Cultural Resources
Open Space	• Parks and Trails • Shoreline
Infrastructure	• Water Resources • Transportation

Scoring Matrix

Within the four sectors, each subsector received a vulnerability ranking based on a scale that assesses the sector's exposure to climate risks, minus the sector's sensitivity, or functionality in the face of the hazard, including accounting for adaptive capacity, or plans and actions the city is taking to reduce a sector's sensitivity.

Table 4: Climate hazard exposure scoring framework

Low	Moderate	High
		
Low exposure to climate impacts.	Moderate exposure and sensitivity to climate impacts.	High exposure and sensitivity to climate impacts.

Table 5: Sector sensitivity and adaptive capacity to climate risks

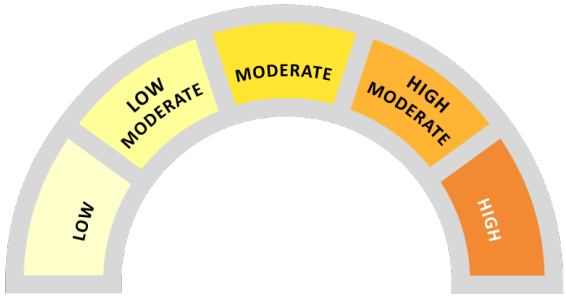
Low	Moderate	High
		
The sector is exposed to the climate hazard but its function is not affected by said exposure. Alternatively, adaptive capacity is high due to adaptation interventions that are in place, being implemented, and are sufficiently effective for sensitivity to be low.	The sector is exposed to and affected by the climate hazard but retains function through adaptive capacity. Plans may address related issues but may not account for climate impacts directly. Some staff capacity and resources are available to address the climate impacts on the sector.	The sector is exposed to the climate hazard and is not able to function as designed when affected by that hazard. Adaptive capacity is low: the sector is plan- and resource-poor.

Climate Vulnerability Assessment

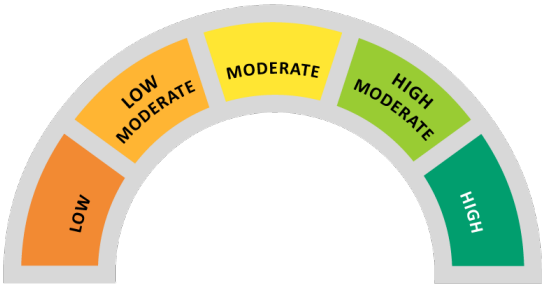
Summary of Vulnerability Assessment

Figure 3 below is a summary of all the elements, or assets, within each sector that Cascadia assessed for climate vulnerability. It is a brief overview of more detailed vulnerability tables in each sector and subsector. The first column is lists the asset, which means different things for different sectors, the second column identifies climate risk, with five possible options on a scale of low to high (per the key below), the third column measures adaptive capacity on the same scale, and the last column shows climate vulnerability. This table is provided as an overview, so the reader can quickly review and the vulnerability of Gig Harbor assets and then look for the more detailed description for assets of special interest. It does not include the vulnerability tables related to specific climate hazards included at the beginning of each sector's section.

KEY

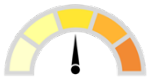
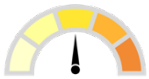
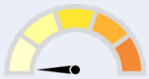
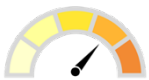
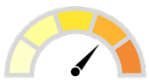
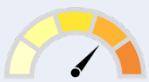
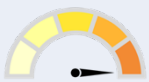
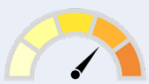
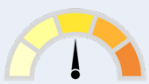
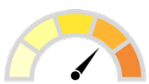
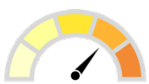
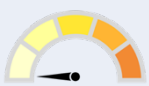
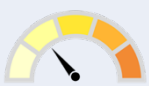


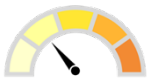
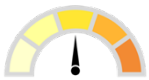
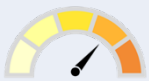
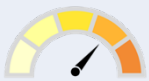
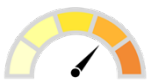
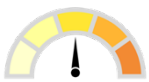
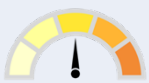
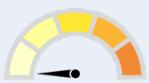
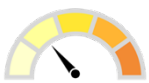
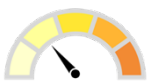
Climate Risk and Vulnerability Dial



Adaptive Capacity Dial

Figure 3. Executive Summary of Vulnerability Rankings by Sector

	Asset	Climate Risk	Adaptive Capacity	Vulnerability
Health and Well-being	**Public Health**			
	Health Facilities and Personnel			
	Emergency Response and Critical Support Facilities and Personnel			
Economy	**Economic Resources**			
	Gig Harbor Business Districts: Uptown, Downtown, and North Gig Harbor			
	Harbor Access and Commercial Fishing			
	Local Tourism			
	Community and Cultural Resources			
	Historic Downtown			
	Harbor History Museum			
	Gig Harbor Lighthouse			

	Asset	Climate Risk	Adaptive Capacity	Vulnerability
Open Space	**Parks and Trails**			
	Donkey Creek Park			
	Crescent Creek Park			
	Gig Harbor Sand Spit and Lighthouse			
	Austin Park at txʷaalqəɬ Estuary			
	Harborview Drive Trail			
	Cushman Trail			
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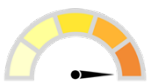
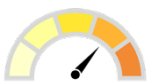
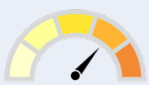
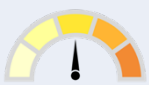
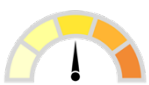
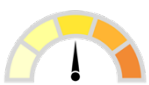
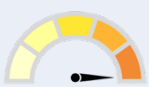
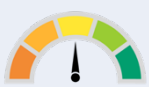
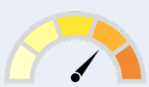
	Segment A			
	Segment B			
	Segment C			
	Segment D			

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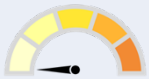
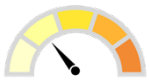
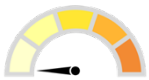
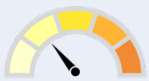
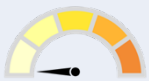
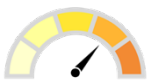
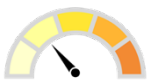
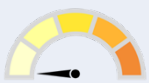
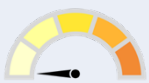
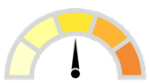
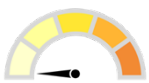
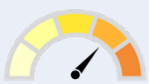
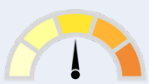
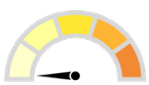
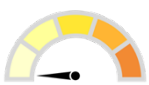
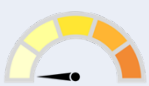
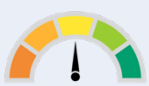
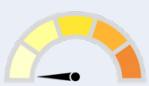
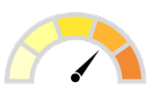
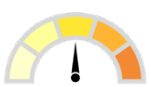
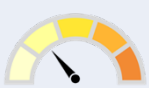
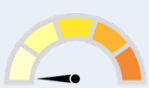
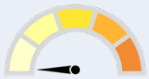
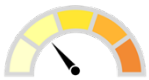
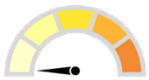
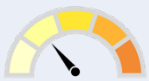
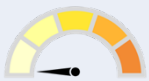
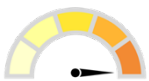
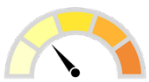
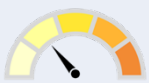
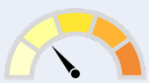
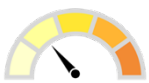
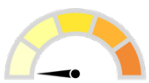
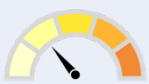
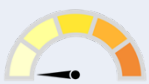
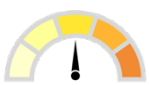
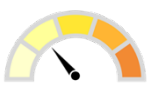
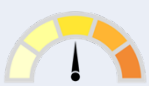
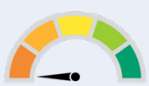
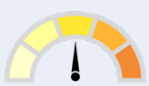
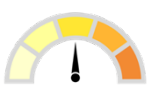
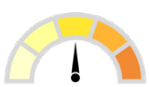
Infrastructure	**Water Resources**			
	Catch Basins			
	Pipes			
	Drainage Basins			
	Outfall Pipes			
	Treatment Plant			
	Lift Stations			
	Sewer Main			
	Manholes			
	Storage Tank			
	Wells			
	Pipelines			

	Asset	Climate Risk	Adaptive Capacity	Vulnerability
	Transportation			
Infrastructure	Roads and Highways – Downtown			
	Roads and Highways – Westside Neighborhood			
	Roads and Highways – Kimball Neighborhood			
	Roads and Highways – Finholm Neighborhood			
	Roads and Highways – Gig Harbor North			
	Active Transportation – Downtown (Harborview Drive)			
	Active Transportation – North Gig Harbor			
	Active Transportation – Westside Neighborhood			
	Active Transportation – Cushman Trail			
	Public Transit (includes Pierce Bus Route 100 and Gig Harbor Trolley)			

Sector 1: Health and Well-being

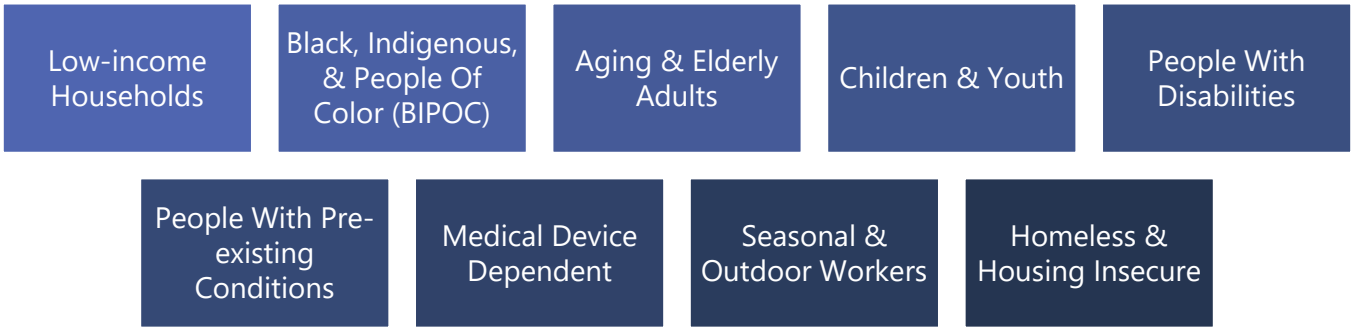
Overview and Key Takeaways

Ensuring the health and well-being of current and future residents is a core goal for the City. While many factors contribute to community health and well-being, the U.S. Centers for Disease Control and Prevention calls climate change "one of the most urgent public health challenges of our time" (CDC Agency Wide Climate and Health Task Force, 2022). The increasing likelihood and severity of temperature extremes, natural disasters, and exposure to climate-related diseases will have immediate and long-term health risks for Gig Harbor residents and workers (Tacoma-Pierce County Public Health Department, 2025).

Climate-Sensitive Populations

Climate impacts reach people wherever they live, work, and play in the City—but those impacts are not distributed evenly. Various groups are more sensitive to climate hazards (Figure 4) and individuals who belong to multiple vulnerable groups may face intersecting risks, heightening their overall vulnerability to climate change (see Appendix B for more information).

Figure 4. Climate-Sensitive Populations in Gig Harbor



Public Health

Climate change can worsen existing environmental health conditions (e.g., worsened air quality from wildfire smoke; post-flooding mold damage in housing that was already in poor condition; hotter working conditions for outdoor workers) and introduce entirely new threats such as mosquito-borne diseases that had never been seen in the area before. Health risks vary based on factors like location, income, age, medical conditions, race, and access to care. These risks often mirror existing health and social inequities and may be compounded by disruptions to transportation, utilities, and employment. Table 6 outlines the exposure, sensitivity, and overall vulnerability of the City's public health systems to climate-related risks.

Table 6: Climate vulnerability of health and well-being

Climate Impact	Exposure	Sensitivity - Adaptive Capacity	Vulnerability
Sea Level Rise	High	Moderate	Moderate-High
Extreme Heat	Moderate	High	Moderate-High
Extreme Precipitation & Flooding	Low-Moderate	Low	Low
Wildfire and Smoke	Low-Moderate	High	Moderate
Vector-borne Disease	Low	Moderate	Low-Moderate

Health Facilities and Personnel

St. Anthony Hospital is the primary emergency care facility for the City and the broader peninsula community (Figure). There are also a number of private clinics across the City providing medical and/or behavioral health services.

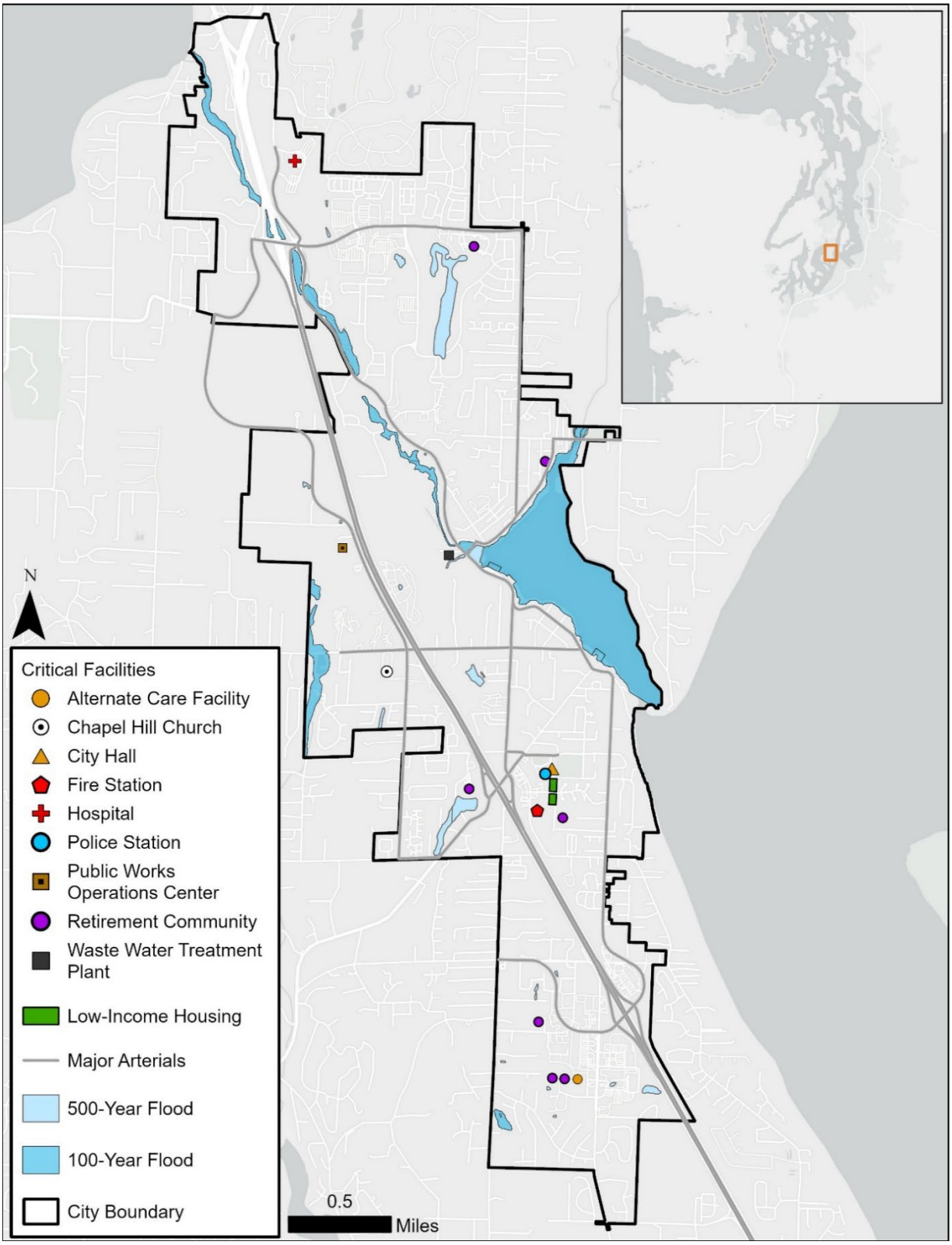
Climate Risks

Table 7 evaluates climate risks and adaptive capacity for health facilities and personnel in the City.

Table 7: Climate risks to health facilities and personnel

Asset	Climate Risk	Adaptive Capacity
Hospitals and Clinics	**Exposure: Moderate** – Events like heat waves and smoke events have resulted in longer emergency department wait times and higher admissions for respiratory and heat-related illnesses (MultiCare, 2022). Record-breaking heat waves have already led to increased emergency visits and hospital strain in Pierce County (Pierce County Climate Resilience Plan, 2021). Rising temperatures may also increase the risk of vector- and waterborne diseases, such as vibriosis and West Nile virus (WDOH, 2022). Flooding and storms may disrupt utilities or block access routes, particularly for patients traveling from low-lying areas or via State Route 16. **Sensitivity: High** – Health facilities are essential services that are highly sensitive to power outages, infrastructure damage, and staffing shortages.	**Moderate** – St. Anthony Hospital and other healthcare facilities are equipped with backup power systems, which can support maintaining operations during extreme weather. The City has a relatively high urban tree canopy coverage—estimated at 41%, with a potential of up to 64%—which helps reduce urban heat island effects (Urban Forestry Management Plan, 2023). While only 53% of Washington households have air conditioning (EIA, 2025), Pierce County offers subsidized energy assistance and provides AC units to qualifying low-income households, helping mitigate heat exposure for vulnerable populations. The City and County also follow EPA guidance on air filtration standards (MERV 13 or higher), and some facilities provide access to clean indoor air during wildfire smoke events. Disease surveillance and vector control programs are in place through the Tacoma–Pierce County Health Department, supporting response to potential increases in vector- and waterborne illness.

Figure 5: Flood risk to critical facilities and affordable housing in the City of Gig Harbor



Emergency Response and Critical Support

The City's emergency response capacity includes Gig Harbor Fire & Medic One stations and the Police Department, with additional support from Pierce County for large-scale emergencies. Critical support facilities in the City play a vital role during extreme weather and climate-related disruptions. Chapel Hill Church serves as the City's primary inclement weather shelter, while FISH Food Bank and Community Services is the main emergency food distribution center for the peninsula. As climate change increases the frequency and severity of extreme/inclement weather, flooding, wildfire, and wildfire smoke events, emergency services and critical support facilities face growing pressure to maintain response times, protect critical infrastructure, and serve vulnerable populations.

Climate Risks

Table 8 evaluates climate risks and adaptive capacity for emergency response and critical support in the City.

Table 8: Climate risks to emergency response and critical support

Asset	Climate Risk	Adaptive Capacity
Gig Harbor Fire & Medic One Stations	**Exposure: Low** – Fire stations are located outside projected flood and wildfire hazard zones (Figure 5). However, firefighters are increasingly exposed to environmental hazards such as wildfire smoke, flooding, and fallen trees or powerlines during response to severe events. **Sensitivity: Moderate** – Fire services are sensitive to power outages and road access disruptions from landslides and storms. Response demands may increase with more frequent extreme weather and wildfire events.	**Moderate-High –** Fire Headquarters functions as the City's primary Emergency Operations Center. The City collaborates closely with Fire & Medic One on training, resource coordination, and public safety events. The City and Fire District are improving public safety facilities and staffing, including building a new Station 51 firehouse and a live-fire training center. However, rising climate hazards may increase response demand, and outreach to vulnerable populations during extreme events remains an area for improvement.

