Friday Harbor Climate Impacts Memo

Date:	May 7, 2024
Subject:	Climate Impacts Memo
Prepared for:	Ryan Ericson, Friday Harbor, Community Development & Planning Director
Prepared by:	Lisa Grueter, Principal; Kamal Raslan, Associate and Project Manager; Isa Hirita, Associate

Introduction

The purpose of this memo is to review existing analyses of climate related trends and impacts for the Town of Friday Harbor and San Juan County.[1] This includes the University of Washington Climate Impacts Group Climate Mapping for a Resilient Washington (2022), Washington Department of Health - Environmental Health Disparities map, and other relevant documents and databases.

This memo summarizes critical asset categories (such as utilities, parks and open space, housing), potential climate change related hazards (e.g. sea level rise, urban heat islands) and geographic areas at risk. These potential climate trends, assets, and impacts can be further evaluated in a forthcoming vulnerability assessment. This analysis will also help the Town of Friday Harbor create a new Climate Element of the Comprehensive Plan under HB 1181. This memo is organized as follows:

[1] Town data will be used, when possible, but given data limitations, regional data for San Juan County will be used if existing data and mapping is not available at the Town level.

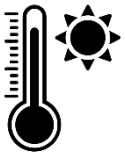
Climate Trends and Potential Impacts

As part of the Fifth National Climate Assessment (2023) climate change trends and projections were included for the Pacific Northwest including Washington State, including:

- **Warming:** Annual average air temperatures in the region have risen by almost 2°F since 1900. Compared to the period of 1900-2020, the annual number of extremely hot days and warm nights in the Northwest has been above the long-term average over the past decade. Future warming in the region is expected to exacerbate regional heatwave intensities.
- **Extreme Precipitation:** Summer precipitation is projected to decline contributing to more frequent, longer, and more severe regional drought conditions that increase wildfire risk and decrease water availability. The frequency and intensity of extreme precipitation events are projected to increase across the region. A greater number of strong atmospheric river events and fewer moderate and weak events are projected to occur. Warmer winter temperatures have led to declines in mountain snowpack, particularly in areas with warm maritime climates. A greater proportion of winter precipitation is projected to fall as rain rather than snow.
- **Coastal Waters:** Annual average coastal sea surface temperatures in the Northwest have warmed approximately 1.2°F since 1900. Human-caused carbon emissions have already driven ocean acidification of surface and subsurface waters off Oregon and Washington. Ocean acidification, hypoxia, and human-caused nutrient inputs negatively affect many species. Sea level is projected to increase across the Northwest. In Puget Sound, where most land is subsiding, sea levels are expected to rise 0.9 to 1.6 feet by 2050 and 3.2 to 10.2 feet by 2150 under a very high scenario (RCP8.5), relative to the reference period.

Based on the University of Washington's Climate Mapping for a Resilient Washington (Raymond, 2022), trend information has been developed for each county in Washington State including San Juan County.

Exhibit 1. Climate Exposure & Median Change by 2050 (RCP 8.5) relative to 1980-2009 : San Juan County

Climate Change	Potential Impacts	Projections for San Juan County
 **Extreme Heat**	An increase in average summer temperatures is expected. This could affect people, landscaping, agriculture, and natural areas like wetlands, wildlife habitats, and other ecosystems. More days above 90°F humidex (humidity and heat) are expected which can affect public health. An increase in the number of cooling degree days is an indicator of greater cooling demand for buildings in the summer. Warmer stream temperatures are expected to reduce habitat quality for aquatic species that depend on cold water. Changes in temperature and precipitation can affect wetlands as well as upland plant communities.[2]	+ 6.1 °F Change in Average Daily Summer (June - Aug) Maximum Temperature + 5.2 days above 90°F humidex + 208 annual number of degree-days above a threshold of average daily temperature of 65°F[3] + 16.0 °C average August stream temperature (°C)
 **Wildfire & Smoke**	There would be more fire-danger days that could affect homes and businesses where forests and wildland vegetation meet or intermingle. More wildfire smoke can result in particulates affecting those with health conditions (e.g. heart and lung disease, pregnancy, etc.).	+ 21 days Change in High Fire Danger Days
 **Drought**	A decrease in late summer precipitation could reduce available water for multiple uses during the period that is typically driest, and low fuel moisture during fire season.	-14.4 % change in total precipitation for July 15 - September 15
 **Extreme Precipitation**	More frequent and intense storms are expected. This could affect flooding, erosion, and runoff and impact stormwater systems, transportation, and emergency responses.	+10 % change in the magnitude of 2-year storm. +15 % change in storm that occurs on average once every 25 years.

[2] See: https://ecology.wa.gov/water-shorelines/wetlands/tools-resources/wetlands-climate-change.

[3] See definition in https://www.eia.gov/energyexplained/units-and-calculators/degree-days.php.

Climate Change	Potential Impacts	Projections for San Juan County
 Created by Adrian Coquet from the Noun Project **Sea Level Rise**	The county would experience an increase in frequency and extent of coastal flooding. This could impact more homes, businesses, and infrastructure.	+0.6 feet sea level rise expected with a 50% likelihood by 2050 +2 feet sea level rise expected with a 50% likelihood by 2100

Source: (Raymond, 2022)

Town Assets and Climate Hazards

Assets of a community include its "people, resources, ecosystems, infrastructure, and the services they provide. Assets are the tangible and intangible things people or communities value." (US Climate Resilience Toolkit, 2021) Organized by the 11 sectors in the Commerce Climate Element Planning Guidance, December 2021, a range of communities, places, businesses, and more could be exposed to climate hazards in Friday Harbor.

Exhibit 2. Asset Matrix – Town of Friday Harbor

Sectors and Example Assets	Town Assets	Relationship to Climate Hazards
Agriculture & Food Systems ▪ Commercial farms, community gardens, etc.	In the Town there is one community garden, and one food bank, as well as two relatively larger grocery stores: Friday Harbor Market Place, and Kings Market. There is no cold storage building. Most food is from the mainland. Local food is produced on San Juan, Lopez and Orcas Islands.	A warming climate, droughts, and extreme precipitation can stress crops and livestock. However, Friday Harbor does not have significant agricultural production. The Town's food system is dependent on delivery of food from off-island.
Buildings & Energy ▪ Commercial buildings, power transmission lines, etc.	Orcas Power & Light Cooperative (OPALCO) is a member-owned, non-profit cooperative utility providing energy services to San Juan County. Fuel mix is 87% greenhouse gas free due to the purchase of hydroelectric power from the Bonneville Power Administration. OPALCO has two microgrid projects - Community Solar and grid-tied battery storage (one complete and one in the works). Power is distributed by 25 submarine cables.	Extreme heat can cause an increase in demand for energy (cooling).

Sectors and Example Assets	Town Assets	Relationship to Climate Hazards
Cultural Resources & Practices ▪ Salmon, shellfish, historic buildings and sites, etc.	Friday Harbor has a designated Historic District. Historic facilities are located in the town center, and the town waterfront is a Maritime heritage center.[5] Friday Harbor and San Juan Island are part of indigenous traditional territories including the Lummi Nation, Samish Indian Nation, Snoqualmie Indian Tribe, Swinomish Indian Tribal Community, and the Tulalip Tribes. The Town shorelines and western side of town are noted as "survey highly advised" due to the very high risk of archaeological resources.[5]	Potential impacts to historic and cultural resources could include: ▪ Loss of cultural and historical sites on coastline to sea-level rise and related impacts ▪ Loss of cultural and historic sites due to more frequent and intense severe weather events ▪ Loss of locally grown, temperature-sensitive foods that are culturally important (berries, shellfish, salmon, etc.) ▪ Extreme heat can result in warmer stream temperatures that can affect fish and wildlife and plants important as cultural resources.
Economic Development ▪ Local businesses, industries, etc.	As of 2022, about 2,160 residents were employed. An evaluation of commute patterns notes that there are about 2,152 people working in Friday Harbor (residents and non-residents), and about 582 residents who work outside of Friday Harbor. The Town's Economic Development Element identifies the key sectors of employment as: Construction; Accommodations, Restaurants, Food Services; Motor Vehicles and Parts; Management, Education, and Health Services.	Extreme heat or wildfire smoke events could affect persons working outdoors, delaying jobs and income (e.g. construction). These impacts could interfere with cultural events and impact tourism.
Ecosystems ▪ Shoreline and riparian areas, open space, wetlands, etc.	Critical areas in Friday Harbor include: marine fish and wildlife habitat, wetlands, coastal flood areas, and geologic hazard areas. There are no natural streams or lakes within the Town limits. (Town of Friday Harbor Stormwater Management Plan, 2005) The Town of Friday Harbor's shoreline jurisdiction includes Trout Lake and about	There could be changes in the size and shape of designated environmentally critical areas, buffers, and shoreline environments. Warmer summer temperatures could reduce tree growth in some

[5] See: https://wisaard.dahp.wa.gov/server/rest/directories/arcgisoutput/Utilities/PrintingTools_GPServer/_ags_43da34d8-04b0-11ef-aed4-0050568cea6e.jpg.

[5] See: https://wisaard.dahp.wa.gov/server/rest/directories/arcgisoutput/Utilities/PrintingTools_GPServer/_ags_04173dfa-04b0-11ef-a8e8-0050568cea6e.jpg.

Sectors and Example Assets	Town Assets	Relationship to Climate Hazards
	1.2 linear miles of marine shorelines. (Shoreline Restoration and Protection Plan, 2015) About 15% of the shoreline has functional habitat (e.g. eelgrass).	areas and increase growth in mild climates. There is a potential for increased ocean acidification and sea surface temperature. There can be stress on cold-water species in lakes. Sea level rise can result in loss of near-shore habitat and coastal wetlands to sea-level rise and erosion.
Emergency Management ▪ Fire and police stations, equipment, etc.	San Juan Island EMS provides 911 and advanced life support and rescue to the Town of Friday Harbor, San Juan Island, and other outer islands. It is headquartered at 1079 Spring Street. It operates 3 ground Mobile Intensive Care Units (MICU's) and 3 paramedic first responder vehicles. San Juan Island Fire and Rescue District provides emergency response to San Juan Island including Friday Harbor and outer islands. Station 31 in Friday Harbor is staffed full time year round, and located at 1011 Mullis Street. The District has 6 type 1 engines, three brush engines, 2 water tenders, a response boat and other vehicles. The Department of Emergency Management (DEM) serves both the Town of Friday Harbor and San Juan County. Its purpose is to prepare for, respond to, and recover from disaster and large scale emergencies. There are a number of emergency plans and documents including a Hazard Mitigation Plan, Debris Management Plan, and Wildfire Protection Plan. The San Juan County Sheriff provides police protection services to Friday Harbor as well as the rest of the county. The Sheriff's Office is located at: 96 2nd Street Friday Harbor.	The 2018 Hazard Mitigation Plan identified a high probability of a severe storm event, a moderate probability of a WUI fire event, and a low probability of a drought. The Town's Watershed Forest Assessment (Town of Friday Harbor Watershed: Trout Lake Forest Assessment, 2019) identified wildfire risk as a concern and identified management strategies. Regarding drought, since 2019 there has been persistent drought in the Pacific Northwest. In 2023, there was a drought advisory including in San Juan County. (K. A. Bumbaco, 2024) In April 2024, the state declared a drought including all counties. (Washington Department of Ecology, 2024)
Health & Well-being ▪ Hospitals, clinics, community well-being, etc.	The PeaceHealth Peace Island Medical Center is located at 1117 Spring Street. It employs 118 active medical staff. It provides a primary and specialty care clinic and a hospital with 10 licensed beds.	Friday Harbor has populations that could be vulnerable to extreme heat due to age or health conditions.