Asset	Climate Risk	Adaptive Capacity
Police Department Facilities	**Exposure: Low** – Police facilities are not located in flood-prone or wildfire-exposed areas (Figure 5). Officers may still encounter hazardous conditions (e.g., heat, storms, smoke) while on duty or during disaster response. **Sensitivity: Moderate** – Operations depend on reliable communication, transportation networks, and access to critical infrastructure. Flooded or blocked roads could hinder patrol and emergency response times.	**Moderate –** While police facilities themselves are not in high-risk zones, their ability to maintain response times during storms or flooding depends on transportation access and interagency coordination. Police personnel participate in regional emergency planning, including tabletop exercises and annual community preparedness events.
City Hall	**Exposure: Low** – City Hall is located outside of high-risk flood and wildfire zones (Figure 5). **Sensitivity: Moderate** – As a government operations hub, City Hall must remain accessible and functional during emergencies.	**Moderate** – City Hall functions as a backup Emergency Operations Center and is equipped with a backup generator. The City's strategic plan includes health and safety investments, such as water system monitoring and programmatic support for vulnerable groups, which align with resilience goals.
Emergency Shelter – Chapel Hill Church	**Exposure: Low–Moderate** – While not in a high-risk flood or wildfire zone, low-income housing complexes in Gig Harbor could still be affected by road closures, power outages, or smoke events during regional emergencies (Figure 5). **Sensitivity: Moderate** – The church is the primary destination for people needing shelter during inclement weather events but has limited utilization:	**Moderate** – The City reports a well-organized sheltering system with adequate capacity based on recent inclement weather events. Regional partnerships and public education events build response capacity, but communication with houseless residents and other health-sensitive groups during climate events remains an area for

Asset	Climate Risk	Adaptive Capacity
	During recent inclement weather events, only a small handful of individuals have visited the shelter.	improvement, according to the City's Health, Housing, and Human Services Manager.
Food Bank – FISH Food Bank and Community Services	**Exposure: Low–Moderate** – The FISH Food Bank is not located in a high flood zone but could be affected by disruptions to road access or utility services during severe weather (Figure 5). **Sensitivity: Moderate** – As the primary food and personal hygiene supply distribution center for the peninsula, the facility is sensitive to supply chain disruptions and increased demand during emergencies.	**Low-Moderate** – FISH provides about a week's worth of food to visitors. However, the food bank is only open on weekdays during the day and closes during severe weather events. Increasing the availability of food assistance could help those with unexpected financial needs during extreme events.
Low-Income Housing	**Exposure: Low** – While not located in a high-risk flood or wildfire zones, affordable housing in Gig Harbor including Section 8, public, approved low-income, and naturally-occurring affordable units could be affected by extreme heat, power outages, and wildfire smoke events (Figure 5). **Sensitivity: Moderate** – Affordable housing plays a key role during inclement weather events, as groups who are unhoused, lack reliable shelter, or those who pay more than 30% of household income for housing costs are at heightened risk of experiencing poor health outcomes during or following extreme weather events (Bezgrebelna, et al., 2021).	**Low** – Low-income tenants have fewer financial resources to prepare for, respond to, or recover from inclement weather events, wildfire smoke events, or power outages, e.g., by installing air conditioning units. As tenants, they also have less control over the condition of their individual units, e.g., whether units are properly weatherized.

Sector 2: Economy

Overview and Key Takeaways

The City's economy is anchored by three key industries: healthcare and social assistance (21.5% of employment in the City), educational services (10.9% of employment in the City), and retail trade (10.6% of employment in the City). While 80% of residents are employed outside the City, the local harbor remains a vital hub for tourism and business (City of Gig Harbor, 2025). The City's downtown waterfront area includes many local businesses and recreation opportunities, as well as community and cultural resources that are significant to the identity of Gig Harbor.

Access to the Harbor is foundational for local tourism, recreation, and commercial fishing. Waterfront access and the infrastructure that supports these activities are particularly vulnerable to sea level rise, coastal flooding, and storm surge.

Local Industries and Businesses

Climate change introduces risks to local industries and businesses through sea level rise, extreme heat, flooding, and wildfire smoke. Many of these risks particularly affect the waterfront and tourism-dependent industries.

Table 9 outlines the exposure, sensitivity, and overall vulnerability of the City's key industries to climate-related risks.

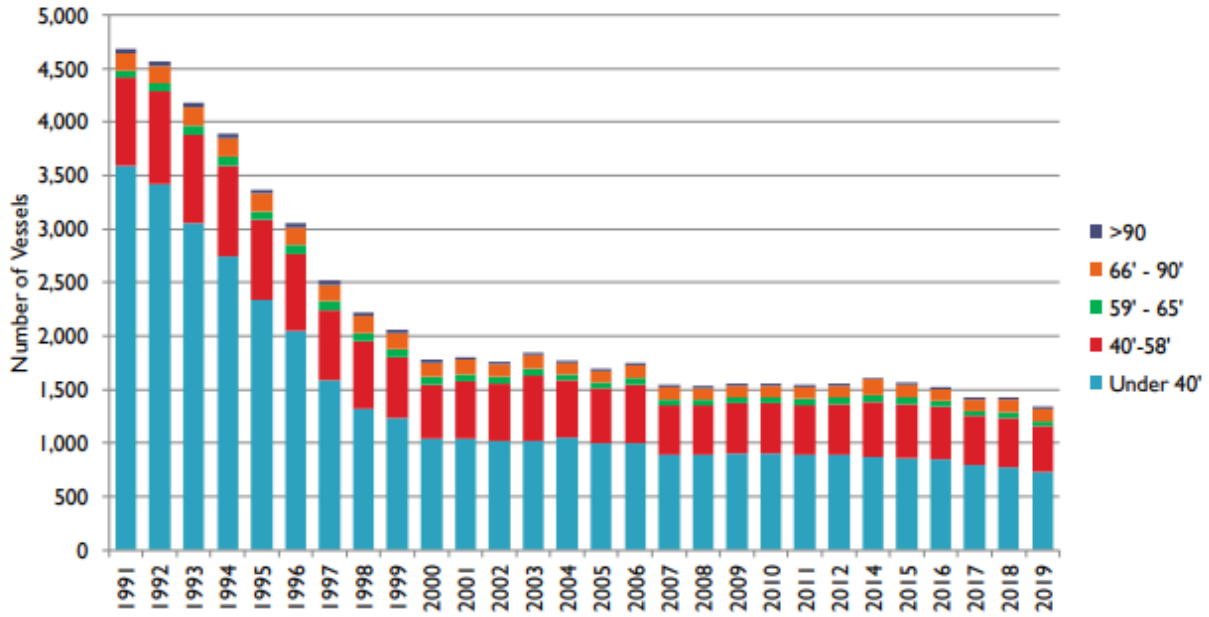
The City has three primary business districts—Historic Downtown, Uptown, and North Gig Harbor—each with a distinct character and mix of commercial activity. The Historic Downtown, located along the waterfront, is home to many local businesses, retail shops, and restaurants. Uptown Gig Harbor is a larger, open-air shopping center with a variety of retail, services, and dining options. North Gig Harbor offers big-box shopping and is more auto-oriented. While all three contribute to the City's economy, they face varying levels of exposure and sensitivity to climate risks.

Table 9: Climate vulnerability of local industries and businesses

Climate Risk	Exposure	Sensitivity - Adaptive Capacity	Vulnerability
Sea Level Rise	High	Moderate-High	Moderate-High
Extreme Heat	Moderate	High	Moderate
Extreme Precipitation & Flooding	Moderate	Moderate-High	Moderate
Wildfire and Smoke	Low	Moderate	Moderate

The overall number of commercial fishing vessels under 40 ft has been declining since 1991 (Figure 6). Commercial fishing has been historically important both economically and culturally to the City of Gig Harbor.

Figure 6: Washington State commercial fishing fleet trends by vessel size (Davido Consulting Group, 2020)



CLIMATE RISKS

Table 10 evaluates climate risks and adaptive capacity for business districts and local industries in the City.

Table 10: Climate risks to City business districts and local industries

Asset	Climate Risk	Adaptive Capacity
Business Districts (Uptown, Historic Downtown, North Gig Harbor)	**Exposure: Moderate–High** – Downtown is vulnerable to sea level rise, flooding, and king tides. All districts face increased wildfire smoke and heat exposure, particularly Uptown and North Gig Harbor due to limited shade and high pavement coverage. **Sensitivity: Moderate–High** – Outdoor shopping layouts reduce usability during extreme heat and smoke events. Small, locally owned businesses have limited capacity for adaptation and service-sector workers face higher economic and health risks during disruptions (Endendijk, et al., 2024).	**Low–Moderate** – The City promotes walkability and infill development, but lacks targeted policies for wildfire smoke, business continuity, or cooling infrastructure.
Harbor Access & Commercial Fishing	**Exposure: High** – Docks, piers, and harbor access are vulnerable to sea level rise, coastal flooding, and storm surge. Ocean warming and acidification threaten marine species like salmon, which are critical to local fishing (State of Salmon in Watersheds, n.d.). **Sensitivity: Moderate** – Older harbor infrastructure and low-lying access roads are especially vulnerable to flooding. Salmon	**Low–Moderate** – The City has invested in resilience upgrades at Skansie Brothers Park, integrating structural accommodations for sea level rise. The City has also invested in changes to Ancich Waterfront Park and associated community paddlers dock to protect against sea level rise and coastal flooding (Washington Coastal Resilience Network , 2025).

Asset	Climate Risk	Adaptive Capacity
	declines have already impacted the viability of Washington's commercial fishing fleet (Figure 6).	
Local Tourism	**Exposure: Moderate–High** – Waterfront tourism is increasingly impacted by sea level rise, king tides, wildfire smoke, and extreme heat. Key visitor assets are concentrated in flood-prone, low-lying areas near the harbor (Figure 7). **Sensitivity: Moderate–High** – Flooding disrupts access to trails, parks, and waterfront businesses. Heat and smoke reduce outdoor recreation and tourism appeal, especially during peak seasons (US EPA, 2025).	**Low** – The City currently lacks targeted plans for tourism resilience. However, resilience projects along the waterfront, such as structural accommodations at Skansie Brothers Park, may have a positive impact on bolstering tourism resilience.

Figure 7: Local business and king tide flooding in December 2022 (Gig Harbor Police, 2022)

Community and Cultural Resources

The City hosts a variety of rich cultural and community resources, including the historic downtown, the Harbor, and various community resources. These resources face increasing climate risks such as sea level rise, extreme heat, extreme precipitation and flooding, and wildfire and smoke impacts. The City can incorporate policies into its comprehensive plan to protect and enhance these cultural resources from climate risks.

Table 11: Climate vulnerability of community and cultural resources

Climate Impact	Exposure	Sensitivity - Adaptive Capacity	Vulnerability
Sea Level Rise	High	Moderate-High	Moderate-High
Extreme Heat	Low	Low	Low
Extreme Precipitation & Flooding	Moderate	Moderate-High	Moderate
Wildfire and Smoke	Low	Moderate-High	Moderate-High

Climate Risks

Table 12 evaluates climate risks and adaptive capacity for community and cultural assets in the City.

Table 12: Climate risks to community and cultural assets

Asset	Climate Risk	Adaptive Capacity
Historic Downtown	**Exposure: High** – As a central cultural and economic hub along the waterfront, Downtown Gig Harbor is highly exposed to sea level rise, storm surge, and king tides (**Error! Reference source not found.**). Wildfire risk is low, however, hotter and drier summers are likely to increase the risk of fire danger days in Pierce County. **Sensitivity: Moderate–High** – Low-lying properties have already experienced flooding (e.g., Netshed No. 9). Buildings face long-term risks from sea level rise and	**Moderate** – The City's Climate Action Plan and Shoreline Master Program include policies that encourage resilient design, shoreline protection, and adaptive reuse of historic structures, supporting long-term climate resilience (Gig Harbor, 2022; Gig Harbor, 2023).

Asset	Climate Risk	Adaptive Capacity
	intensified storms. Most of the Historic Downtown is located in the WUI Interface or Intermix, demonstrating an increased risk of fire damage in a wildfire event (Figure 9).	
Harbor History Museum	**Exposure: Moderate** – Located on the waterfront, the Museum faces sea level rise, coastal flooding, and storm surge, especially during king tides. **Sensitivity: High** – The Maritime Gallery has experienced repeated flooding and additional impacts on building infrastructure and visitor access are expected as sea levels rise (Armstrong, 2022).	**Low–Moderate** – While no formal plan is in place, the Museum is taking action by elevating exhibits like the Midway School to reduce future risk (Armstrong, 2022)
Gig Harbor Sand Spit and Lighthouse	**Exposure: Low** – While positioned at the mouth of the harbor and susceptible to sea level rise, king tides, and flooding, the lighthouse equipment itself is located well above projected future king tide levels, reducing direct operational risk. **Sensitivity: Low** – The sand spit and associated lighthouse are owned by the City but located outside City limits.	**High** – The Public Works Operations Division maintains the structure, which is recognized by the U.S. Coast Guard as a Private Aid to Navigation (PAToN). While equipment is elevated, flooding and erosion still pose risks to the historic structure and limit public access to the surrounding park and shoreline.[2]

[2] Information on lighthouse ownership, location, and elevation of operational equipment was confirmed by the City of Gig Harbor Public Works Director.

Figure 8: Map of the City's Historic Downtown, the Harbor History Museum, and the Lighthouse in 100-year and 500-year flood zones and projected sea level rise by 2100

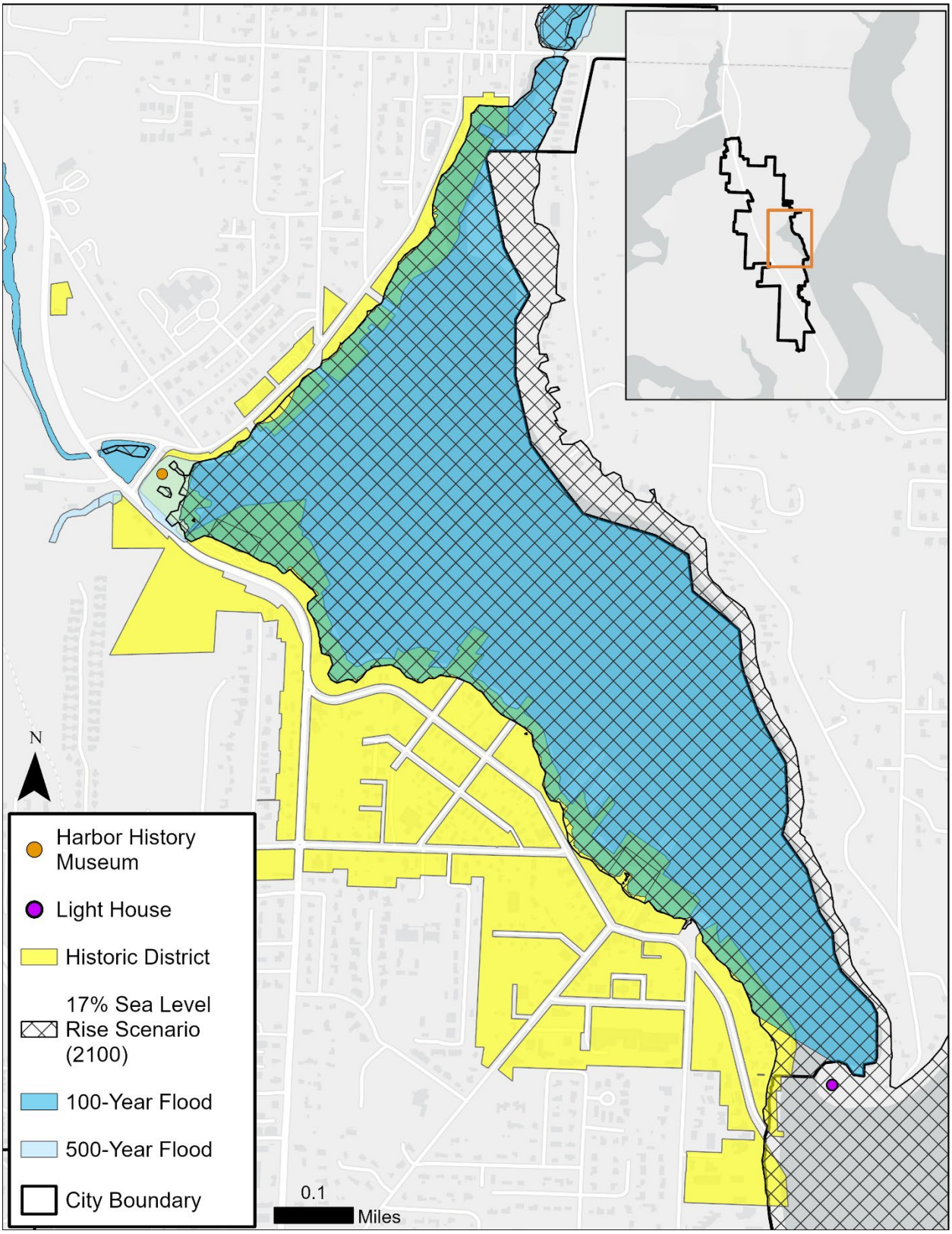
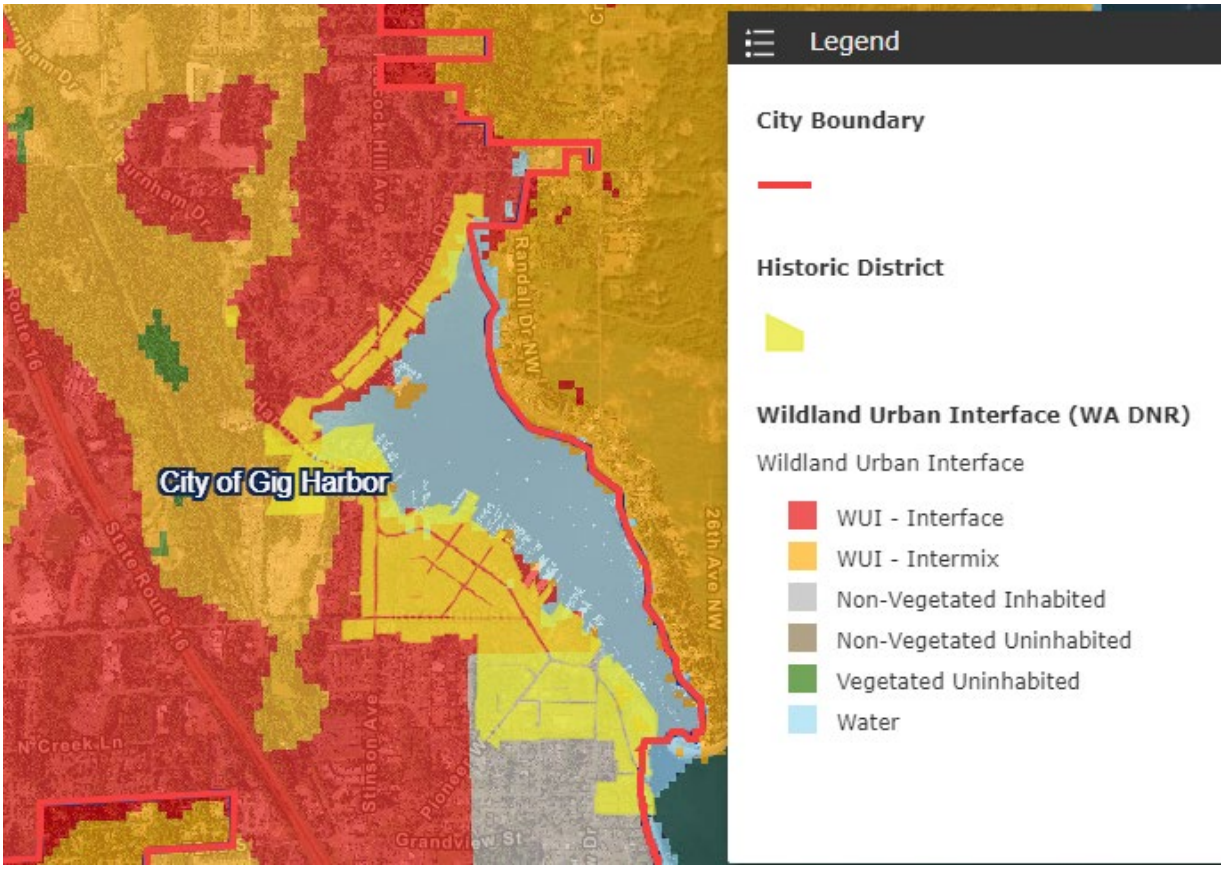


Figure 9. Gig Harbor Historic Downtown with wildland urban interface overlay



Sector 3: Open Space

Overview and Key Takeaways

The City's open space system includes parks, trails, and shorelines that connect communities and support local economies and ecosystems. Climate change is expected to increasingly impact these spaces by accelerating coastal erosion, flooding, and extreme heat, all of which threaten public access, natural habitat, and recreational infrastructure. In some areas, shoreline development and armoring have reduced the natural resilience of coastal systems. Waterfront parks like Donkey Creek Park, Gig Harbor Sand Spit and Lighthouse, and Austin Park at txʷaalqəɬ Estuary face the greatest climate exposure, while inland parks and trails remain sensitive to stormwater, slope erosion, and extreme heat.

Parks and Trails

The City offers a well-connected network of parks and trails that provide access to nature, recreation, and scenic views across the City. From waterfront parks and historic landmarks to wooded trails and open green spaces, these areas serve as vital community assets supporting public health, ecological function, and local identity. Many are located along the shoreline or near creeks, making them especially vulnerable to climate-related hazards such as sea level rise, flooding, erosion, and extreme heat. City parks that were analyzed for vulnerability to climate impacts were chosen by the CPAT from a list obtained from City maps. Table 13Table 13 outlines the exposure, sensitivity, and overall vulnerability of the City's parks and trails to climate-related risks.

Table 13: Climate vulnerability of parks and trails

Climate Risk	Exposure	Sensitivity - Adaptive Capacity	Vulnerability
Sea Level Rise	Moderate-High	Moderate	Moderate-High
Extreme Heat	Moderate	Low-Moderate	Moderate
Extreme Precipitation & Flooding	Moderate	Moderate	Moderate
Wildfire and Smoke	Low	Low-Moderate	Low

Climate Risk	Exposure	Sensitivity - Adaptive Capacity	Vulnerability
Drought	Low-Moderate	Moderate	Moderate

Climate Risks

Table 14 evaluates climate risks and adaptive capacity for specific park and trail assets in the City.

Table 14: Climate risks to park and trail assets

Asset	Climate Risk	Adaptive Capacity
Donkey Creek Park	**Exposure: High** – Sea level rise can lead to saltwater intrusion and coastal flooding, increasing salinity in the ecosystem. Extreme heat and drought can result in low stream flow, impacting park ecosystems and creek health. **Sensitivity**: **Moderate** – Saltwater intrusion and low stream flow can threaten salmon populations (coho, chum, and steelhead), while sea level rise, coastal flooding, and extreme heat may impact park ecosystems and limit access for users (Gig Harbor, 2009).	**Moderate** – The North Creek Culvert Removal project is underway, but no site-specific plan exists. Flooding and contamination (lead, PCBs) require continued monitoring.
Crescent Creek Park	**Exposure: Moderate** – Heavy rain events can cause creek overflow and flooding, particularly along Crescent Valley Road, while drought can reduce stream flow and impact the surrounding ecosystem. **Sensitivity: Low** – Flooding along Crescent Valley Road can disrupt park access, damage infrastructure, and impact creek habitats, while drought conditions	**Low–Moderate** – Staff are aware of flooding along Crescent Valley Road, but it is not addressed in formal plans. No major damage has been reported.

Asset	Climate Risk	Adaptive Capacity
	may stress vegetation, reduce water availability for wildlife, and alter ecosystem health (Friedrich, 2023).	
Gig Harbor Sand Spit and Lighthouse	**Exposure: High** – The lighthouse is owned by the City and recognized by the Coast Guard. It poses a risk to public safety, with potential flooding projected to reach up to three feet above the structure (Figure 10).[3] **Sensitivity: Moderate–High** – Ongoing sea level rise and coastal flooding may lead to increased maintenance costs, further damage to the historic lighthouse, and reduced accessibility for visitors due to flooding of the park shore and related infrastructure.	**Low** – Despite high exposure, no formal adaptation strategies are in place.
Austin Park at txʷaalqəɬ Estuary	**Exposure: High** – The park is vulnerable to sea level rise, coastal flooding, erosion, drought, and extreme heat, which threaten infrastructure and natural habitats. Increased storm events and king tides amplify these risks, leading to ongoing challenges. **Sensitivity: Moderate–High** – Damage to park infrastructure, loss of natural habitats, and increased maintenance demands may result from worsening coastal hazards, drought stress on vegetation, and extreme heat affecting both ecological integrity and visitor access.	**Moderate** – Recent shoreline and native vegetation upgrades improve resilience to sea level rise and flooding.
Harborview Drive Trail	**Exposure: Moderate** – The trail connecting to downtown Gig Harbor is vulnerable to sea level rise, coastal flooding, and erosion, which may impact its	**Moderate** – The City actively manages flooding by closing roads and trails during high water events.

[3] This information was shared during CPAT Meeting 3 on February 27, 2025.

Asset	Climate Risk	Adaptive Capacity
	accessibility and scenic views. Increased storm events and king tides further heighten these risks. **Sensitivity: Moderate** – As a key route for recreation and transportation, disruptions from flooding and erosion could limit access, degrade the trail's condition, and create long-term maintenance challenges.	
Cushman Trail	**Exposure: Low–Moderate** – The trail faces climate risks such as increased stormwater runoff, erosion, landslides, rising temperatures, and drier conditions, which could damage the trail surface and surrounding slopes. **Sensitivity: Low–Moderate** – Erosion and landslides may threaten trail stability, while reduced shade cover from rising temperatures and drier conditions could impact both safety and comfort for trail users.	**Low** – Current plans do not address heat, erosion, or stormwater impacts.

Figure 10: Gig Harbor Sand Spit and Lighthouse during the 2022 king tide flood (Dammeier, 2022)

Shoreline

The City includes shorelines along Colvos Passage and the Tacoma Narrows. These areas, part of South Puget Sound, provide critical ecological functions, support public safety, and sustain local industries like tourism and fishing (Gig Harbor, 2022). However, the shorelines face increasing climate risks such as sea level rise, flooding, landslides, and habitat degradation. Table 15 outlines the exposure, sensitivity, and overall vulnerability of the City's shorelines to climate-related risks.

Table 15: Climate vulnerability of shorelines

Climate Risk	Exposure	Sensitivity - Adaptive Capacity	Vulnerability
Sea Level Rise	High	Moderate	High
Extreme Heat	Moderate	Moderate	Moderate
Extreme Precipitation & Flooding	Moderate	Moderate	Moderate
Drought	Low	High	Low
Wildfire and Smoke	Low	High	Low

Climate Risks

To balance shoreline development with climate resilience, the City divides its shorelines into four distinct planning segments (A–D) based on their ecological functions, land use, and zoning. It manages these segments through land use policies, shoreline management programs, and environmental protection ordinances.

Table 16 evaluates climate risks and overall vulnerability for each shoreline planning segment in the City. The following section addresses adaptive capacity for these segments.

Table 16: Climate risks to shoreline planning segments

Asset	Climate Risk
Segment A Eastern Urban Growth Area (UGA) along Colvos Passage to the Gig Harbor spit Length: approximately 1,656 feet	**Exposure: High** – Steep, landslide-prone feeder bluffs along Colvos Passage and Tacoma Narrows are susceptible to erosion from increased storm intensity, sea level rise, and groundwater seepage **Sensitivity: High** – The stability of the area is influenced by its reliance on natural sediment supply, which can be disrupted by development or changing environmental conditions, and by ongoing issues with chronic slope instability (Mauger, 2015).
Segment B North of the Gig Harbor spit to North Harborview Drive NW/Rust Street Intersection Length: approximately 9,614 feet	**Exposure: Moderate–High** – The area is vulnerable to shoreline erosion due to increased wave energy and more frequent storm surge events. **Sensitivity: Moderate** – Dense shoreline development and the lack of large woody debris and riparian vegetation increase the area's vulnerability to erosion, reduced habitat quality, and decreased natural flood protection.
Segment C North Harborview Drive NW/Rust Street Intersection to Harborview Drive end/Old Ferry Landing Length: approximately 11,720 feet	**Exposure: Moderate** – Extreme precipitation events are expected to increase the risk of both flooding and landslides. **Sensitivity: Moderate** – Shore modifications have reduced natural resilience, limited sediment transport, and reduced estuarine wetland functionality.
Segment D Harborview Drive end/Old Ferry Landing to southern UGA along the Tacoma Narrows Length: approximately 13,092 feet	**Exposure: High** – Steep, landslide-prone feeder bluffs along Colvos Passage and Tacoma Narrows are susceptible to erosion from increased storm intensity, sea level rise, and groundwater seepage. **Sensitivity: High** – The area is more vulnerable to climate impacts due to open shorelines with limited natural barriers and increased urbanization.

Adaptive Capacity

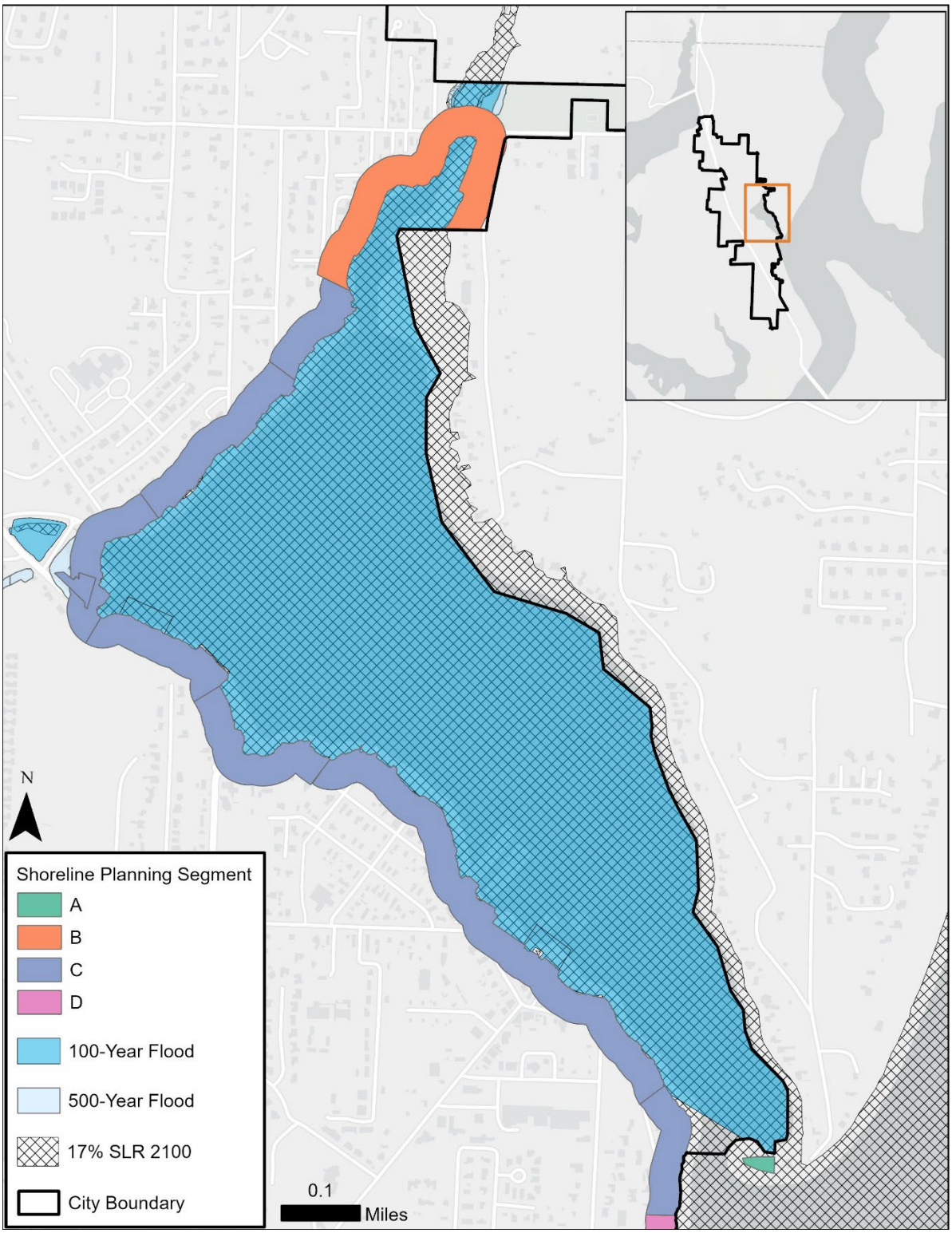
Moderate

The City has taken steps to strengthen shoreline resilience both through ecological restoration and planning efforts. Restoring and protecting natural features—such as feeder bluffs, estuarine wetlands, and eelgrass beds—can help bolster the City's natural resilience to storm surge and erosion, as these ecosystems act as buffers against coastal hazards (Shipman et al., 2014). The City's Shoreline Management Plan prioritizes vegetation restoration, shoreline inventories, and collaboration with the West Sound Watersheds Council for ecosystem recovery (Gig Harbor, 2022).

Resilience actions include elevating historic netsheds, integrating 2.5 feet of sea level rise into future planning, and initiating restoration at Donkey and Crescent Creeks, especially the protection of large woody debris and riparian vegetation. Public access areas—such as parks and piers—present opportunities for managed retreat (Gig Harbor, 2022; Ecology, 2023).

Shoreline armoring has reduced natural resilience in some areas by disrupting coastal habitats (Toft et al., 2013). The City is addressing this through active restoration at the Eddon Boat property and upcoming public education efforts.

Figure 11: Flood and sea level rise risk of shoreline segments.



Sector 4: Infrastructure

Overview and Key Takeaways

Climate change is expected to increasingly disrupt the City's water and transportation infrastructure through sea level rise, coastal flooding, drought, and extreme heat—hazards that threaten the reliability, safety, and longevity of critical systems. The City's transportation network includes arterial roads, local streets, sidewalks, bike lanes, and transit infrastructure, while the water system is supported by aquifers, stormwater infrastructure, and private wells. Many of these assets are located near the shoreline or in low-lying areas, making them more vulnerable to flooding and erosion. Drought threatens groundwater recharge, while high temperatures can degrade road surfaces and reduce comfort and safety for pedestrians and cyclists. Climate risks vary depending on asset location, system redundancy, and the presence of mitigation policies, all of which influence overall vulnerability and capacity to respond.

Water Resources

Water resources in the City, including stormwater infrastructure, wastewater systems, and groundwater aquifers, are essential for public health, environmental protection, and community resilience. These systems face growing climate risks from sea level rise, flooding, and drought, particularly in low-lying areas and along the shoreline where infrastructure is most exposed. Table 17 outlines the exposure, sensitivity, and overall vulnerability of the City's water resources to climate-related risks.

Table 17: Climate vulnerability of water infrastructure

Climate Impact	Exposure	Sensitivity-Adaptive Capacity	Vulnerability
Sea Level Rise	High	Moderate-High	High
Extreme Heat	Low	Low	Low
Extreme Precipitation & Flooding	Moderate-High	Moderate-High	High
Drought	Moderate-High	Low-Moderate	Moderate-High
Wildfire and Smoke	Low	Low-Moderate	Low

Stormwater

The City's stormwater infrastructure, including 97 miles of pipelines, 4,667 catch basins, and 31 outfalls, faces increasing risks from climate change. Extreme precipitation can overwhelm the system, leading to flooding and runoff impacts in various areas (City of Gig Harbor, n.d). Sea level rise heightens the risk of coastal flooding and saltwater intrusion, particularly in the 320 Zone (see Appendix H), while drought conditions may reduce groundwater recharge, affecting overall drainage capacity.

Climate Risks

Table 18 evaluates climate risks and adaptive capacity for stormwater infrastructure assets in the City.

Table 18: Climate vulnerability of stormwater infrastructure

Asset	Climate Risk	Adaptive Capacity
Catch Basins	**Exposure: Moderate** – Heavy rainfall, tidal flooding, and wildfire debris can clog inlets, leading to backups and localized street flooding. The majority of catch basins located in lower coastal areas are more exposed to coastal flooding. **Sensitivity: Low** – Not all 4,667 catch basins are equally sensitive to climate hazards. The catch basins will likely remain able to prevent flooding and protect water quality, due to their number and locations.	**Moderate** – The City has labeled catch basins with "Only rain down the storm drain" signage and includes street sweeping in its routine maintenance, though detailed protocols are limited. Approximately half of the catch basins are on private property, presenting additional management challenges.
Pipes	**Exposure: Low–Moderate** – Increased precipitation, erosion, and wildfire debris can block pipes. Sea level rise and tidal influence may allow saltwater intrusion, leading to corrosion and structural degradation. **Sensitivity: Moderate** – Pipes are especially sensitive during 25- and 100-year storm events. Trunkline 2 on Soundview Drive currently lacks the capacity to handle these extreme conditions (Gig Harbor, 2018).	**Moderate** – The City has identified several flood-prone areas, including North Creek Basin and coastal neighborhoods. While Trunkline 2 and two other trunklines currently cannot handle 25- or 100-year storm events, the City has plans in place to upgrade these lines to meet design standards (Gig Harbor, 2018).

Asset	Climate Risk	Adaptive Capacity
Drainage Basins	**Exposure: Moderate** – Intense storms, changing precipitation patterns, and drought contribute to runoff, erosion, flooding, and water quality impacts. **Sensitivity: Low** – Drainage basins in the City generally have low sensitivity, since they can still function effectively under most conditions. Some areas such as Skansie, North Creek, Peacock, and Stinson-Rosedale (see Appendix G) experience more frequent flooding, however this appears to be more associated with other stormwater infrastructure issues than with the basins themselves.	**Moderate** – All drainage basins within City limits are prioritized for stormwater improvements, with a focus on the North Creek Basin, where infrastructure upgrades aim to improve water quality and mitigate localized flooding risks.
Outfall Pipes	**Exposure: High** – Outfall pipes are exposed to heavy runoff from extreme precipitation and saltwater intrusion from sea level rise. Saltwater intrusion increases the risk of corrosion and backflow. **Sensitivity: Moderate** – Saltwater intrusion from sea level rise can compromise structural integrity. Higher tides, even with 17% probability of SLR projections , can reduce stormwater drainage efficiency and even reverse wastewater outfall flow in (EPA, n.d.) Several outfalls are already near or over capacity during 100-year flow events. Outfall K exceeds its limit with 5.00 cfs against a 4.0 cfs capacity, Outfall J reaches 6.50 cfs out of 6.6 cfs, and Outfall H handles 0.70 cfs of its 1.0 cfs capacity. These conditions make them especially sensitive to increased precipitation and sea level rise (Gig Harbor, 2018).	**Moderate–High** – The City is actively upgrading outfall structures to improve resilience to stormwater and tidal impacts, though outfalls on private land continue to present access and maintenance challenges (Gig Harbor, 2018).

Wastewater

The Gig Harbor Wastewater Treatment Plant currently serves approximately 11,490 residents, managing millions of gallons of wastewater each year through a 57-mile sewer network and 17 lift stations. The City is the only local government with a designated Urban Growth Area and is the provider of sewer service on the Gig Harbor Peninsula (Sewer Utility, 2010). While the system is actively maintained, it faces growing climate threats—including saltwater intrusion, flooding, and extreme weather—that may lead to system overflows, pump failure, pipe corrosion, and potential discharge into Gig Harbor Bay, particularly in flood-prone areas such as Borgen Boulevard, Burnham Drive, and the waterfront (FEMA, 2021).

Climate Risks

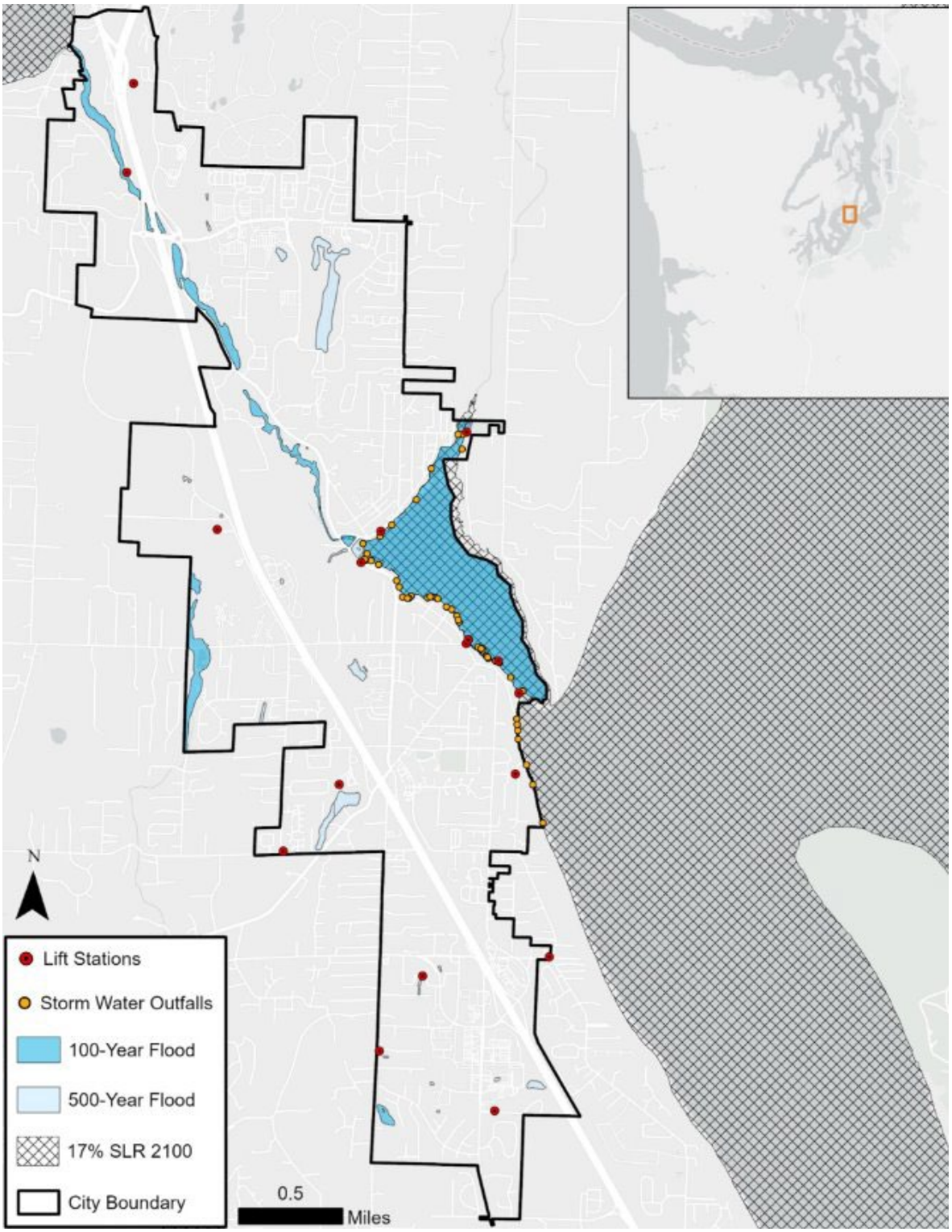
Table 19 evaluates climate risks and adaptive capacity for wastewater infrastructure in the City.