Sectors and Example Assets	Town Assets	Relationship to Climate Hazards
Transportation ▪ Roads, sidewalks, trails, etc.	The current transportation system is summarized in the 2015 Comprehensive Plan, and is under update. Friday Harbor is served by a network of roads, totaling approximately 13 miles. Ferry traffic peaks tend to be lower in the winter season, when the average vehicle volume on the ferries is under their total capacity, and higher in summer, when the ferries run at capacity much of the time. The Town of Friday Harbor does not have any designated bicycle route. Sidewalks are provided in the downtown commercial area as well as in the newer residential areas in the Town. In the older residential areas, pedestrians use the streets or shoulders as walking paths. Washington State Ferries currently serves Friday Harbor, providing transportation to and from Anacortes; and Orcas, Shaw, and Lopez islands. The existing terminal includes ferry holding lanes, commuter parking lots, and waiting areas. The Port of Friday Harbor operates a 498-slip marina surrounded by a floating breakwater. Capacity of the marina is 20,000 boat nights per year plus an equal number of day visits. The Port of Friday Harbor operates the Friday Harbor Airport. It is a primary service airport with regularly scheduled service.	Climate change could result in infrastructure damage and increased maintenance requirements (e.g. roadside vegetation). A primary concern is sea level rise and damage to the ferry terminal area, and other shoreline facilities with marinas and trails.
Waste Management ▪ Transfer stations, waste hauling, hazardous waste, etc.	The Town of Friday Harbor solid waste department provides municipal solid waste collection and disposal services to residential and business uses within the existing Town limits. All single family and small multifamily developments (4 or fewer) are eligible for recycling and yard waste services. Currently, both the Town and San Juan County bring their solid waste to a facility on Sutton Road where a contractor processes it into large containers and hauls it off island to permanent landfills. The Town and County have a Solid Waste and Moderate-Risk Waste Management Plan (2018).	Due to climate hazards, there could be increased solid waste (downed tree limbs, building rubble, roof shingles, vehicles, and appliances).

Sectors and Example Assets	Town Assets	Relationship to Climate Hazards
	The Department of Emergency Management has a Debris Management Plan (2019).	
Water Resources ▪ Groundwater supplies, water treatment facilities, etc.	The Town owns and operates a municipal water system that serves both the Town and portions of unincorporated San Juan County. The system is classified by the State of Washington as a Group A Community public water system. (Water System Plan, 2013) The Town of Friday Harbor owns approximately 590 acres of mature forest and the town reservoir at Trout Lake. The reservoir provides drinking water to the town. (Town of Friday Harbor Watershed: Trout Lake Forest Assessment, 2019) The Town is bordered on three sides by hills and ridges, and most surface waters drain to the east into Friday Harbor. In the southwest part of the Town, the land drains to the south away from Friday Harbor into North Bay. Water drains overland into and through the current stormwater conveyance system. This current system is somewhat discontinuous and piecemeal with pipes of various sizes and ditches scattered throughout the Town. (Town of Friday Harbor Stormwater Management Plan, Chapter 2, 2005) The Town of Friday Harbor Wastewater Treatment Plant (WWTP) serves the Town population plus wastewater from the UW laboratories. The Friday Harbor wastewater treatment plant is located at the southwest corner of the intersection of Harbor Street and Tucker Avenue. Natural topography does not allow for gravity flow to convey all wastes to the treatment plant. About nine pump stations receive flow from one area by gravity and pumps that flow over a topographic ridge to continue to the treatment plant.	The forest land surrounding the reservoir could be affected by extreme heat and drought as described under Ecosystems. Other water resource impacts due to climate hazards include: ▪ Changes in water quality ▪ Increased demands on stormwater management systems with the potential for more combined stormwater and sewer overflows
Zoning & Development ▪ Single and multi-family residences, apartments, commercial properties, etc.	The Town of Friday Harbor has approximately: 1,178 households (ACS 2022) and 1,519 housing units. 50% of the dwellings are single-family and 10% are manufactured homes. The remaining 40% of units are 2+ attached units. (OFM 2022) Commercial properties are focused in the downtown. Single family uses predominate elsewhere.	Key climate hazards for the Town include sea level rise and extreme precipitation events and erosion, drought, and other concerns. Potential impacts could include: ▪ Increased erosion or damage to coastal infrastructure, beaches, and other natural

Sectors and Example Assets	Town Assets	Relationship to Climate Hazards
	The Town of Friday Harbor manages five public parks and two pocket parks including Breezeway Park, Cahail Park, David Jones Park, Evergreen Park, Memorial Park, Overlook Park, and Sunken Park.	features due to sea level rise and storm surge ▪ Increased demand for irrigation of non-native, non-productive landscaping ▪ Changes in housing stock availability due to hazard events ▪ Increased impervious surface runoff and associated management and maintenance costs

Overburdened Communities

Climate change has profound negative effects on human health and community well-being,[6] it can exacerbate existing health conditions or create new health challenges. Every resident is vulnerable to climate impacts but some communities and individuals face higher risks than others.[7] Overburdened communities are those in a geographic area where populations face a disproportionate convergence of environmental harms and health impacts, as defined in RCW 19.405.020. RCW 36.70A.030 (29). These communities are often more vulnerable to existing social and economic risk which impacts their exposure, sensitivity, and ability to adapt to climate-related stresses. These overburdened communities include groups such as adults over 65, children under 5, immigrants (including those with limited English language proficiency), families with low incomes, outdoor workers, and Black, Indigenous, and people of color (BIPOC).

For example, older adults may have preexisting health conditions and reduced mobility rendering them particularly vulnerable to impacts of extreme weather events exacerbated by climate change such as power outages or need for evacuation. Similarly, children under 5 years old may face challenges in regulating their body temperatures and underdeveloped immune systems, heightening their susceptibility to health impacts from wildfires and extreme heat. Furthermore, households with low incomes may encounter increased vulnerability to illnesses and have limited resources to retrofit their homes or seek medical care in response to climate change related hazards.

Overburdened communities are among the most exposed and most sensitive while having fewer individual and community resources to adequately prepare for and respond to such challenges. Therefore, gaining insight into specific climate impacts and identifying

[6] https://nca2023.globalchange.gov/chapter/15/

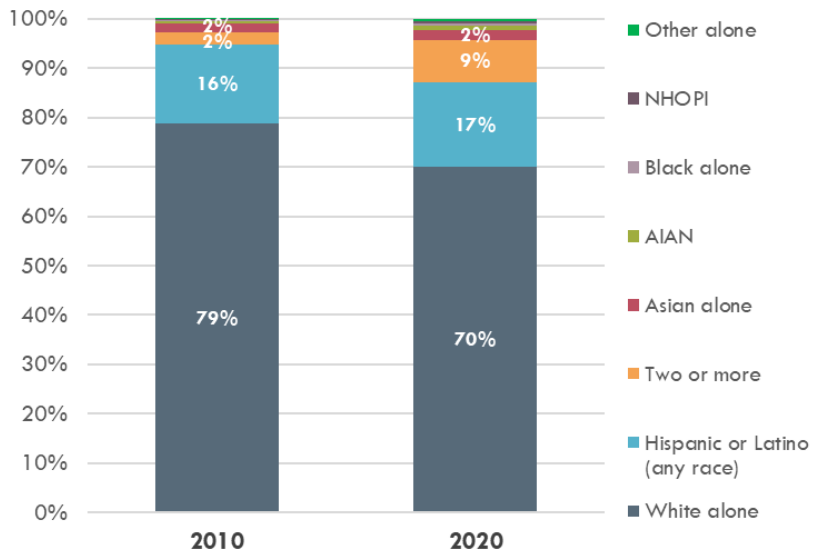
[7] https://www.epa.gov/climate-indicators/understanding-connections-between-climate-change-and-human-health

overburdened communities within Friday Harbor can help institutions develop strategies aimed at enhancing resilience and minimizing climate impacts.