Table 19: Climate vulnerability of wastewater infrastructure

Asset	Climate Risk	Adaptive Capacity
Treatment Plant	**Exposure: Low** – The facility is exposed to heat and drought conditions that may affect water availability for treatment processes, with potential indirect impacts from upstream flooding events that could alter influent water quality. **Sensitivity: Low** – Warmer water and lower water supplies could cause operational challenges, such as odor issues and equipment stress, if not planned for and managed.	**Moderate** – The City completed a major upgrade to the treatment plant in 2016 (Phase II) (Carollo, 2024).
Lift Stations	**Exposure: Moderate–High** – Lift stations located near the coastline are vulnerable to flooding, storm surges, and sea level rise, as well as extreme weather events that can trigger power outages—disrupting lift system operations and wastewater transport (Figure 12).	**Moderate–High** – Many lift stations are located in areas vulnerable to sea level rise and flooding see (Appendix D). While some have been serviced, the City plans to upgrade high-risk stations—such as Lift Station 5—with work scheduled for 2025–2026 (CPAT Meeting).

Asset	Climate Risk	Adaptive Capacity
	Sensitivity: Moderate – Lift stations are sensitive to power disruptions that affect pump operations. Flooding and saltwater intrusion can reduce pump efficiency and lead to mechanical failures or damage to equipment.	
Sewer Main	**Exposure: Moderate–High** – Several mains are situated in flood plains (e.g., near Borgen Boulevard, Burnham Drive, and the waterfront). The area is exposed to flooding, extreme precipitation, and saltwater intrusion as a result of sea-level rise. **Sensitivity: Moderate** – Sewer mains are sensitive to flooding events that can cause overflows and backups. Susceptible to saltwater intrusion, leading to increased maintenance needs and potential structural degradation.	**Low–Moderate** – Targeted upgrades have been made in flood-prone areas, including increasing pipe diameters along Harborview and Burnham Drive from 15 to 18 inches. Broader system improvements are still needed (Carollo, 2024).
Manholes	**Exposure: Low** – Exposure to heavy rainfall, flooding, and coastal influences (saltwater and storm surges) is low and similar to sewer mains. **Sensitivity: Low** – Manholes are sensitive to physical damage from floodwater and corrosion due to saltwater intrusion.	**Low–Moderate** – The City lacks a formal plan to address manhole-specific vulnerabilities but has capital projects underway to upgrade select structures.

Figure 12. Lift stations and outfalls in 100- and 500-year flood zones and sea level rise



Water Supply

The City's water supply infrastructure faces growing climate risks, including sea level rise, extreme precipitation, and drought. While newer storage tanks and high-capacity wells enhance resilience, aging tanks, vulnerable wells, and coastal pipelines may require upgrades to withstand future conditions. Saltwater intrusion, flooding, and supply deficits pose key challenges, with Well 2 and its aquifer recharge area particularly susceptible to saltwater intrusion from sea level rise.

Climate Risks

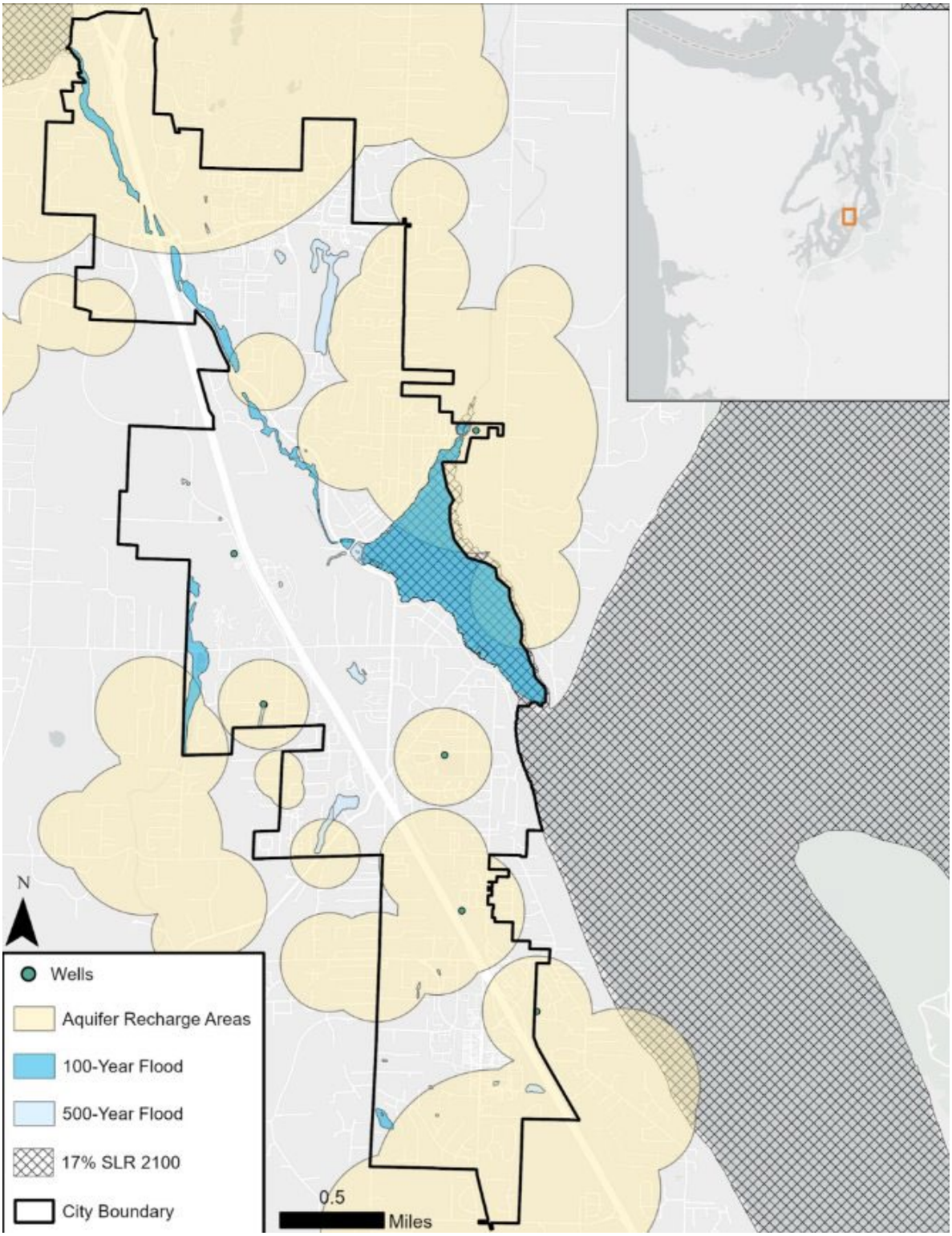
Table 20 evaluates climate risks and adaptive capacity for water supply infrastructure assets in the City.

Table 20: Climate vulnerability of water supply infrastructure

Asset	Climate Risk	Adaptive Capacity
Storage Tank	**Exposure: Low** – Tanks may be exposed to extreme precipitation, flooding, storm surge (especially in low-lying areas), drought, and extreme heat, which can affect supply (EPA, 2025). **Sensitivity: Low** – Tanks are vulnerable to structural damage and foundation erosion during flood events, particularly in 100- and 500-year floodplains. High temperatures may degrade materials and compromise tank integrity.	**Moderate** – The City's six water storage tanks hold a combined 4.75 million gallons. The North Tank has high adaptive capacity due to its size and newer design, while Grandview A, B, and East Tank may need upgrades to maintain future system reliability (Carollo, 2024).
Wells	**Exposure: Moderate–High** – Public and private wells face risks from sea level rise, saltwater intrusion, heavy rainfall, and prolonged drought that can reduce groundwater availability. **Sensitivity: Moderate** – Wells are vulnerable to contamination from saltwater and runoff, groundwater fluctuations, and drought-related water quality and supply issues. The Pierce County Coordinated Water System Plan warns of a potential water supply deficit by 2040. Well 2 and Well 10 and their corresponding aquifer recharge areas are especially at risk of saltwater intrusion (Carollo, 2024).	**Low–Moderate** – The City tracks well performance through its Water System Plan. Well 2 and Well 3 have strong pumping capacity and redundancy, while Well 1 and Well 10 shows limited or no operational capacity, highlighting gaps in overall availability (Carollo, 2024).

Asset	Climate Risk	Adaptive Capacity
Pipelines	**Exposure: Low** – Pipelines are exposed to flooding, storm surge, and rapid weather shifts, including saltwater intrusion in coastal areas. **Sensitivity: Moderate** – Smaller coastal pipes (e.g., 8-inch lines) are more prone to erosion, physical stress, and material degradation from heat and saltwater, increasing the risk of leaks or failures (Tansel & Kaixuan, 2022).	**Low–Moderate** – Systemwide pipe upgrades are part of the City's infrastructure renewal strategy. However, no targeted improvements are currently planned for vulnerable low-lying coastal areas exposed to flooding and saltwater intrusion.

Figure 13: Wells and aquifer recharging areas in 100- and 500-year flood zones and sea level rise



Transportation

The City's transportation infrastructure is crucial for emergency management, maintaining access to goods and services, and supporting a thriving tourism industry. The City's transportation system consists of a system of roads and highways, active transportation elements including bike lanes and sidewalks, and public transportation services including Pierce County Transit buses and the Gig Harbor Ferry (which runs in the summer months) (City of Gig Harbor, 2025). Both the public transit system and roadways connect the City to surrounding jurisdictions: Pierce County Transit buses connect to the City of Tacoma while State Route 16 links the City to the rest of Pierce County to the southeast and to Kitsap County to the north. Bike lanes and sidewalks support Gig Harbor's non-driving population getting to appointments and activities, as well as recreation.

Climate change poses several key threats to the City's transportation system. Sea level rise, especially in combination with storm surges, may cause coastal flooding which can impact roads and disrupt transportation services. Extreme precipitation events increase the risk of landslides that can block roads and limit connectivity, while hotter temperatures wear down asphalt more quickly, and cause it to become more brittle, leading to deteriorated road conditions that require more frequent maintenance. In cases of extreme heat, roads can also buckle (Chen, Xu, Wu, & Zheng, 2010).

Table 21 outlines the exposure, sensitivity, and overall vulnerability of the City's transportation infrastructure to climate-related risks.

Table 21: Climate vulnerability of transportation infrastructure

Climate Impact	Exposure	Sensitivity-Adaptive Capacity	Vulnerability
Sea Level Rise	Moderate	Moderate	Moderate
Extreme Heat	Moderate	Moderate-High	Moderate
Extreme Precipitation & Flooding	High	Moderate	Moderate-High
Drought	Low	Low	Low
Wildfire and Smoke	Low-Moderate	Moderate	Moderate

Roads and Highways

Gig Harbor's is connected to Tacoma, Kitsap County, and beyond by State Route 16, which also serves as a primary north-south route for travel within the city. Some neighborhoods have streets laid out in a grid pattern, though as a function of geography and urban planning, not all neighborhoods can have roads on a grid system. The City classifies roads by freeway, principal artery, minor artery, collector road, and local road. Centers of importance (identified in the tables below and in Appendix I) are connected to each other by primary and secondary arteries, such as Borgen Road, Peacock Hill Ave, Harborview Drive, Pioneer Way, and Point Fosdick Drive (City of Gig Harbor, 2025). Primary climate hazards to roads and highways include extreme heat, which can degrade asphalt, and flooding, which can also require more maintenance and impede ability to travel on arteries (Chen, Xu, Wu, & Zheng, 2010) (EPA, 2025)

Climate Risks

Table 22 evaluates climate risks and adaptive capacity for roads and highways in the City.

Table 22: Climate risks to roads and highways

Asset	Climate Risk	Adaptive Capacity
Roads and Highways- Downtown	**Exposure: Low–Moderate** – Some roads that are primary arteries through Downtown (e.g Harborview Drive and Pioneer Way) are exposed to extreme precipitation and may but effects will likely be mostly related to increased wear and tear rather than impeded ability to travel on them. **Sensitivity: Low–Moderate** – Those same roads may to flood due to extreme precipitation events. Some redundancy maintains functionality, but detours will cause delays.	**Moderate–High** – The City has alternative routes in place for if Harborview Drive experiences coastal flooding. However, this may result in traffic delays.
Roads and Highways- Kimball Neighborhood	**Exposure: Moderate** – The Kimball Neighborhood is exposed to extreme precipitation and warming temperatures. Because is not coastal, it will not be directly affected by sea level rise.	**Moderate–High** – The City has alternative routes in place for when roads and highways experience inland flooding. The Pierce County Flood Hazard

Asset	Climate Risk	Adaptive Capacity
	Sensitivity: Low–Moderate – Few roads in this neighborhood flood. However, the area includes a significant amount of senior housing, and older adults are especially sensitive to climate impacts, which means that access for employees, caretakers, emergency responders, etc., is important.	Management Plan also identifies flood-prone areas and actions to mitigate (Pierce County, 2019).
Roads and Highways-Westside Neighborhood	**Exposure: Low–moderate** – The roads in this neighborhood are especially exposed to heat, with surface temperature categorized as severe (Figure 14). **Sensitivity: Low-Moderate** – The surface temperature of the roads will not immediately impact ability to travel on them, but over time, their condition will deteriorate.	**High** – The City of Gig Harbor Public Works actively manages road maintenance and repair. (City of Gig Harbor, n.d.)
Roads and Highways-Finholm Neighborhood	**Exposure: High** –This neighborhood is harbor-adjacent and experiences coastal flooding during king tides and storm surges, driven in part by sea level rise and extreme precipitation events. **Sensitivity: High** – The extreme precipitation may impact the ability of residents to use some roads in Finholm, which can cause delays, but alternative routes exist if the main roads are flooded.	**Moderate** – The Pierce County Comprehensive Flood Management Plan (2023) includes projects to address flooding on Harborview Drive.
Roads and Highways-Gig Harbor North	**Exposure: Low–Moderate** – Heat is the principal climate risk for roadways in this neighborhood, with warming temperatures exacerbated by asphalt and concrete from buildings and parking lots in the business district, leading to high surface temperatures.	**Low–Moderate** – Because flooding exposure is not high in this neighborhood, there are currently no actions planned to reduce flooding. The City is implementing its Urban Forest Management Plan (CPAT meeting #2), which can help address the urban heat island effect on roads.

Asset	Climate Risk	Adaptive Capacity
	Sensitivity: Low–Moderate – While some areas of Gig Harbor North are located in the 100-year floodplain, it does not include major roads (Pierce County, 2019). Gig Harbor North includes the hospital so road access is important.	

Active Transportation

Climate Risks

Gig Harbor has a network of bike lanes and sidewalks that facilitate non-motorized transportation for recreation and to move around the city. This is crucial because many of the city's older residents do not drive and rely on a combination of transit and walking to get get around (City of Gig Harbor, 2025). These bike lanes and sidewalks are most exposed to heat, where warmer temperatures can cause surfaces to become much hotter than the air temperature (Figure 14), and extreme precipitation events which are projected to increase by up to 1.1 days by mid-century (Salathé, E.P. et al., 2010).

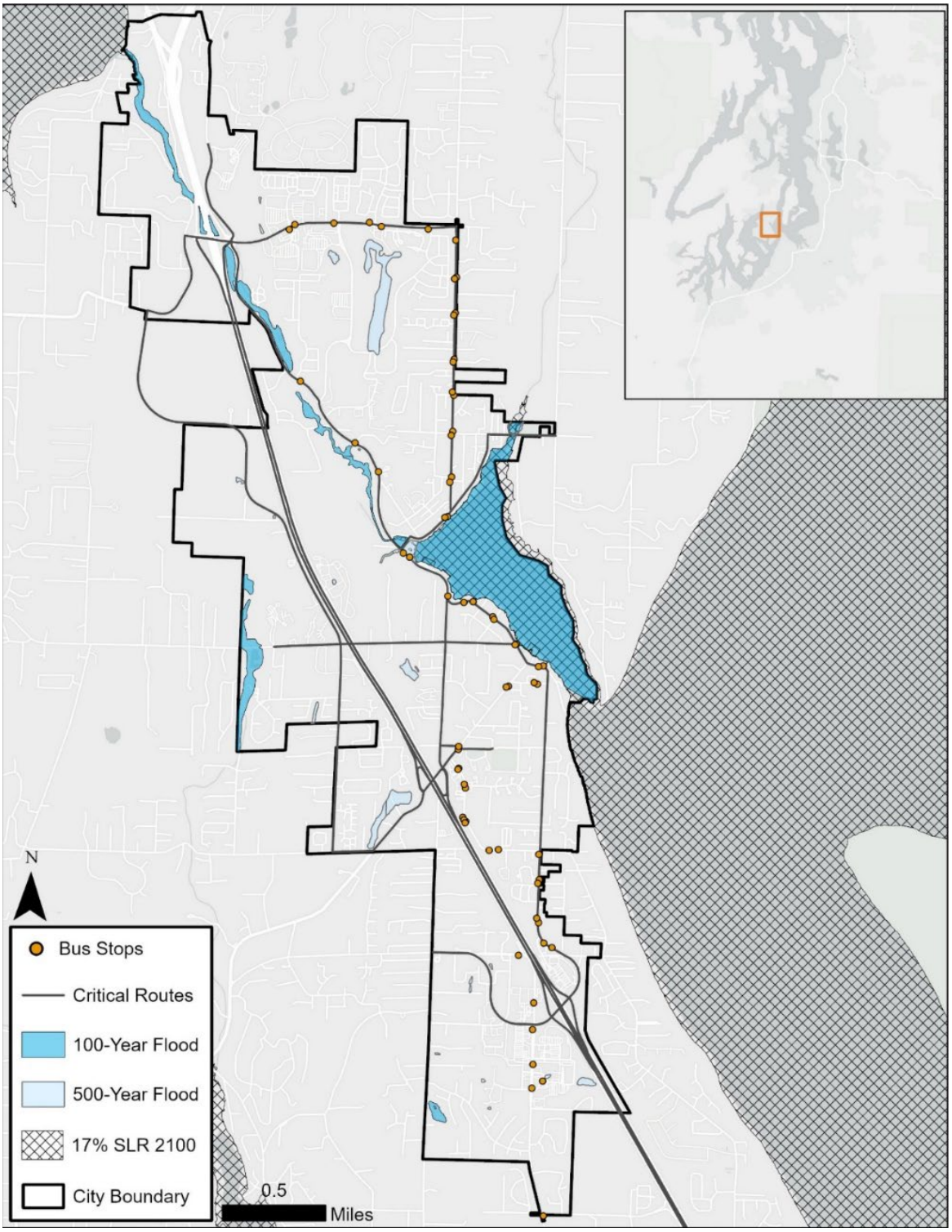
Table 23 evaluates climate risks and adaptive capacity for active transportation assets in the City.

Table 23: Climate risks to active transportation assets

Asset	Climate Risk	Adaptive Capacity
Bike Lanes & Sidewalks – Downtown (Harborview Drive)	**Exposure: Low** – The Downtown sidewalks and bike lane, specifically on Harborview Drive, are exposed to extreme precipitation and rising temperatures. **Sensitivity: Moderate** – Roads that are drivable in heavy rain or extreme heat are less bikeable, and there is less bike lane redundancy than car-road redundancy.	**Moderate** – Few protected alternatives exist if Harborview becomes impassable but this is unlikely, and traffic is not heavy on the neighborhood streets farther inland.

Asset	Climate Risk	Adaptive Capacity
Bike Lanes & Sidewalks – North Gig Harbor	**Exposure: Moderate** – Surface temperatures are categorized as "severe" in this neighborhood (Figure 15) **Sensitivity: Low–Moderate** – The neighborhood is a commercial hub that features St. Anthony's Hospital. Many of the City's older adult residents use non-motorized transport to get to medical appointments, so bike lanes and sidewalks that reach high temperatures during warmer weather and heat events may have negative impacts (Figure 15).	**High** – The planned Cushman Trail extension and new sidewalks will improve connectivity and pedestrian service levels.
Bike Lanes & Sidewalks – Westside Neighborhood	**Exposure: Moderate** – Bike use may be impacted by heavy rain and warming temperatures. **Sensitivity: Moderate** – Trails are not in mapped floodplains, but comfort is reduced in poor weather (Pierce County, 2019).	**Moderate–High** – The Urban Forest Management Plan aims to increase canopy cover, although it does not directly address bike lane shading. A new two-lane roadway with sidewalks and stormwater and/or low-impact development improvements is also planned.
Cushman Trail	**Exposure: Moderate** –This 6.2 mile paved, non-motorized trail through Gig Harbor is exposed to warm temperatures and extreme precipitation. **Sensitivity: Moderate** – Minimal shading increases discomfort during heat events, though the trail is not flood-prone.	**Low** – No current plans exist to add shade infrastructure or heat mitigation features.