Race and Ethnicity

Between 2010 and 2020 the racial and ethnic make-up of the town has changed to include fewer people who identify as “White alone” and in increase in those who identify as “Hispanic/Latino of any race” or “Two or more” races. This is seen in the exhibits below.

Exhibit 3. Population Distribution and Diversity of Friday Habor 2010 and 2020



Sources: U.S. Decennial Census 2010 and 2020; BERK, 2024

Exhibit 4. Data for Population Distribution and Diversity Chart – Friday Harbor 2010 and 2020

	2010	2020	Change (share)
White alone	79%	70%	-9
Hispanic or Latino (any race)	16%	17%	+1.3
Two or more	2%	9%	+6.2
Asian alone	2%	2%	-0.1
American Indian/Alaska Native	0%	1%	+0.5
Black alone	0%	1%	+0.3
Native Hawaiian or Other Pacific Islander	0%	0%	+0.2
Other alone	0%	1%	+0.5

Sources: U.S. Decennial Census 2010 and 2020; BERK, 2024

Language

Separate from the racial and ethnic demographics of Friday Harbor, foreign language groups make up a small but notable percentage of the population whose perspectives we want to have represented on the Comprehensive Plan. Student data is a reliable way to determine "Language Spoken at Home" and was pulled from the State Office of Superintendent and Public Instruction (OSPI). The information can be extrapolated to the town population to get a better understanding of language groups in Friday Harbor. This may inform the languages that we should translate written material into, what languages we should be offering translation for during public meetings, and if there are specific community agencies that work with non-English speakers that we should be engaging with directly. Exhibit 5 shows which languages are spoken at home by students in Friday Harbor Public Schools per OSPI.

Exhibit 5. Languages spoken at home by public school students, 2023

Friday Harbor	Student Count	Percent
English	702	87%
Spanish	95	12%
Pilipino/Filipino	2	0.2%
Unknown	11	1%

Sources: OSPI, 2023; BERK, 2024

This data reflects that the best use of resources is to provide Spanish language translations for written materials and to prepare for real time Spanish language translation as needed during public meetings and focus groups.

Another notable language group that should be engaged with is the participants in the recently reinstated San Juan County Library English Language Learning program. This program offers Spanish to English conversational and lesson planning for free to residents of San Juan County at the library in Friday Harbor.

Labor and Income

The last demographic indicator that the engagement strategy will be tailored to is a diversity of income and jobs. By targeting different professional groups who work on Friday Harbor, we can garner more diverse perspectives beyond the predominant groups of high income earners who commute into or out of Friday Harbor, or those who live on Friday Harbor and work remotely for jobs not based in Friday Harbor as seen in Exhibit 6.

Exhibit 6. Origin and Destination for People Living and/or Working in Friday Harbor by Income Level, 2021

	Live in Friday Harbor, Work Elsewhere		Work in Friday Harbor, Live Elsewhere		Live and Work in Friday Harbor	
	People	Percent	People	Percent	People	Percent
Low Income Jobs	76	13%	177	15%	154	16%

Moderate Income Jobs	171	29%		304	26%	376	38%
High Income Jobs	335	58%		687	59%	454	46%

Sources: Longitudinal Employer-Household Dynamics, 2021; BERK, 2024

Offering a broad range of outreach options including surveys, focus groups, and other activities will ensure that a range of racial, ethnic, income, and language groups in the Town are represented. The data from earlier engagement activities will also be used to test the validity and sampling of our activities and adjust future engagement events to reach a diverse cross section of the population in the event that the data does not reach a representative sample of the population. If the majority group is overrepresented with regards to any of these indicator demographics, future activities will be adjusted accordingly and it will be noted in the engagement summary which is to be written at the end of this effort.

Tribes

Indigenous people of the Pacific Northwest need to be included in important conversations related to climate preparedness and historic preservation of land and resources. The tribes with an interest in Friday Harbor or San Juan Island are identified in Exhibit 7, and include the Lummi Nation, Samish Indian Nation, Snoqualmie Indian Tribe, Swinomish Indian Tribal Community, and the Tulalip Tribes. These tribes will be engaged as part of the ongoing outreach of the Comprehensive Plan. Work already completed by some tribes on this list include studies on rising ocean temperatures, sea level rise, flooding, and stream temperatures that threated the ancestral land, water, and air of the traditional territories of these tribes.[8] Overall, tribal governments provide necessary insight into the climate impacts of the area and provide invaluable historical context as it relates to culture and environment.

> The area now known as Friday Harbor, Washington was first occupied by Coastal Salish people who harvested shellfish and managed the native grasslands and oak woodlands with fire in order to exploit edible camas bulbs. Traveling to the island by cedar canoes, they also harvested salmon, deer, waterfowl, and berries to take back to mainland winter camps. ~Town of Friday Harbor Comprehensive Plan, 2018

[8] See: Samish Indian Nation, Our Future Climate In Samish Traditional Territory, Available: https://storymaps.arcgis.com/stories/2aa409a8988e401088cd0658148a53e9.

Exhibit 7 Tribal Areas of Interest per Washington State Department of Archaeology and Historic Preservation

Source: DAHP, 2024; BERK, 2024

Findings and Next Steps

The Town of Friday Harbor is at risk of a number of climate related hazards based on its unique demographic, economic, and geographic characteristics. The Town is particularly susceptible to the potential impacts of extreme heat, extreme precipitation, and sea level rise related hazards which are exacerbated in frequency and severity by climate change. Other impacts such as wildfire smoke and the potential for wildfires predominantly impact inland infrastructure such as the town reservoir and airport. Hazards related to inundation due to sea level rise pose a threat to critical coastal infrastructure such as the ferry terminal and other coastal utility and marine resources. Changes in precipitation timing and severity could affect the Town's utility service delivery and infrastructure maintenance.