Figure 14: Flood (100-year flood plain) and sea level rise risk (17%) to active transportation assets



Public Transit

Gig Harbor has two public transit services. They are the Gig Harbor Trolley and the Pierce County Bus Route 100. The Trolley route goes from Borgen Road in Gig Harbor North, down Burnham Drive to Harborview Drive, to Pioneer Way to the Kimball Neighborhood and then south to the Westside neighborhood. The Pierce County Bus Route 100 enters Gig Harbor on the North at Peacock Hill Avenue and goes south on that street until it intersects with Harborview Drive, where its route overlaps with the Trolley until it continues heading south out of Gig Harbor on Point Fosdick Drive. At least parts of the bus and trolley routes are exposed to heat and flooding (coastal and inland) during heavy precipitation, king tides, and storm surges. However, Pierce County Transit's Continuity of Operations Plan includes alternate routes.

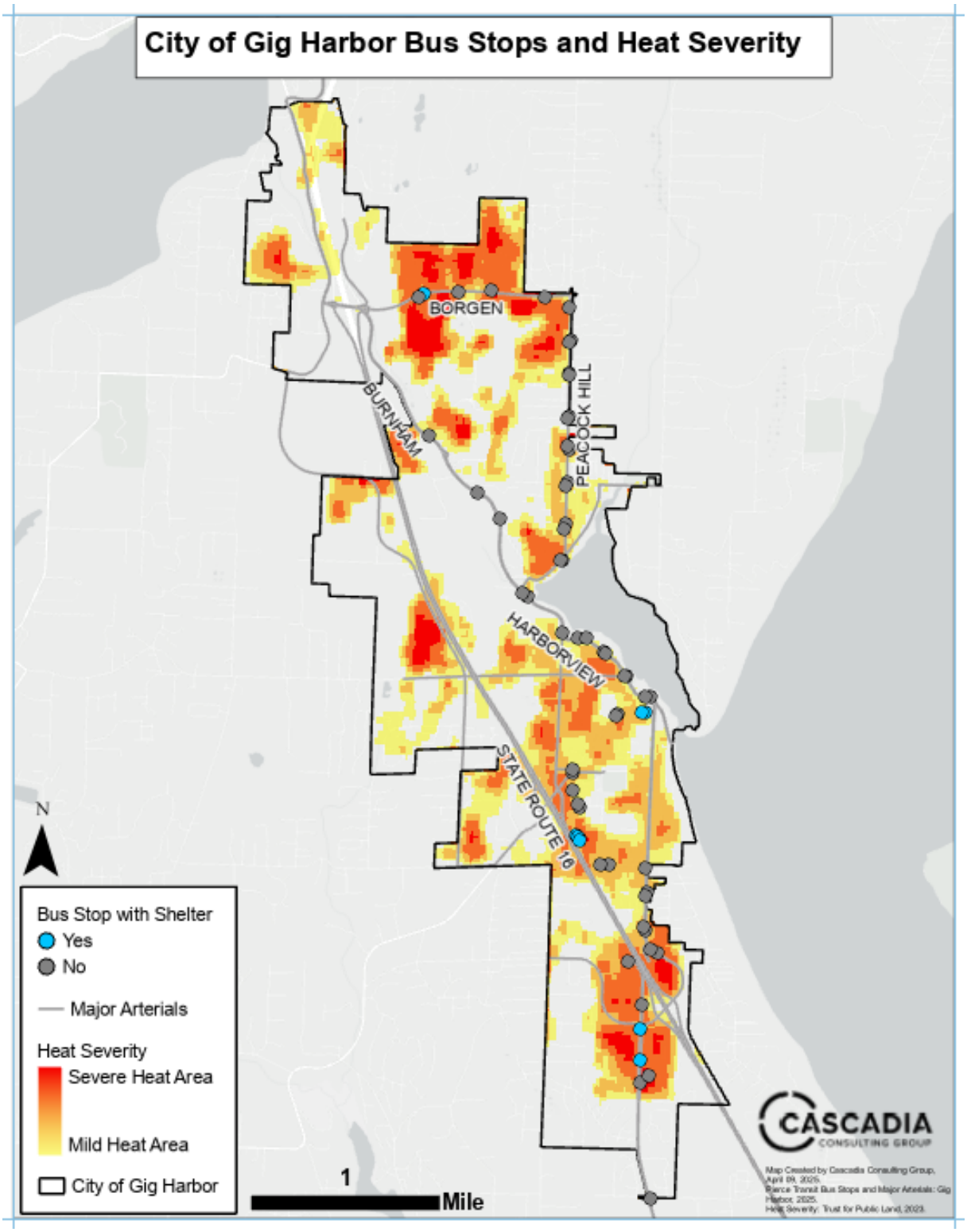
Climate Risks

Table 24 evaluates climate risks and adaptive capacity for public transit assets in the City.

Table 24: Climate risks to public transportation

Asset	Climate Risks	Adaptive Capacity
Public Transit (includes Pierce Bus Route 100 and Gig Harbor Trolley)	**Exposure: High** – Parts of transit routes, particularly on Harborview Drive, already experience flooding during storm events. Parts of Pierce County Bus Route 100 and the Trolley route also go through the hottest parts of the City (Figure 15). **Sensitivity: Low–Moderate** – While flooding disrupts service, multiple plans identify alternate routes to maintain operations (City of Gig Harbor, 2025) (Pierce Transit, 2016).	**Low–Moderate** – Pierce Transit's Flood Hazard Management Plan (2023) includes detour options for flood-impacted routes. Extreme heat is not currently identified as a direct risk in the Pierce County Destination 2040 Long Range Plan (2016), but broader climate resilience strategies—such as the Continuity of Operations Plan (2022)—will provide partial coverage for future disruptions.

Figure 15: Surface temperature and transit stops



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Appendix A: Climate Impacts Assessment

Climate Drivers and Variability

Climate change refers to the long-term shifting of weather patterns and environmental conditions, and is primarily caused by human activity, particularly burning fossil fuels, which produces greenhouse gas emissions (GHGs). Higher levels of atmospheric GHGs, notably carbon emissions, have driven the increase in land and ocean temperatures since the Industrial Revolution, leading to various biophysical impacts such as more frequent and intense heatwaves, wildfires, storms, droughts, melting glaciers, sea-level rise, and ocean acidification (Marvel, et al., 2023).

Natural feedback processes like the El Niño-Southern Oscillation and the Pacific Decadal Oscillation contribute to variations in air temperature, extreme weather events, precipitation, and ocean conditions over interannual and interdecadal periods. However, the rate of climate change caused by human activities far exceeds any natural variability from these processes (Perlwitz, Knutson, Kossin, & LeGrande, 2017). Climate Scenarios and Projection Models Natural feedback processes like the El Niño-Southern Oscillation and the Pacific Decadal Oscillation contribute to variations in air temperature, extreme weather events, precipitation, and ocean conditions over interannual and interdecadal periods. However, the rate of climate change caused by human activities far exceeds any natural variability from these processes (Perlwitz, Knutson, Kossin, & LeGrande, 2017).

Climate Scenarios and Projection Models

The rise in GHG emissions in the atmosphere have already caused the climate to change significantly. Models projecting future climate conditions and impacts use a variety of climate scenarios, including how climate risks will increase and intensify over the next century. These scenarios are based primarily on the concentration of GHGs in the atmosphere, and include factors such as future land use, population growth, and technological innovation.

This Climate Vulnerability Assessment primarily uses Representative Concentration Pathway (RCP) 8.5. RCP 8.5 represents a “business-as-usual” scenario in which emissions continue at their current trajectory. It is a high emissions scenario and projects a global temperature warming of about 4.3˚C (39.74˚F) by 2100 relative to pre-industrial temperatures. This climate impacts summary primarily uses RCP 8.5 because it represents the Earth’s current most realistic emissions trajectory.

Key Climate Impacts

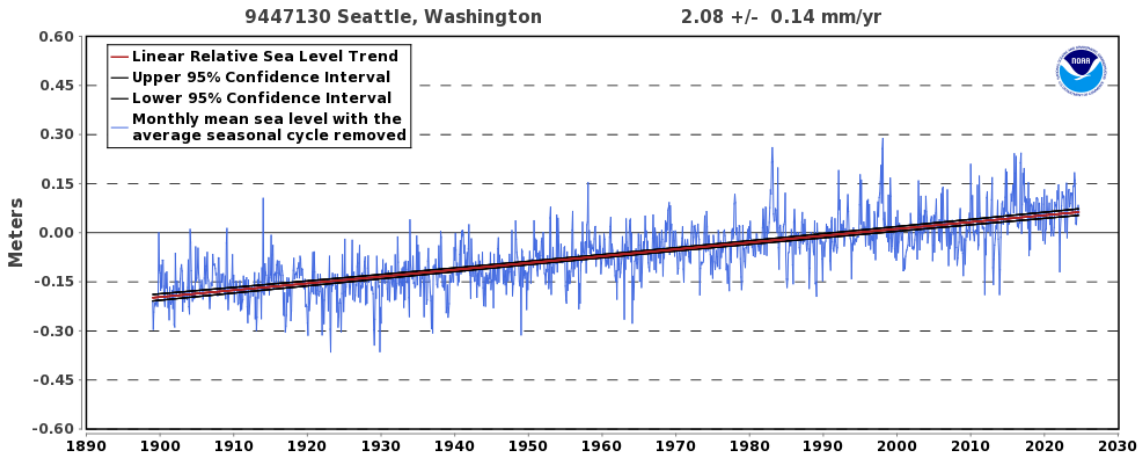
The following sections provide an overview of key climate change impacts facing the City and how they are expected to affect local sectors or focus areas for consideration for policies and measures to build resilience to these impacts into the Comprehensive Plan.

Sea Level Rise (SLR)

Sea levels in the Puget Sound region are rising at a rate of approximately 2.08 millimeters per year, based on NOAA data from 1899 to 2023 (Figure 16), a rate equating to a rise of about 2.08 feet over a 100-year period. This rate is influenced by factors such as glacier and ice sheet melt, the thermal expansion of seawater, and vertical land movement (Newton, 2021).

As sea levels rise, the City faces increased risks of damage from wave action, particularly during storms. Although these areas are currently elevated enough to avoid damage from most winter storms, rising water levels are reducing their safety margins. (Region 5 All Hazard Mitigation Plan, 2020).

Figure 16: Relative sea level trends at NOAA Tide Gauge 9447130 Seattle, WA, from 1899 to 2023



Sea level rise is projected to accelerate over the rest of the 21st century.

Table 25 highlights projections of relative sea level rise around the City. The high-emissions scenario (RCP 8.5) indicates significant increases by mid-century and end-century. By 2050, there is a 50% likelihood that sea levels could rise by 0.8 feet, while the likelihood of a 1.1-foot rise is 17%, and a 1.5-foot rise. By 2100, these projections increase substantially, with a 50% likelihood of a 2.3-foot rise, a 17% likelihood of a 3.1-foot rise, and a 1% likelihood of a 5.1-foot rise.

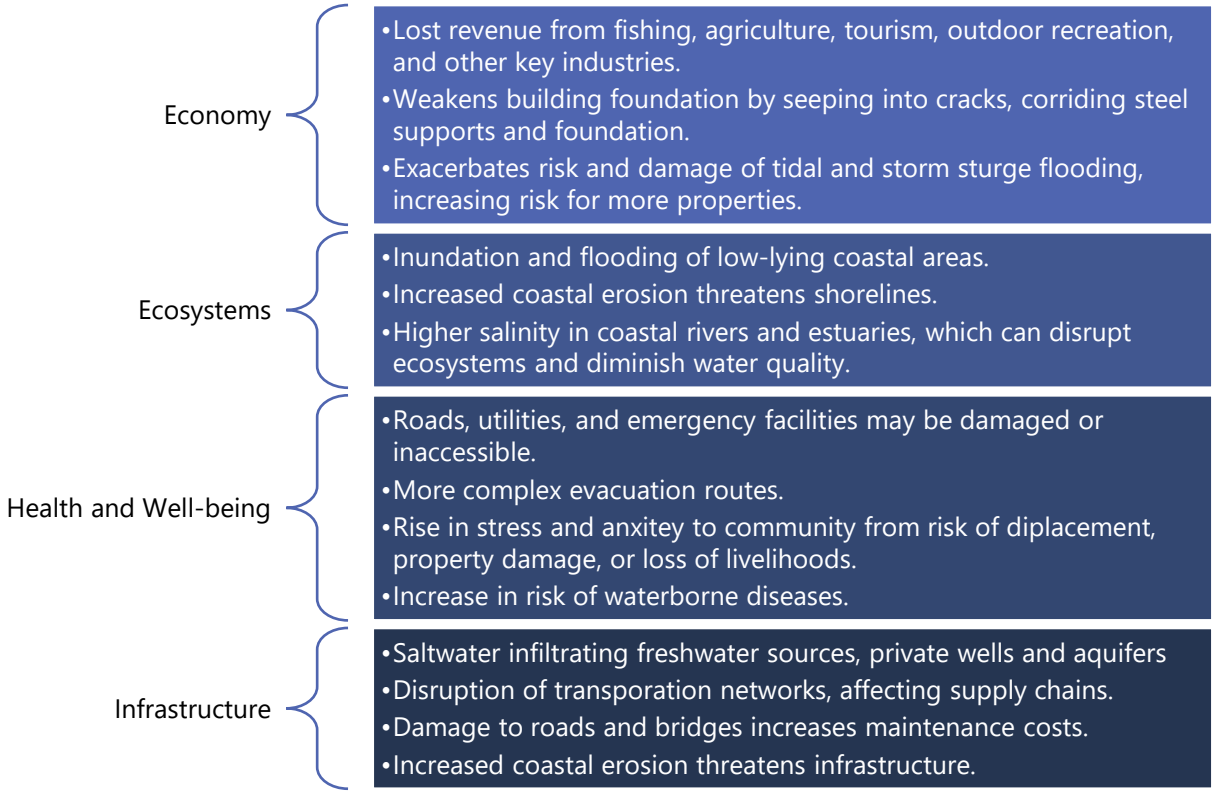
Table 25: Relative sea level projections under 1%, 17%, and 50% likelihood under RCP 8.5 for Pierce County

Year	1% Likelihood under RCP 8.5	17% Likelihood under RCP 8.5	50% Likelihood under RCP 8.5
2050	1.5 feet	1.1 feet	0.8 feet
2100	5.1 feet	3.1 feet	2.3 feet

Due to rising sea levels, the City will face additional impacts such as increased flooding risks, loss of habitat for critical marine and shoreline species, and heightened vulnerability of transportation and utility systems to storm surges (Region 5 All Hazard Mitigation Plan, 2020).

Due to rising sea levels, the City will face additional impacts such as increased flooding risks, loss of habitat for critical marine and shoreline species, and heightened vulnerability of transportation and utility systems to storm surges (Region 5 All Hazard Mitigation Plan, 2020).

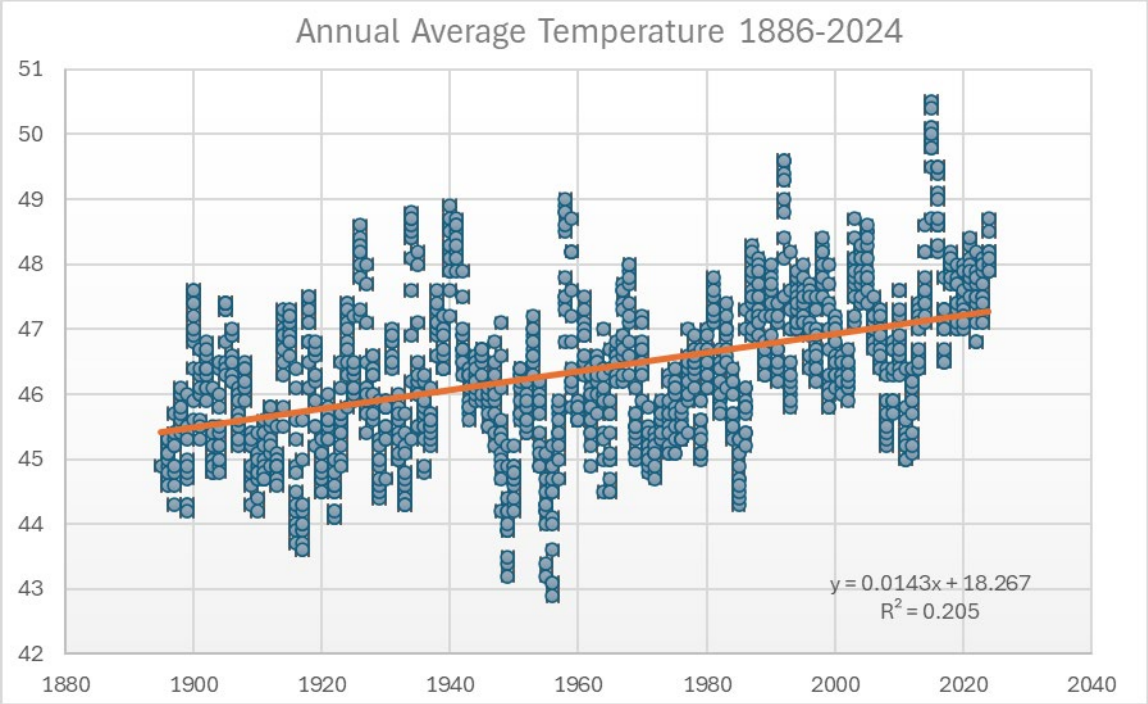
Figure 17: Sectors affected by sea level rise



Warming Temperatures and Extreme Heat

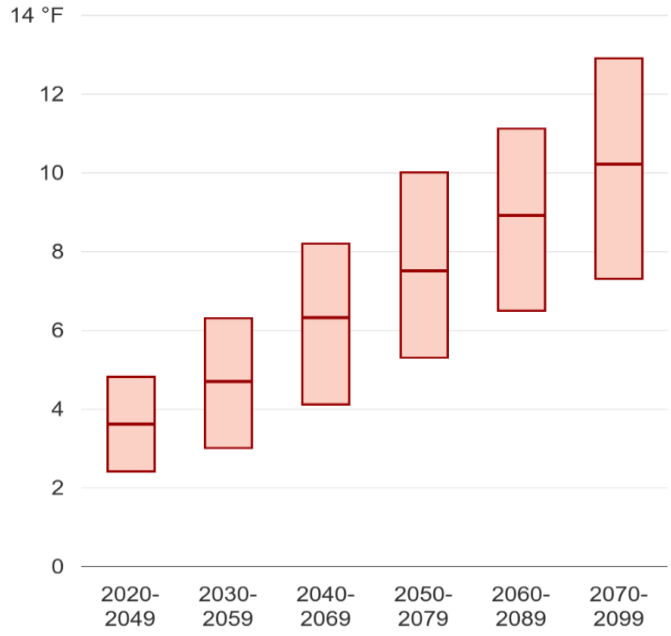
Average temperatures in Washington state have warmed over the last century and are expected to continue warming through the next century and beyond. The Northwest's average yearly temperature has increased by 2°F since the early 20th century. Additionally, the Northwest's coldest day of the year from 1986 to 2016 was 4.78°F warmer compared to 1901 to 1960 (Vose, 2017). In the City, the average temperatures have increased 1.83°F from 1896 to 2024 (Figure 4) (National Centers for Environmental Information (NCEI), 2024).