The Town residents, visitors, and workers may have health and socio-economic conditions that put them at a higher risk for the health impacts of heat or smoke exposure. These same hazards and other acute climate events may interfere with the Town's local tourism-based economy.

Following a confirmation of assets and needs with the Town staff, the Consultant team will work to develop the Friday Harbor Vulnerability Assessment.

Appendices

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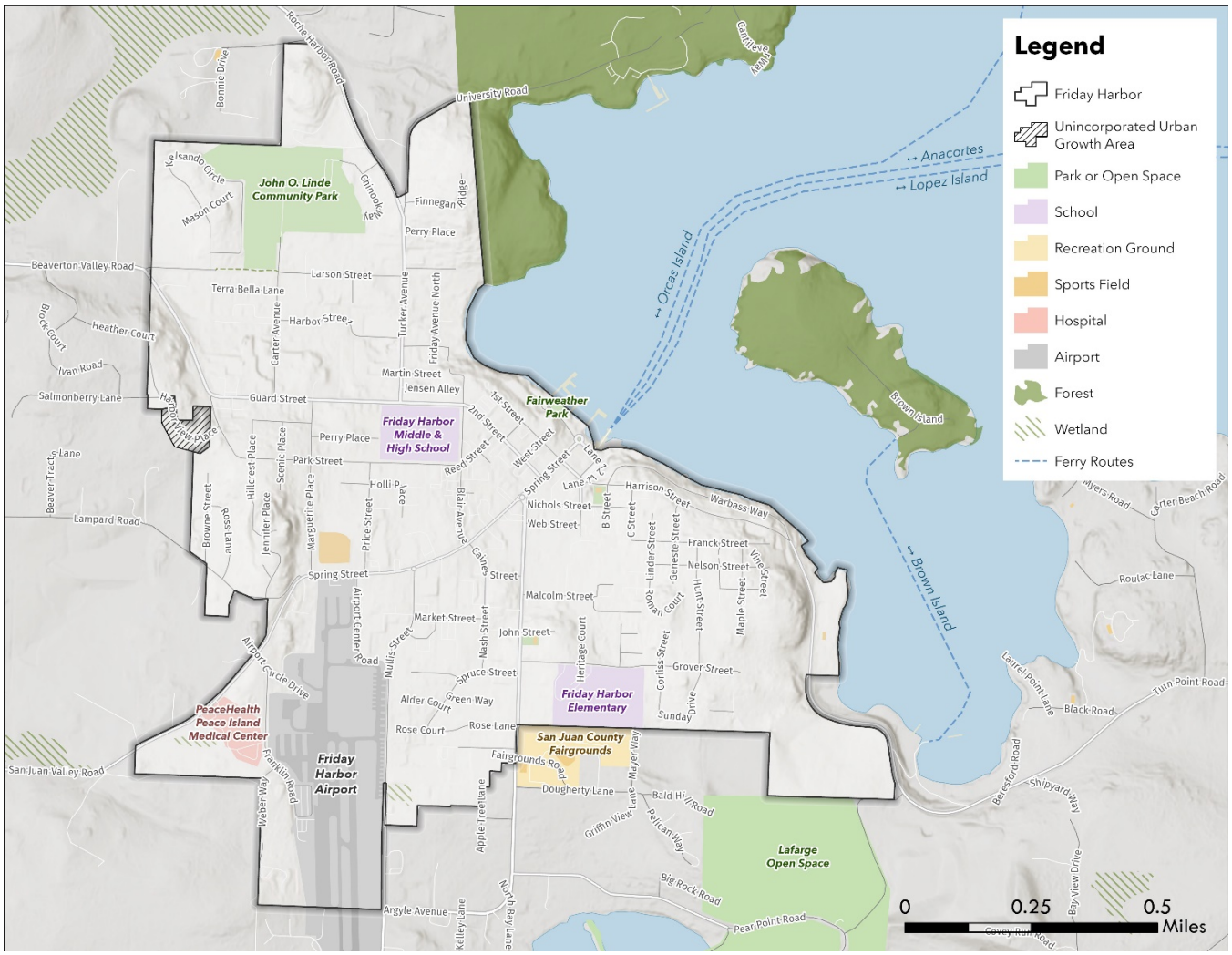
Appendix A. Friday Harbor Map Folio