Figure 18: Annual average temperature in the City of Gig Harbor 1896-2025 (NCEI 2025)



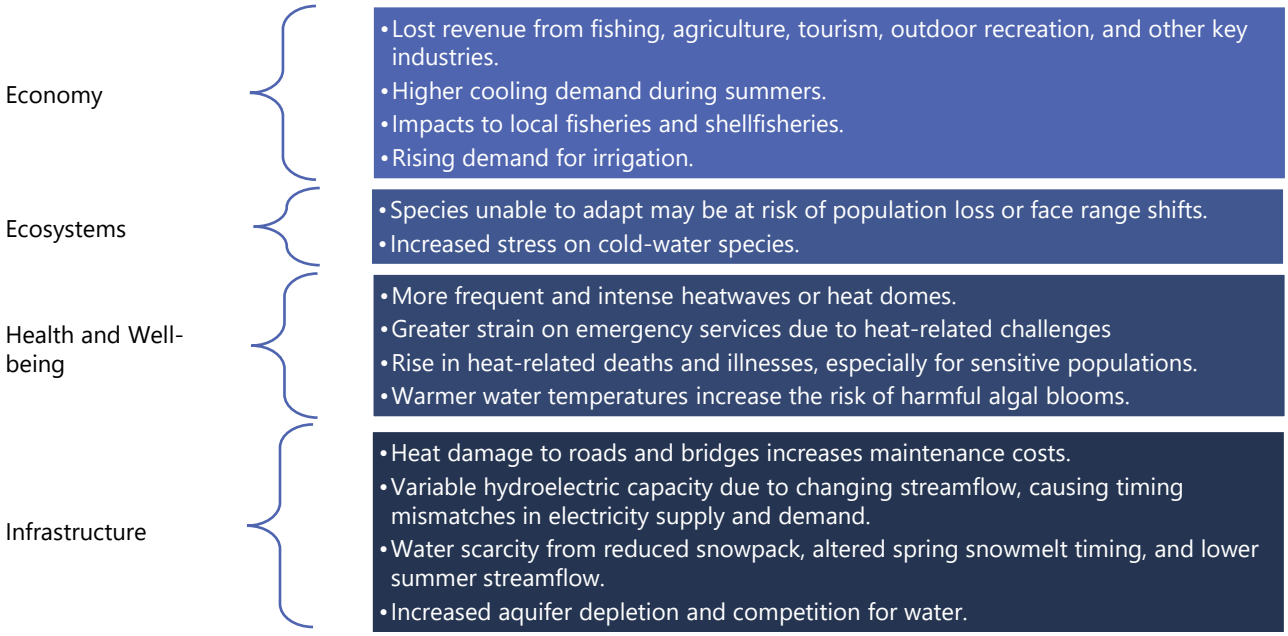
By mid-century (2040-2069), the average summer maximum temperature is expected to increase by 6.3°F under the higher emissions scenario (RCP 8.5). By end-century (2070-2099), the average summer maximum temperature is expected to increase by 10.2°F under the higher emissions scenario (RCP 8.5)

Figure 19: Summer average maximum temperature in Pierce County (Raymond & Rogers, 2022)



As temperatures rise, the City's population health, economy, ecosystems, and infrastructure are especially affected by longer, hotter summers and hotter average temperatures and heat waves. Without adaptive measures, such as air conditioning, extreme heat poses a significant risk to health, including premature death.

Figure 20: Sectors affected by extreme heat



Extreme Precipitation and Flooding

The Puget Sound region has already observed an increase in the frequency and intensity of extreme precipitation events, with projections indicating this trend will continue, alongside a shift toward more winter precipitation falling as rain instead of snow (Chang et al., 2023). In the Gig Harbor area, low-lying areas, like the downtown area, will be more prone to flooding due to extreme precipitation and storm surges. Recent observations highlight localized flooding during high tides and storm events, underscoring the increasing risks posed by sea level rise and intensified weather patterns.

Future projections indicate a slight increase in Pierce County's total annual precipitation compared to the 1980-2009 average. Average annual precipitation is expected to rise by 4.2% by mid-century (2050-2079) and by 5.2% by end-century (2070-2099) (Table 26Table 26).

Table 26: Annual precipitation Pierce County

	2050-2079	2070-2099
Total Annual Precipitation	Pierce County	Pierce County
Percent change in average total annual precipitation for future 30-year periods compared to the 1980-2009 average.	4.2% (-3 to 12%)	5.2 % (-4.5 to 17.2 %)

(Salathé, E.P. et al., 2010) *Accessed via Climate Mapping for a Resilient Washington.*

Compared to the historical baseline of 14 days (1980-2009), median projections show increases of 0.3 to 1.1 additional days of precipitation above 1-inch by the late 21st century under RCP 8.5 (Figure 21). Meanwhile, summer precipitation west of the Cascades mountain range is expected to decrease, while fall and winter precipitation is projected to increase, relative to 1950-1999 (Figure 22).

Figure 21: Change in days with heavy precipitation in Pierce County, WA

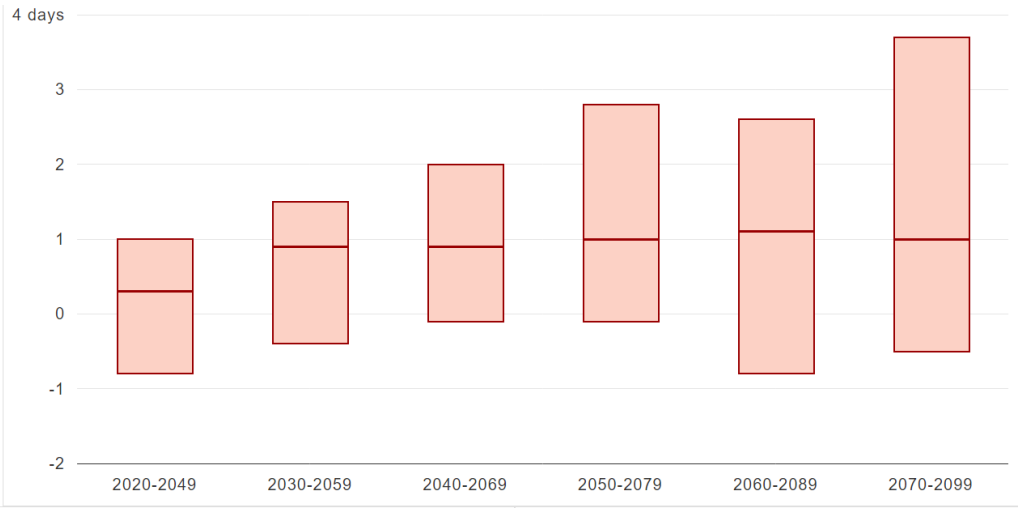
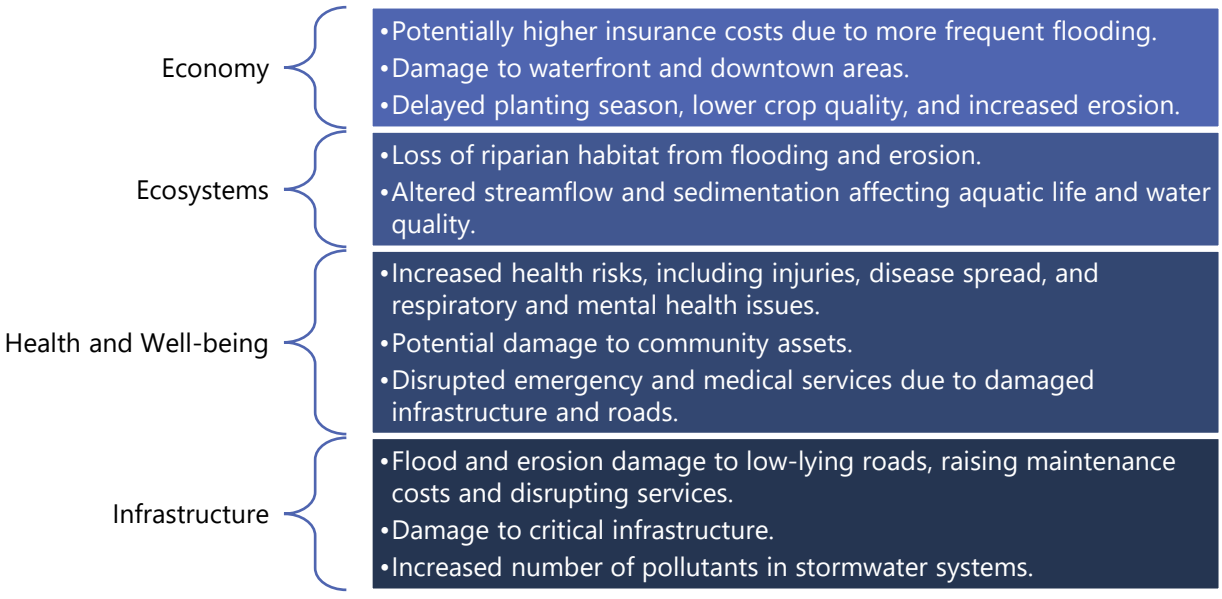


Figure 22: Projected change in precipitation west of the Cascades for 2050 and 2080

The increased runoff volumes in the fall, winter, and spring may put stress on drainage and infrastructure systems, increasing the likelihood of floods due to infrastructure systems being designed for historical flooding rather than future flooding. While more rainfall may enhance the availability of water it may also provide problems for water resources and management, including increased runoff pollution, a higher danger of landslides, and flooding in low-lying places (U.S. Environmental Protection Agency (EPA), n.d.).

Figure 23: Sectors affected by extreme precipitation and flooding



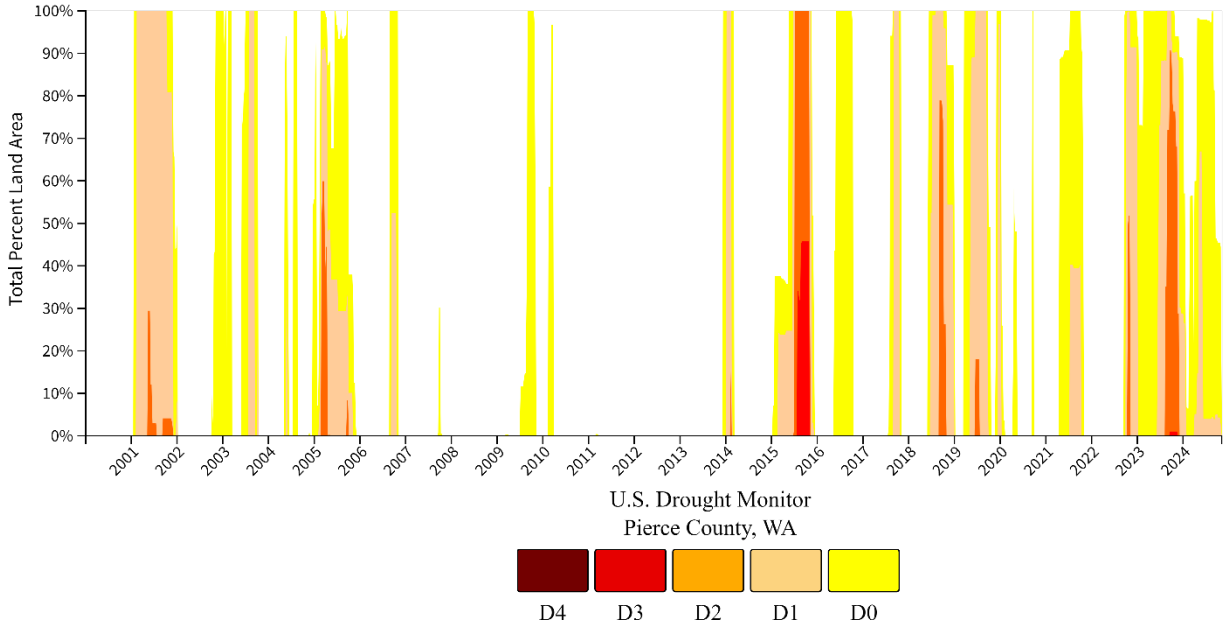
Drought

The City and the broader Pierce County region have faced periodic droughts that have impacted both natural and human systems. These drought events, often driven by a combination of low precipitation and higher-than-average temperatures, have stressed water resources and ecosystems (National Weather Service , n.d.).

The US Drought Monitor uses five categories to measure drought in the US. D0 means abnormally dry, and the four stages of drought are ranked D1–D4. These categories represent varying levels of drought severity, ranging from early signs of dryness to extreme drought conditions.

Figure 10 shows the area and intensity of drought in the City from 2000 to 2024. The figure shows that between 2000 and 2014, the City only experienced five (5) periods of drought categorized more severe than D0. However, since 2014, there have been 10 instances of drought at the severity level D1 or greater. This is consistent with the trends of decreased precipitation, especially in the summer.

Figure 24: Drought severity for the City of Gig Harbor, 2000-2024



In the Northwest, summer precipitation is projected to decline under all scenarios, contributing to more frequent, longer, and more severe regional drought conditions that increase wildfire risk and decrease water availability (Chang, et al., 2023). Pierce County is projected to experience a decrease in summer precipitation of 30% by mid-century (2050-2079) and 39% by end-century (2070-2099) (Table 27).

Table 27. Summer precipitation drought in Pierce County

	2050-2079	2070-2099
Precipitation Drought	Pierce County	Pierce County
Likelihood of a year with summer precipitation below 75% of historical normal[4]	30% (18 to 49%)	39% (21 to 58%)

Projected temperature increases will increase the likelihood that precipitation will fall as rain instead of snow, reducing water storage in the snowpack (Frankson, et al. , 2022).
Table 28 shows a significant reduction in April 1st snowpack in Pierce County by the end of the century. By 2050-2079, snowpack is projected to decrease by 77%, and by 2070-2099, it could drop by 87% compared to the 1980-2009 average. The loss of snowpack could have implications for water supply, recreation, and energy supply for the region.

Table 28. Snowpack drought in Pierce County

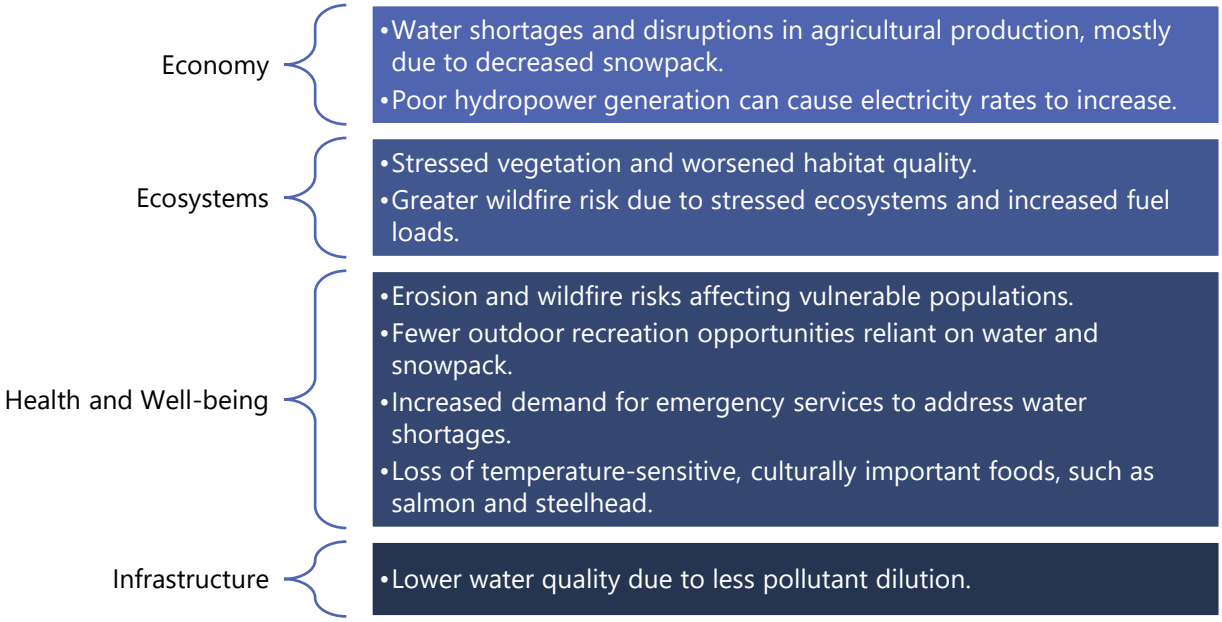
	2050-2079	2070-2099
Percent change in April 1st snowpack	Pierce County	Pierce County
Percent change in April 1st snowpack for future 30-year periods compared to the 1980-2009 average (RCP 8.5)	- 77 % (-85 to -62%)	-87% (-91 to -76%)

(Salathé, E.P. et al., 2010) *Accessed via Climate Mapping for a Resilient Washington.*

In the City, and the rest of Pierce County, drought generally does not cause loss of life or direct property damage, unlike other natural disasters. However, it can significantly impact local agriculture, water availability, public health, and the economy (Region 5 All Hazard Mitigation Plan, 2020).

[4] Likelihood that summer (June-August) precipitation in any given year is below 75% of average precipitation, the historical normal for the period 1980-2009. (Salathé, E.P. et al., 2010) Accessed via Climate Mapping for a Resilient Washington.

Figure 25: Sectors affected By drought



Wildfire, Smoke, and Air Quality

Wildfire

Although the City's wildfire risk is fairly low, the severity of wildfire impacts in the western United States are increasing as hotter and drier summers can dry out forest vegetation, making it more flammable. Between 1984 and 2015, the number of large wildfires west of the Rockies have doubled. Warmer, drier conditions have also contributed to an increase in human-caused fires. In much of the Pacific Northwest, projections show that the area of land burned each year could increase by 600% with each 1°C rise in average annual temperatures (Washington State Department of Ecology, 2024).

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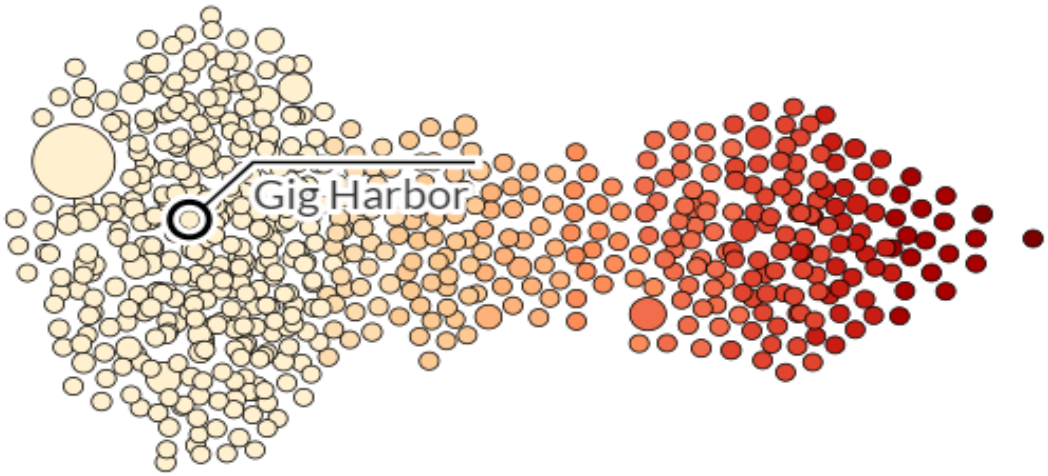
Figure 26: Washington communities ranked by wildfire likelihood



Wildfire likelihood represents the probability of a wildfire occurring each year. The City's wildfire likelihood falls in the 21st percentile among communities in Washington (Figure 26: Washington communities ranked by wildfire likelihood). Although this is a relatively lower risk compared to many other communities, the growing threat of wildfires driven by climate change remains a concern, particularly due to the impacts of smoke and worsening air quality (Short, 2022).

Annual high fire danger days is expected to rise for Pierce County, relative to the historical average of 50 days (1971–2000) (Table 29: Projections of wildfire danger days in Pierce County). Between 2010 and 2039, high fire danger days are expected to rise by approximately 6 days; and by 2040–2069, this increase is projected to reach about 10 days, reflecting a growing wildfire risk for the region over time.

Table 29: Projections of wildfire danger days in Pierce County

	2010-2039	2040-2069
Wildfire Danger	Pierce County	Pierce County
Change in annual high fire danger days	6 days (-1 to 10 days)[5]	10 days (2 to 21 days)

(T. Sheehan, et al., 2015) *Accessed via Climate Mapping for a Resilient Washington.*[6]

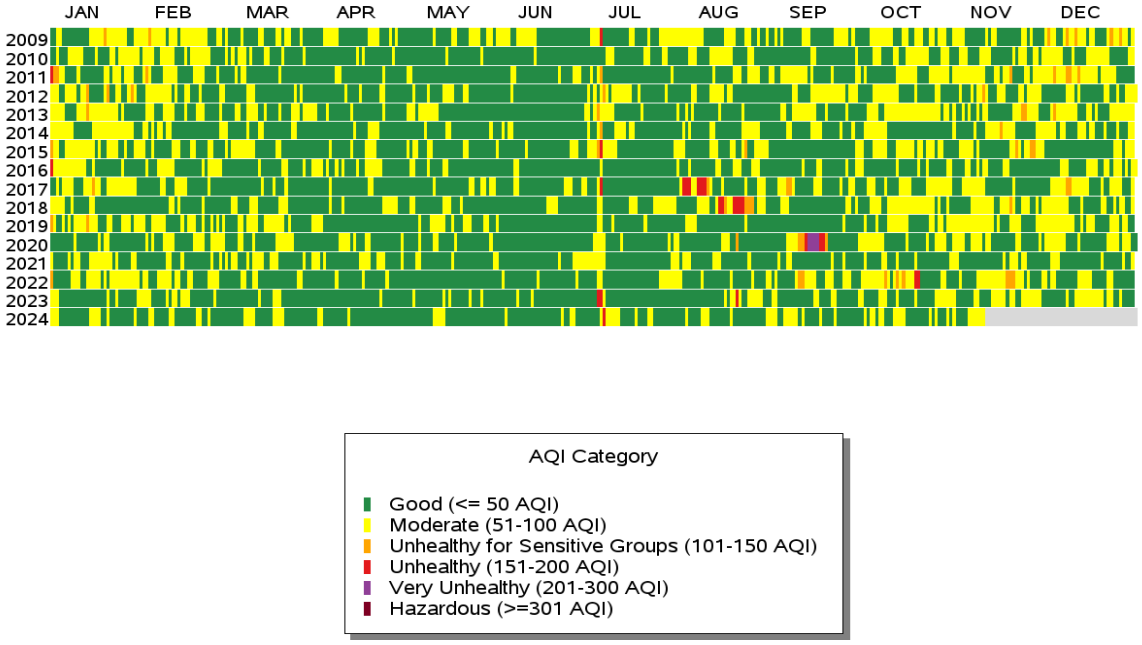
[5] Represents the model's median value for each indicator, while the range (in parentheses) indicates 10th and 90th percentile of values.