Study Area

Exhibit 8. Friday Harbor Overview Map

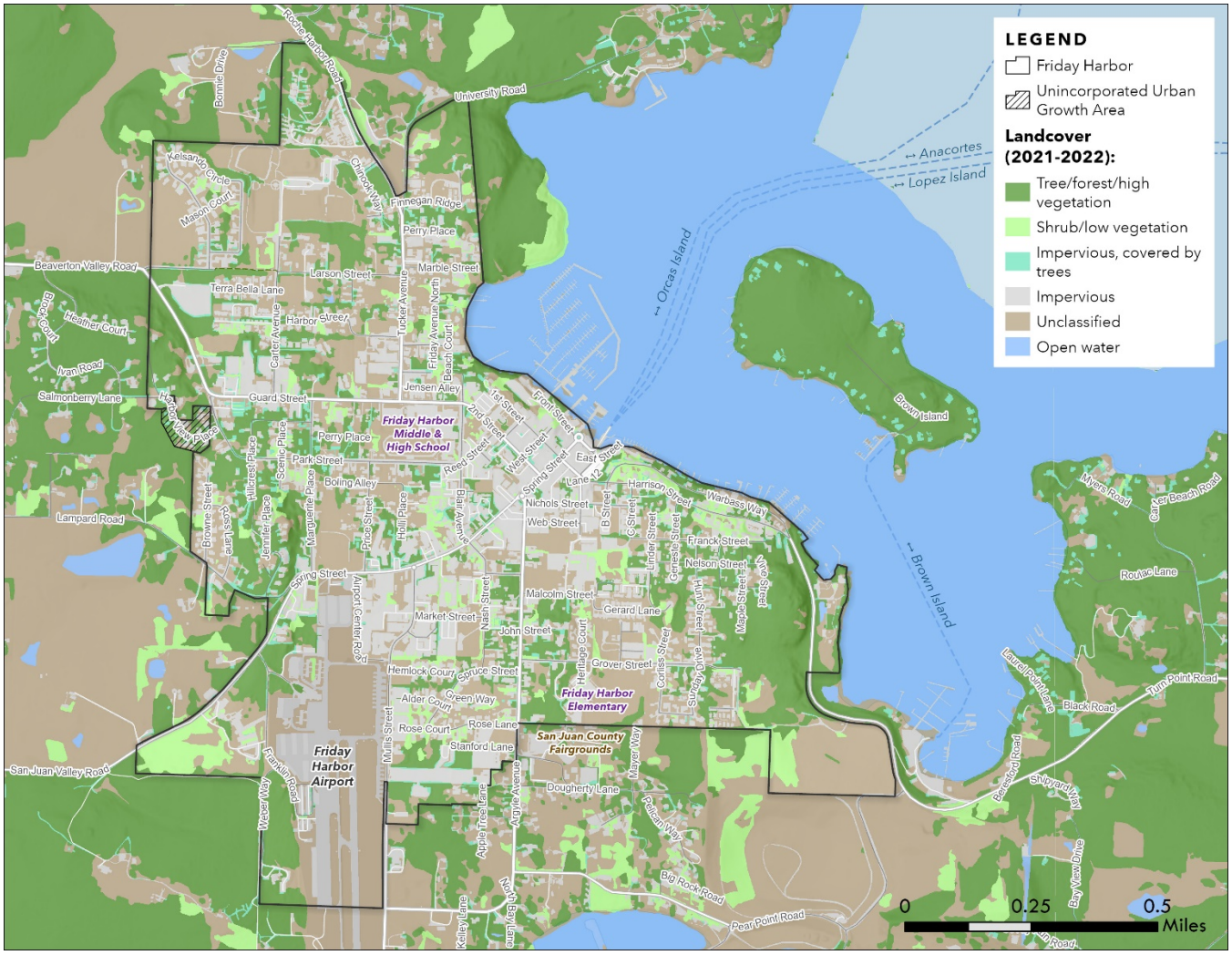


Source: San Juan County, Town of Friday Harbor, BERK 2024.

- The map highlights major town facilities including parks, schools, medical, airport, ferry and other facilities.

Land Cover, Trees, Heat Islands

Exhibit 9. Land Cover – Friday Harbor

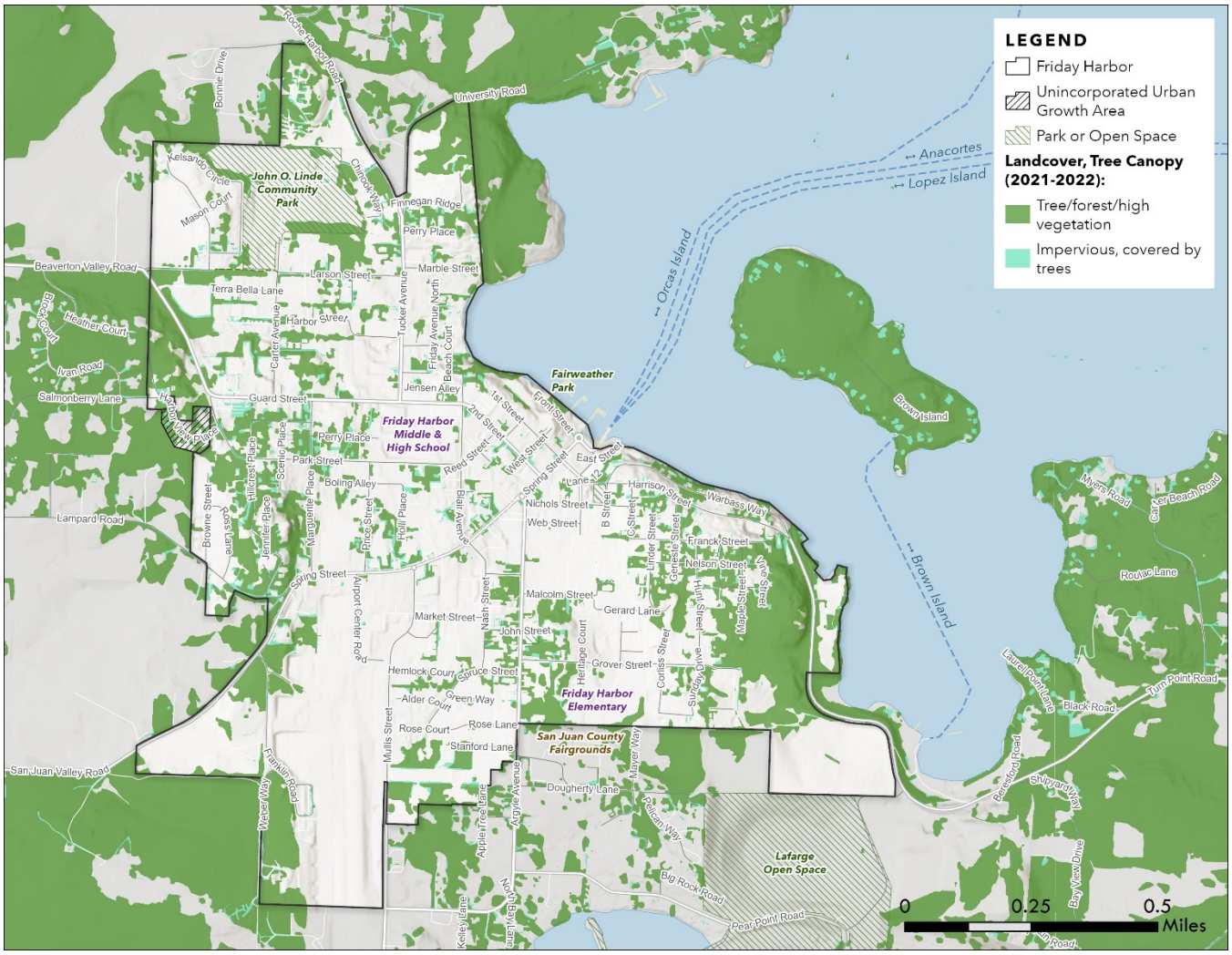


Sources: Washington State Ecopia Land Cover, 2022; BERK Consulting, 2024.

Takeaways

- Tree cover and vegetation highly concentrated outside of town limits.
- Large swaths of impervious surfaces and unclassified areas throughout town.