[6] Table shows the change in annual high fire danger days compared to the 1971-2000 average of 50 days

Smoke and Air Quality

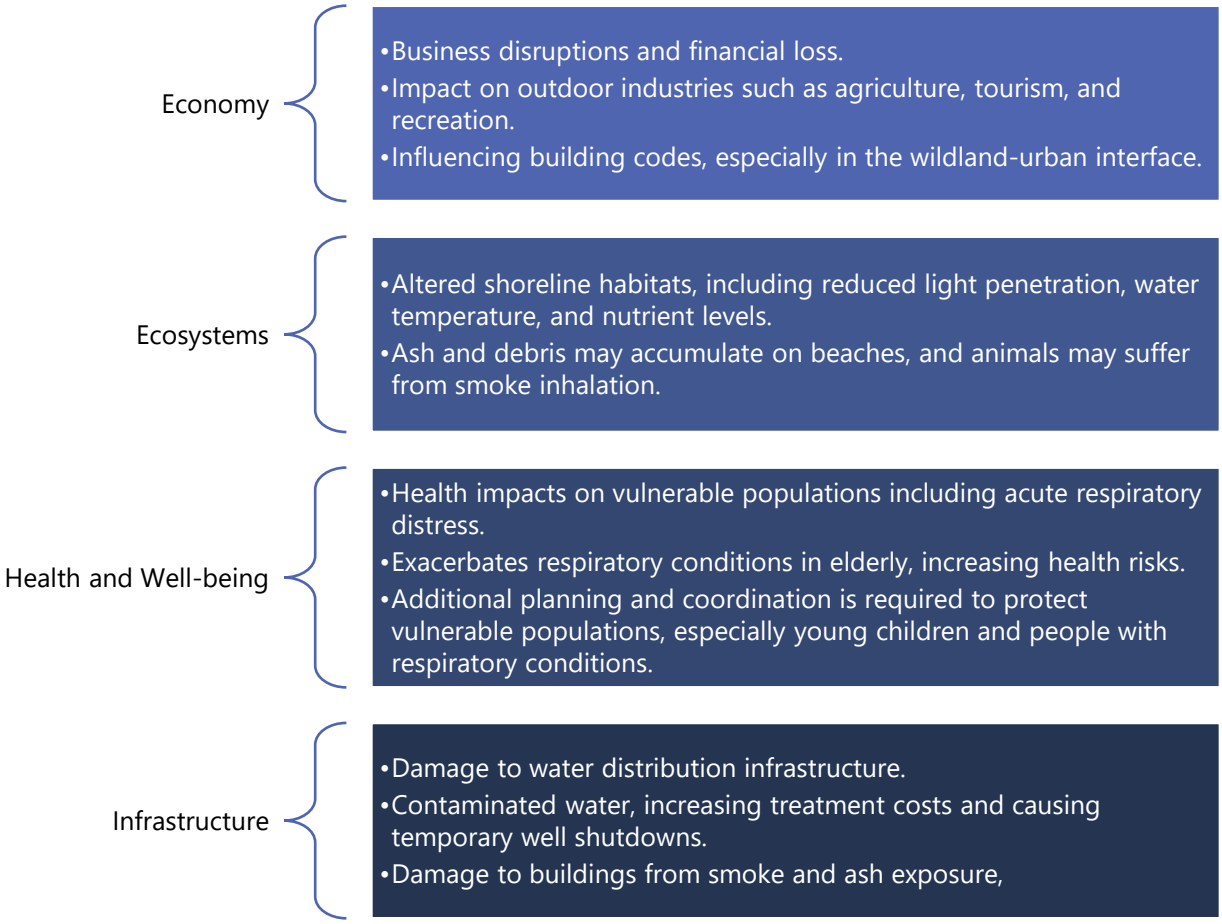
In the City, the increased frequency, size, and severity of wildfires in the greater region will lead to heightened exposure to wildfire smoke, which significantly reduces air quality. This is especially harmful to vulnerable populations, including older adults, young children, pregnant people, and individuals with pre-existing conditions. The impacts of wildfire smoke can cause acute respiratory issues, exacerbate chronic conditions, and increase hospital admissions for cardiovascular and respiratory diseases. Additionally, prolonged exposure to poor air quality can lead to long-term health effects, including increased risk of premature death (Chang, et al., 2023).

Figure 27: Daily AQI for Pierce County, WA 2009-2024. US Environmental Protection Agency



The Daily Air Quality Index (AQI) is monitored at multiple locations across Pierce County, including Tacoma, Puyallup, and Mount Rainier, tracking pollutants such as CO, NO_2, ozone, PM_{10}, and $PM_{2.5}$. While most days fall within the Good to Moderate AQI range, there are periods of poorer air quality, particularly from July through October (Figure 27: Daily AQI for Pierce County, WA 2009-2024. US Environmental Protection Agency). Smoke and deteriorating air quality have been increasingly frequent during these months.

Figure 28: Sectors affected by wildfire smoke



Appendix B: Climate-sensitive Populations

Climate impacts reach people wherever they live, work, and play in the City—but those impacts are not distributed evenly. Various groups are more sensitive to climate hazards and individuals who belong to multiple vulnerable groups may face intersecting risks, heightening their overall vulnerability to climate change. Described below are climate-sensitive populations living in the City of Gig Harbor.

	Population Estimates
Total Population	12,604[7]

Low-income

Population Estimates	22% less than 50% Area Median Income ($103,688) [8] 6% under poverty line[3]

Low-income communities across Washington tend to face disproportionate exposure to environmental health threats, including higher ambient air pollution concentrations. Workers with low-income levels may also experience more hardship associated with reduced pay from lost labor hours (US EPA, 2021). Lacking financial resources also reduces a person's ability to respond to climate risks (e.g., their ability to rebuild their home, afford health care, or evacuate/relocate to a less risk-prone location) (Gamble, et al., 2016).

Aging and Elderly

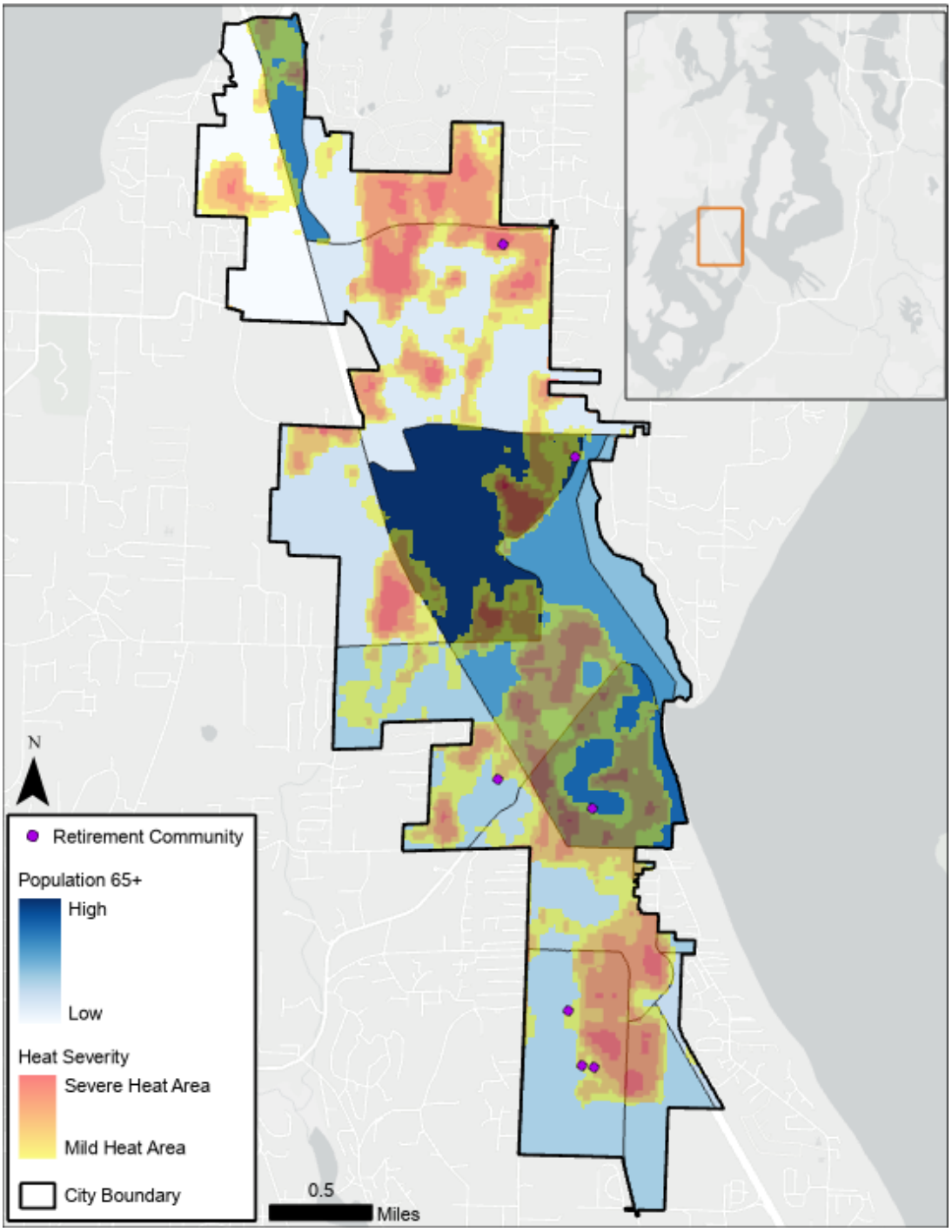
Population Estimates	26.9% over 65[3]

Older individuals are more susceptible to the negative health consequences of heat exposure, wildfire smoke, and drought-driven dust, and may have more trouble evacuating in case of a flood (US EPA, 2021). Electricity-dependent populations also face negative health risks during power outages caused by wildfires or severe storms. The City's Health, Housing, and Human Services Manager highlighted aging populations as representing a significant portion of the City's population that is also especially vulnerable to health impacts from environmental events. There is an urban heat island between Harbor Ridge Middle School and North Harborview Drive where older people and other vulnerable populations should take precautions during heat waves. There are also two heat islands along Point Fosdick Drive and Borgen Boulevard created by shopping centers with large parking lots (Figure 29: Aging populations, retirement communities, and heat island locations in the City of Gig Harbor).

[7] American Community Survey 5-Year Estimates, 2023

[8] 2023 Gig Harbor Housing Needs Assessment

Figure 29: Aging populations, retirement communities, and heat island locations in the City of Gig Harbor



Children and Youth

Population Estimates	21.8% under 18[3]

Children, youth, and infants are particularly sensitive to climate change effects such as poor air quality, contaminated water, disruptions from extreme weather, and vector borne illnesses like Lyme disease (US EPA, 2025). Young athletes exercising outdoors and children who live in homes without air conditioning are at particular risk of heat stroke and other heat related illnesses (US EPA, 2025). Their developing bodies and dependence on adults for care make them more vulnerable to health impacts from these hazards, while both the acute psychological stress of experiencing disasters and broader distress about the looming presence of climate change can have long-term effects on their mental health and wellbeing (US EPA, 2025).

People Living with Disabilities

Population Estimates	10%[3]

People living with disabilities that affect vision, hearing, speech, cognition, and mobility may have trouble evacuating to safer places during flooding, heat waves, and other extreme weather events, especially if emergency warning systems are not designed with accessibility in mind (US EPA, 2025). Disruptions to transit, medical care, or electricity during a climate-related disaster may endanger their lives (US EPA, 2025). Finally, people living with disabilities are more likely to have economic risk factors such as poverty and unemployment, giving them less resources to prepare for, respond to, or recover from climate-related events (US EPA, 2025).

People with Pre-existing Conditions and Medical Device Dependencies

Population Estimates	282 Medicare at-risk individuals[9]

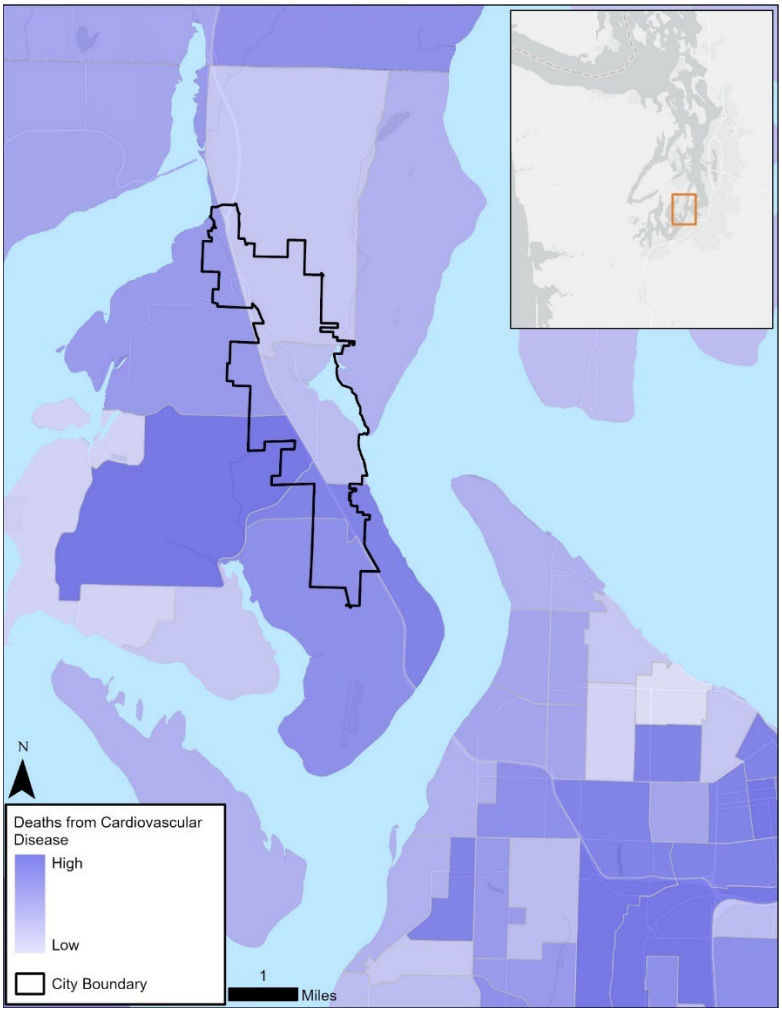
Chronic medical conditions can be worsened by climate change impacts. Climate change can lead to more outdoor air pollutants and increased allergens, which can especially impact people with asthma and chronic obstructive pulmonary disease (COPD), among other illnesses (US EPA, 2025). Air pollution, extreme heat, and severe weather patterns can translate both directly and indirectly to increases in cardiovascular morbidity and mortality, which could be a particular

[9] This is a combined count from the two census tracts incapsulating the City's municipal boundaries. Total number of individuals residing in city limits may be lower (U.S. Department of Health and Human Services (HHS) Assistant Secretary for Preparedness & Response, 2024).

concern for communities in south Gig Harbor who currently have high rates of cardiovascular disease compared to the rest of the state (Figure 30) (Aitken, Brown, & Comellas, 2022).

At-risk Medicare beneficiaries rely on electricity-dependent durable medical and assistive equipment and devices to live independently in their homes. Some of these individuals also have health care service dependencies. Severe weather and other emergencies, especially those with prolonged power outages, can be life-threatening for these individuals.

Figure 30: Deaths due to cardiovascular disease in the City of Gig Harbor and surrounding region[10]



[10] Map data source: Washington Tracking Network, 2022. Proportion of deaths in a population due to cardiovascular disease (NCHS 113: Major cardiovascular diseases).

Seasonal and Outdoor Workers

Climate change has increased the risk to workers' health and safety.[11] Workers, especially those who work outdoors or in hot indoor environments, are at increased risk of occupational injuries, heat stress, and other heat-related illnesses such chronic kidney diseases. Global warming will influence the distribution of weeds, insect pests, and pathogens, and will introduce new pests, all of which could change the types and amounts of pesticides used, thereby affecting the health of agricultural workers and others. Climate change is also increasing ground-level ozone concentrations, with adverse effects on outdoor workers and others. Extreme weather events related to climate change pose injury risks to rescue and recovery workers.

Houseless or Housing Insecure

Population Estimates	18% of households are cost burdened[4] 15% are severely cost burdened[4]

Climate change may impact the health of houseless people through increased heat waves, increased air pollution, increased severity of floods and storms, and changing infectious disease vectors. Damage from severe hazards like flooding and landslides exacerbated by climate change poses a risk to housing stock, constraining supply and increasing housing costs. Housing cost burden can lead to financial stress and limit a household's ability to afford other essentials, such as healthcare and education.[12] Cost burden also limits the financial resources available to households to adapt to climate change (e.g., by weatherizing or floodproofing one's home) or recover from climate-related disasters.

Black, Indigenous, and People of Color

Population Estimates	18% non-white[13]

Current and projected health, environmental, and socioeconomic effects of climate change are well-documented and central to environmental justice because of their disparate effects on marginalized populations. The population of Black, Indigenous, and People of Color (BIPOC) in the City has grown over the last two decades. In 2023, people of Hispanic or Latino ethnicity (of any race) and the "Two or More Races" category comprised the greatest proportion of the City's non-white population, at 5.4% and 10.8% respectively. Asian residents made up 4.1%, American

[11] (Levy & Roelefs, 2019)

[12] The US Department of Housing and Urban Development defines a household as cost burdened if it pays between 30% and 50% of its gross household income for housing and severely cost burdened if it pays more than 50% of its gross household income on housing (rent or mortgage, plus utilities).

[13] U.S. Census Estimates, 2023

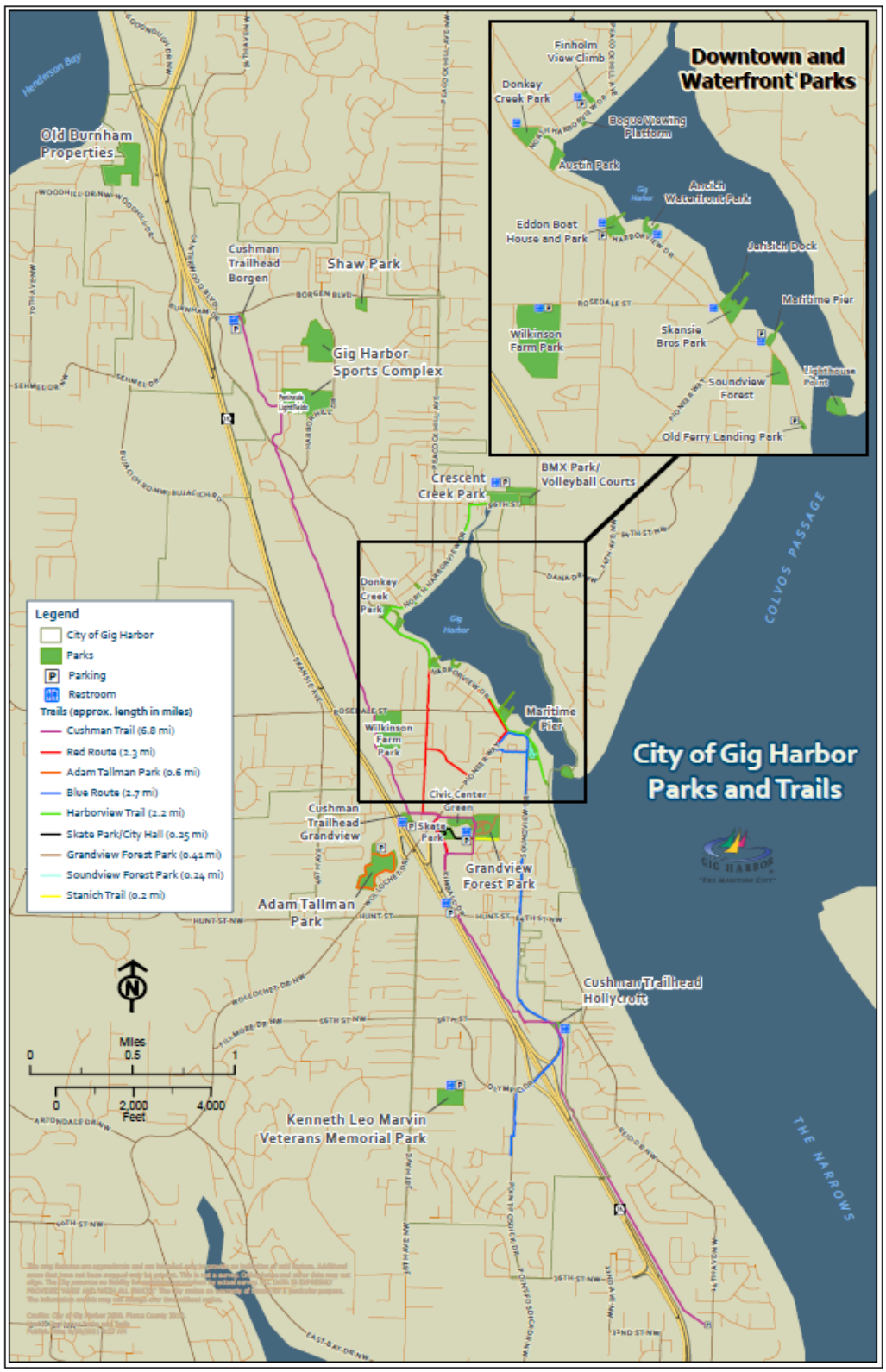
Indian or Alaska Native residents comprised 0.7%, and Black or African American residents comprised 0.5%.