Exhibit 10. Tree Canopy – Friday Harbor

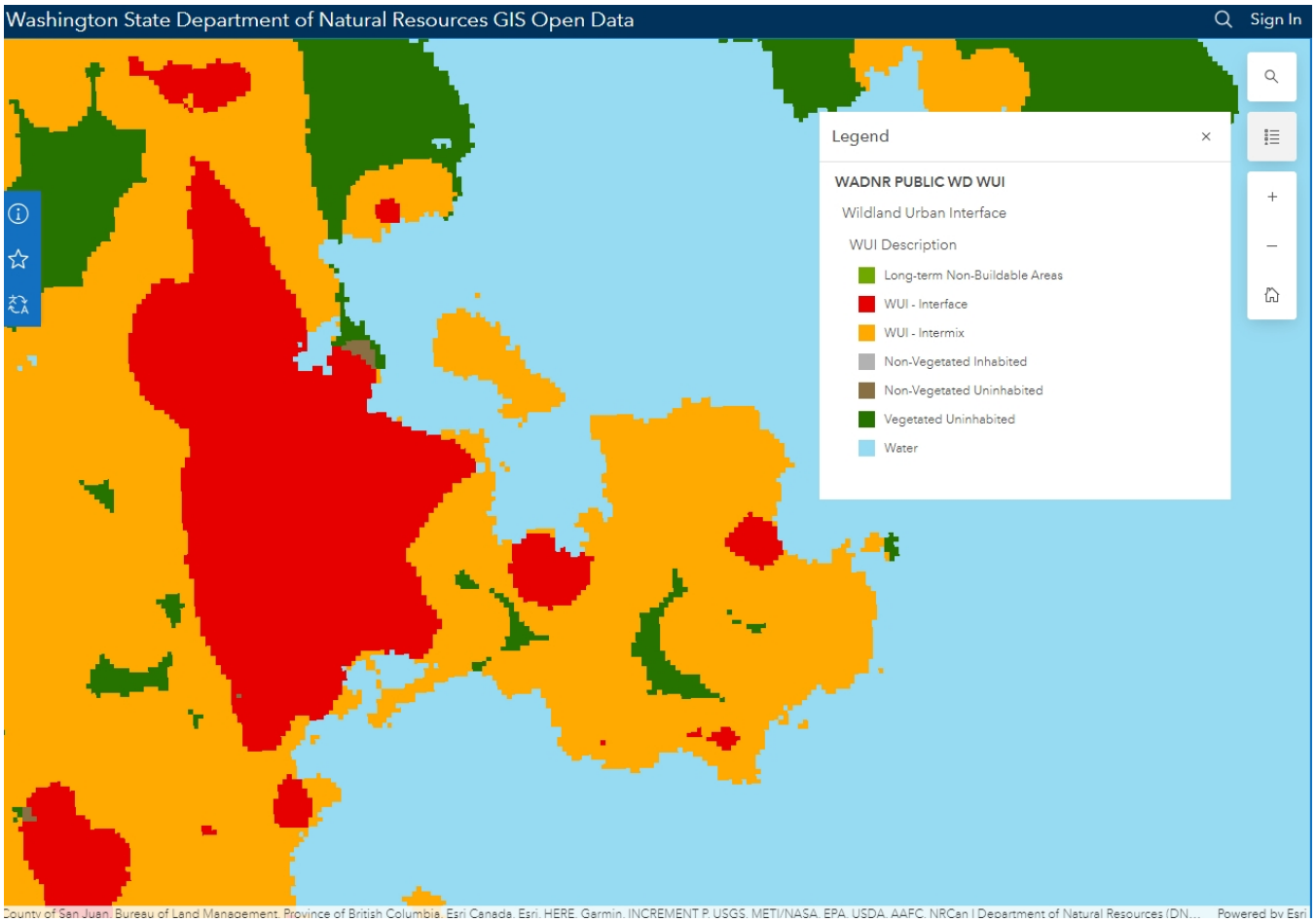


Sources: Washington State Ecopia Land Cover; 2022, BERK Consulting, 2024.

Takeaways

- Tree cover and high vegetation concentrated in westernmost part of town.
- Parts of town do not have large tree canopy or vegetation which can exacerbate some climate hazards.

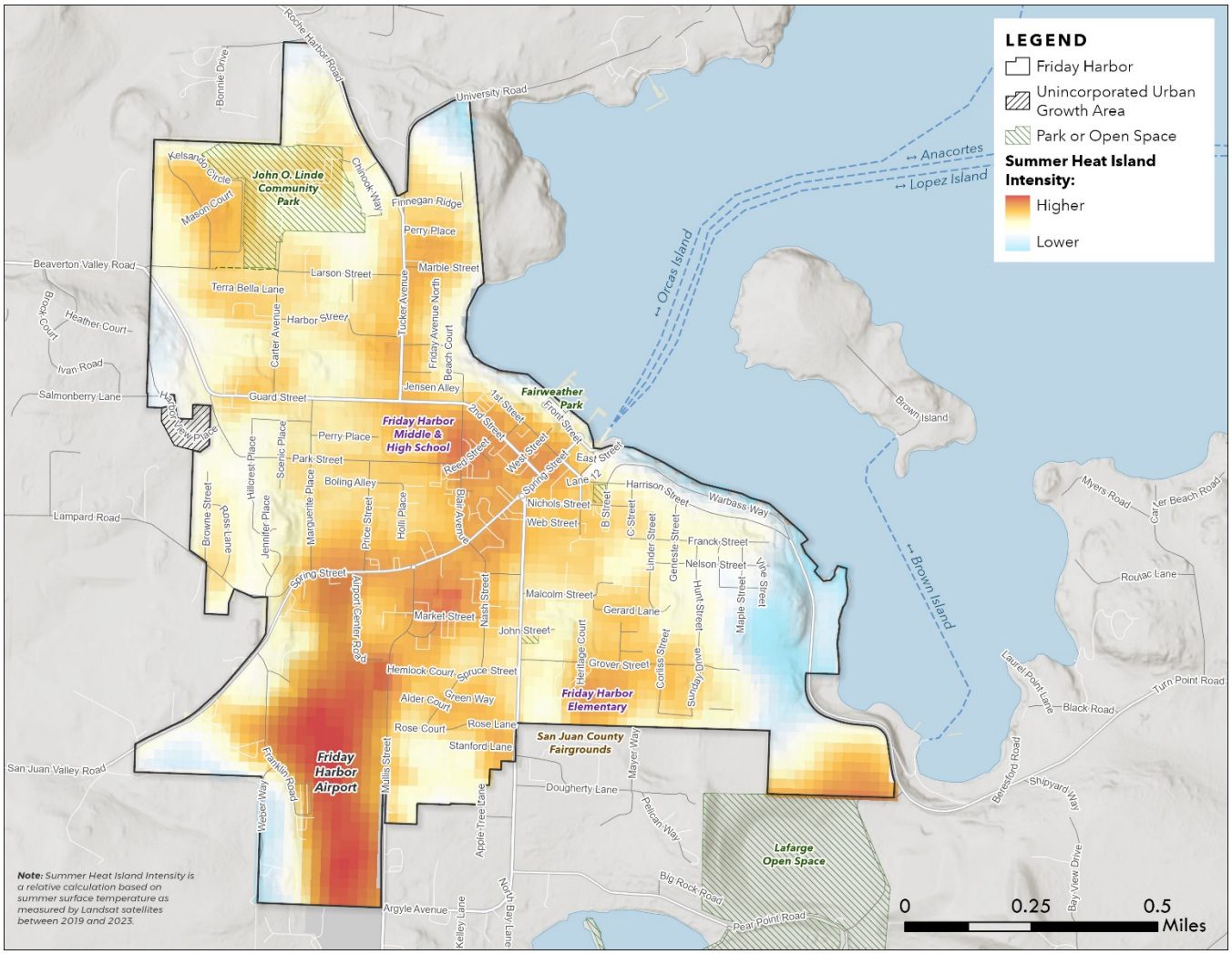
Exhibit 11. Wildland Urban Interface – Department of Natural Resources (2019)