According to the 2023 Housing Needs Assessment, in the City, Hispanic households and other racial or ethnic groups are the most likely to be cost burdened, with a 57% and 59% share of households experiencing cost burden, respectively. These groups are also more likely to be severely cost-burdened and are thereby more sensitive to economic impacts of climate change, e.g., increased housing costs or displacement due to damage from extreme weather.

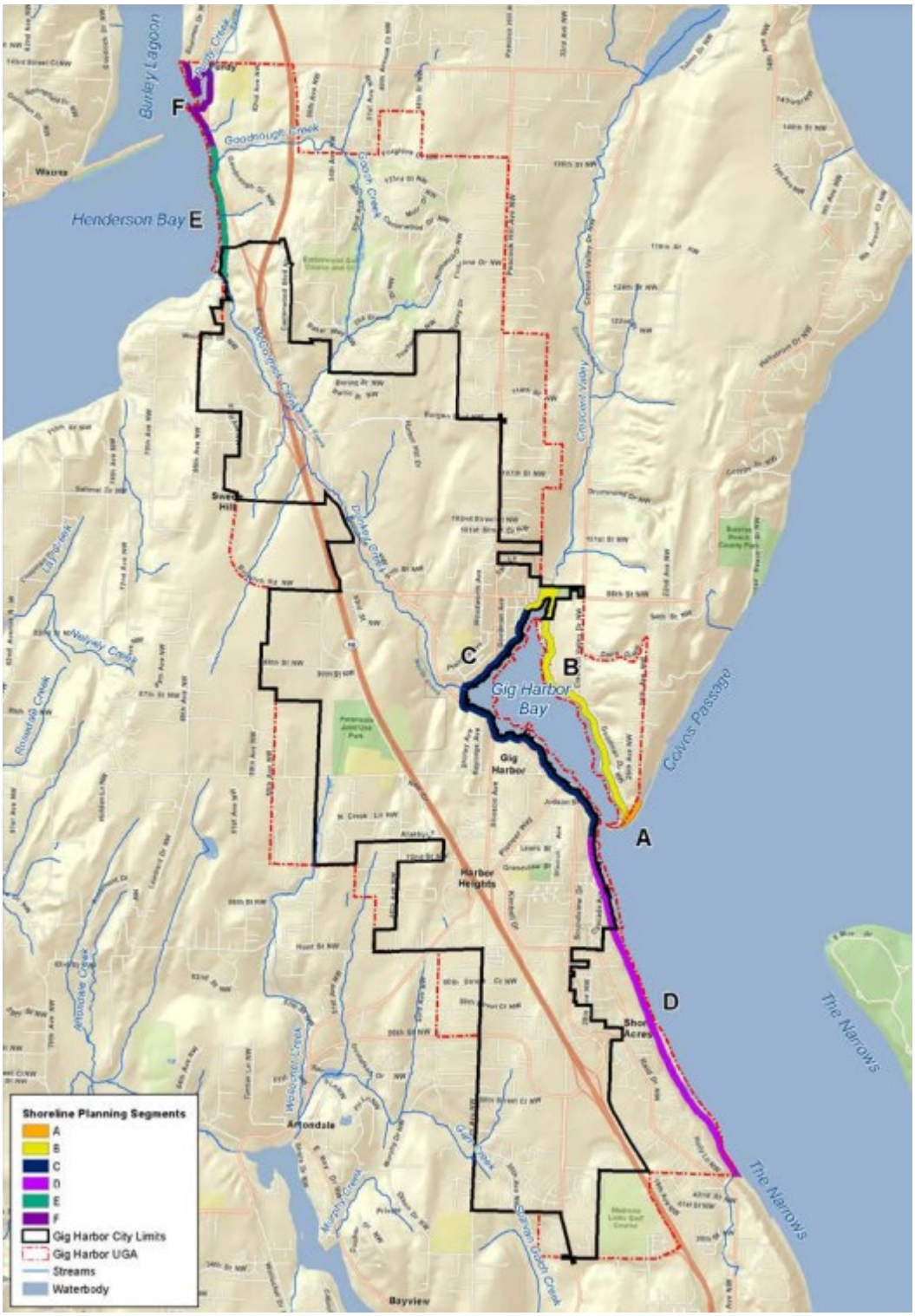
Public health research indicates that Tribal and Native residents are likely to experience a range of nutritional, physical, mental, and cultural health and well-being impacts from future climate change, which will be compounded by historical and multigenerational trauma.[14]

[14] (Sahu, Chattopadhyay, Das, & Chaturvedi, 2022)

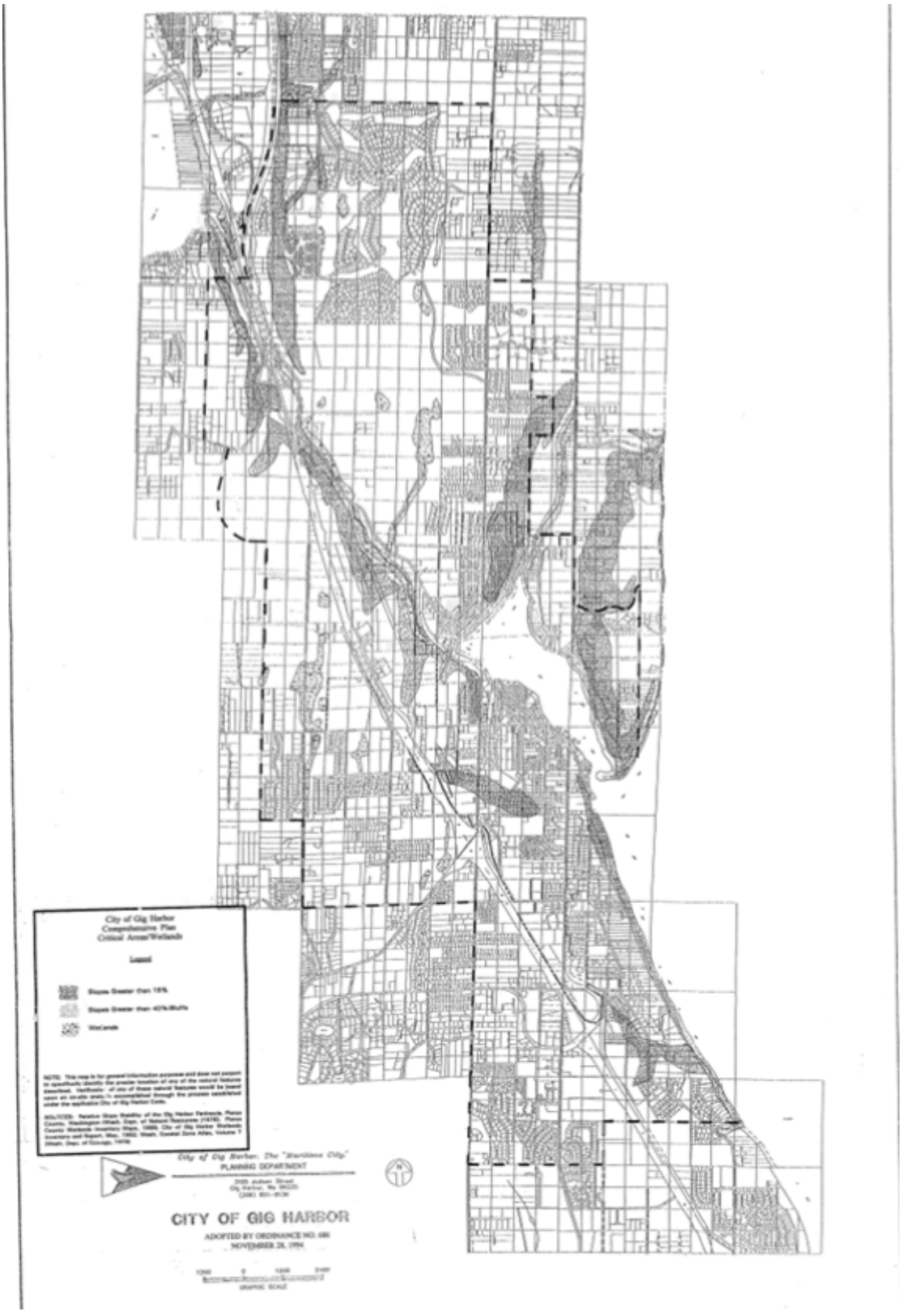
Appendix C: Gig Harbor Parks and Trails Map



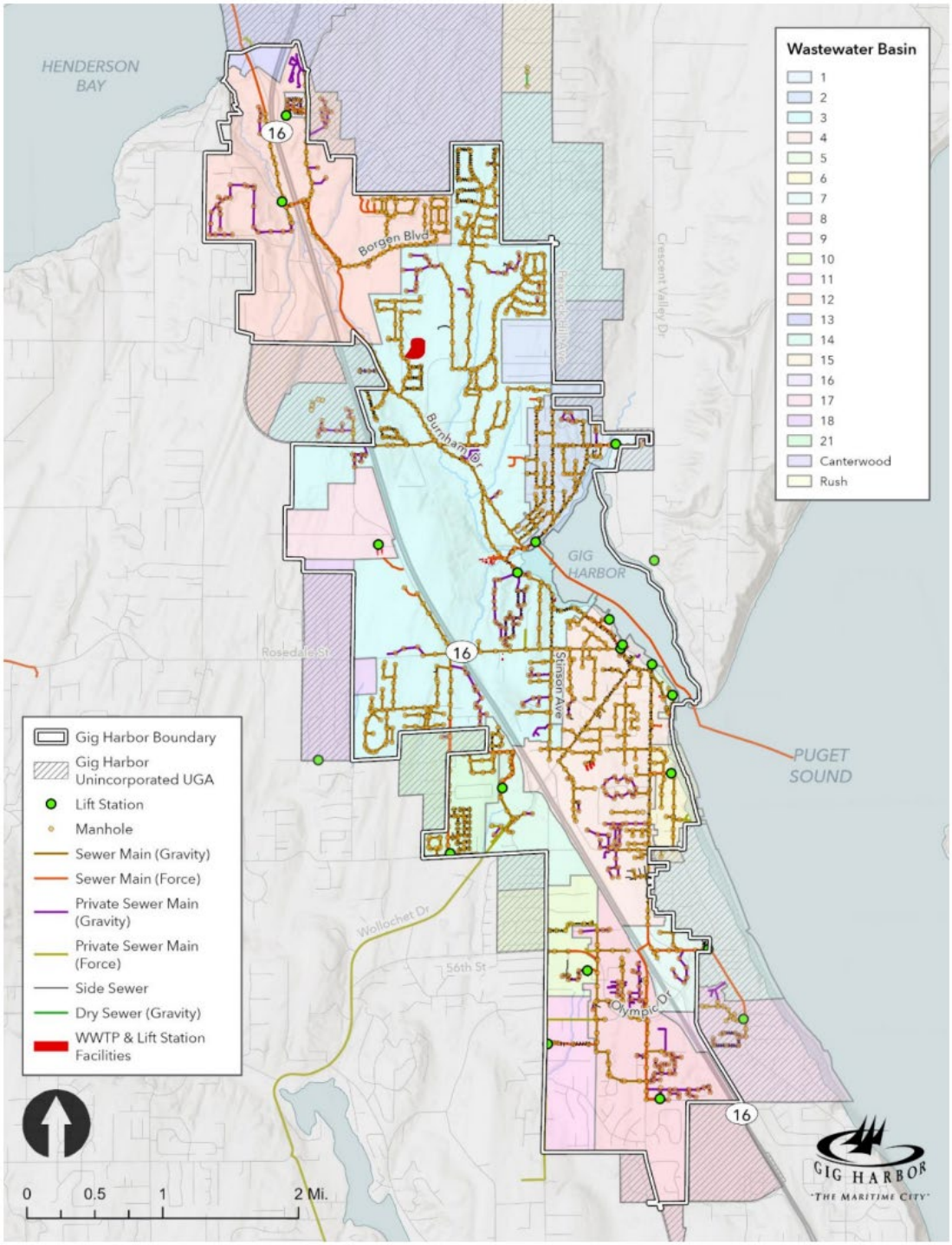
Appendix D: Shoreline Planning Segments from Sustainability Management Plan



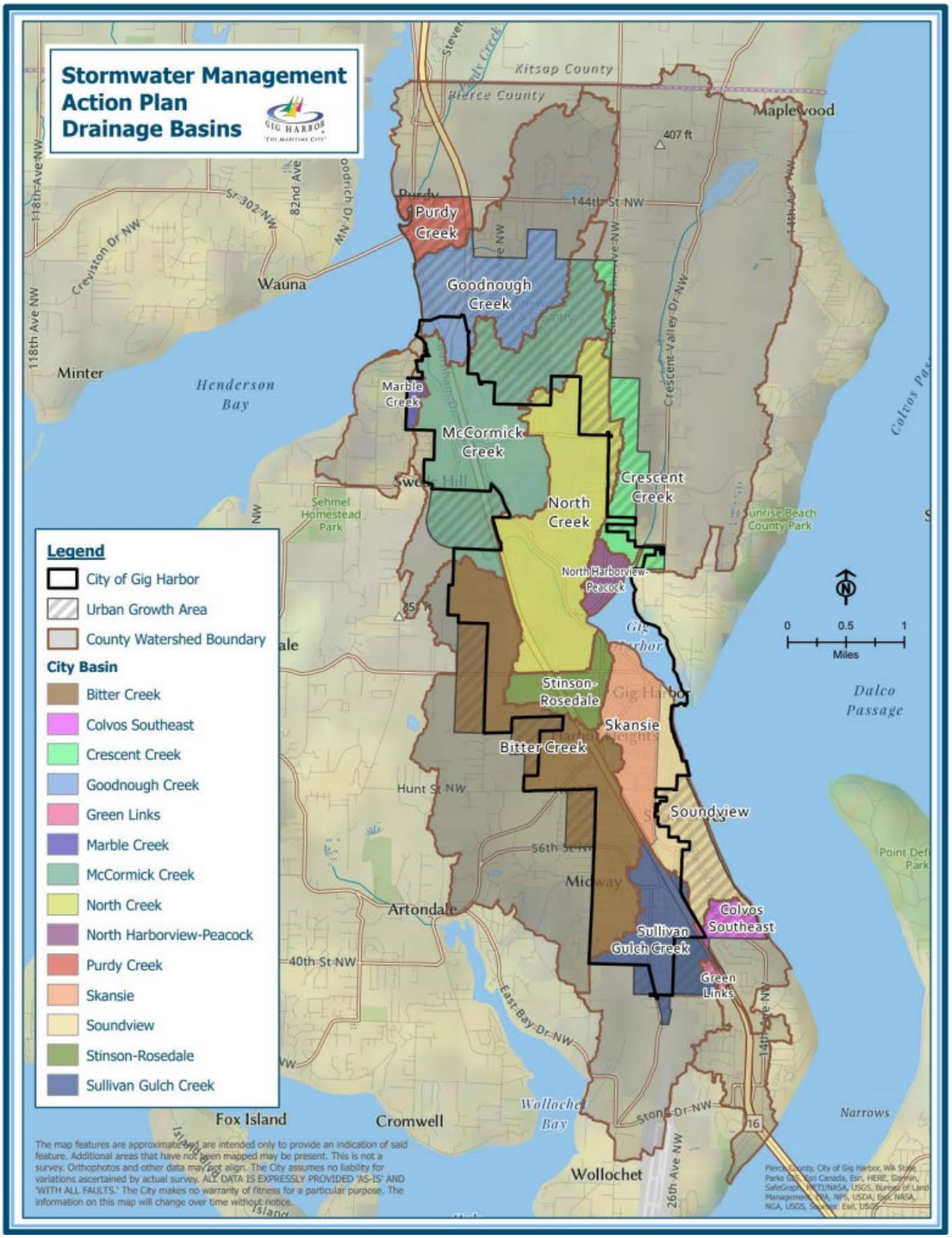
Appendix E: Critical Areas and Wetlands



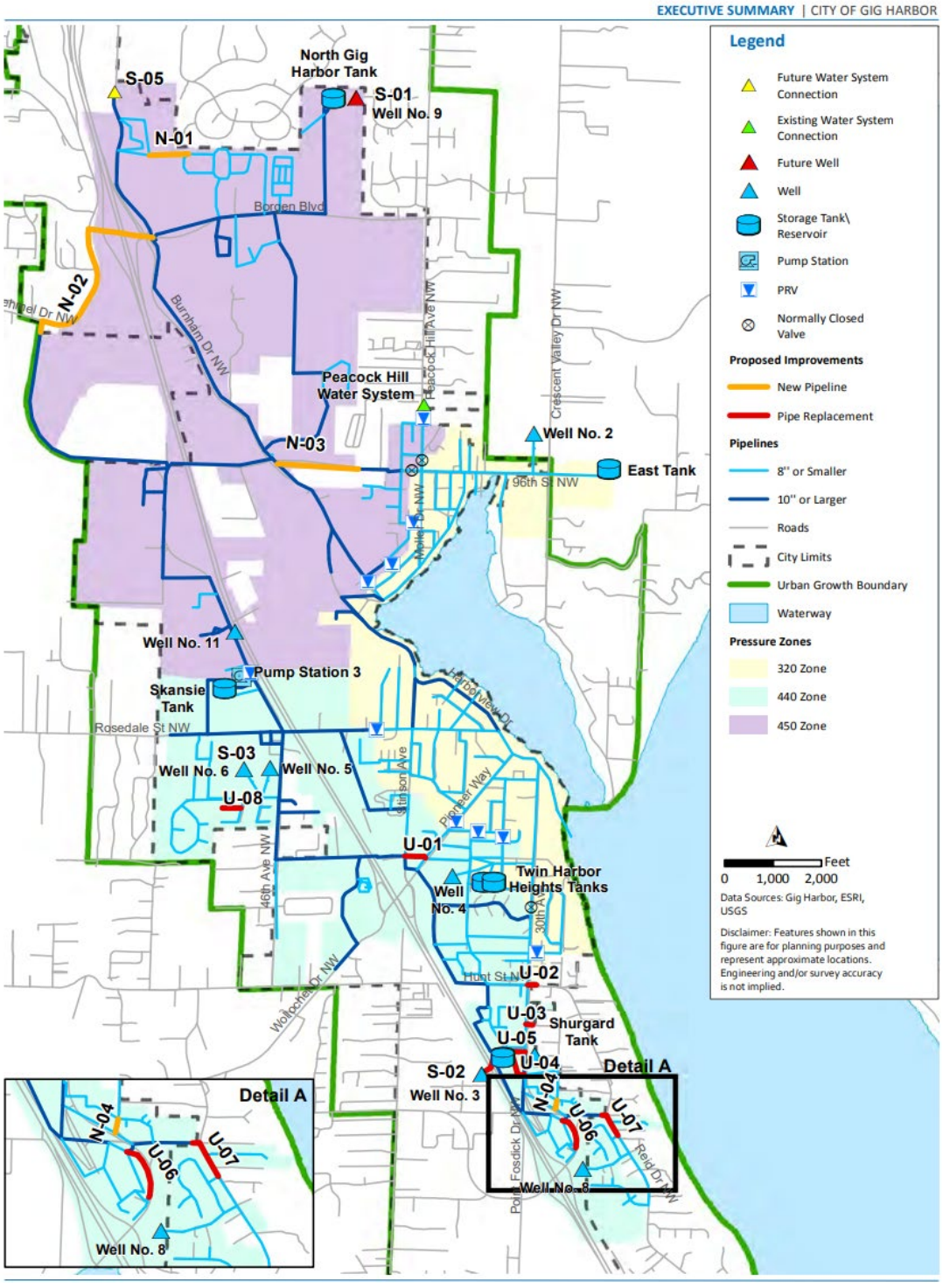
Appendix F: Gig Harbor Wastewater Basin Map



Appendix G: Gig Harbor Drainage Basins



Appendix H: Gig Harbor Water System Capital Improvement Plan 2018



Appendix I: Gig Harbor Centers of Importance