https://data-wadnr.opendata.arcgis.com/maps/8ef03bb8bf614334bf6964fdd43deebe/explore?location=48.531022%2C-122.990292%2C13.99

- While much of the Town center lacks tree cover, the Washington Department of Natural Resources has mapped it as having a Wildland Urban Interface (WUI) and much of the rest of the town as WUI - Intermix. The WUI depicts areas of Washington where structures and wildland overlap with specific structure densities.
- Note: The open water area north of the marina is incorrectly shown as WUI.

Exhibit 12. Summer Heat Island Intensity



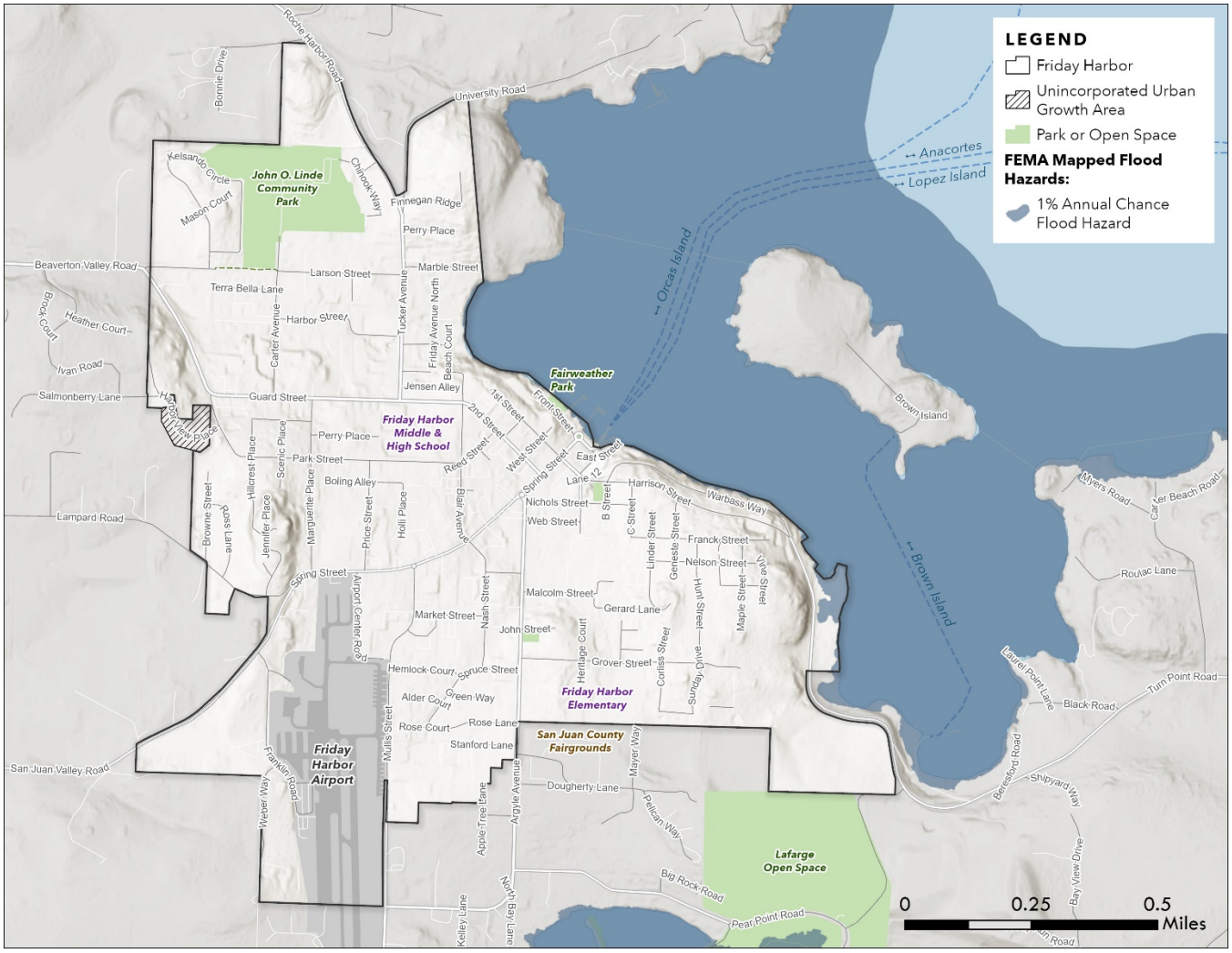
Sources: Landsat8, 2019-2023; BERK Consulting, 2024.

Takeaways

- Most intense summer heat island temperatures are felt at the airport area.
- Other areas in downtown have high summer heat island intensity.
- Largest swath of tree canopy from previous maps have lowest intensity of urban heat island.

Flooding and Sea Level Rise

Exhibit 13. Flood Hazards (FEMA) – Friday Harbor

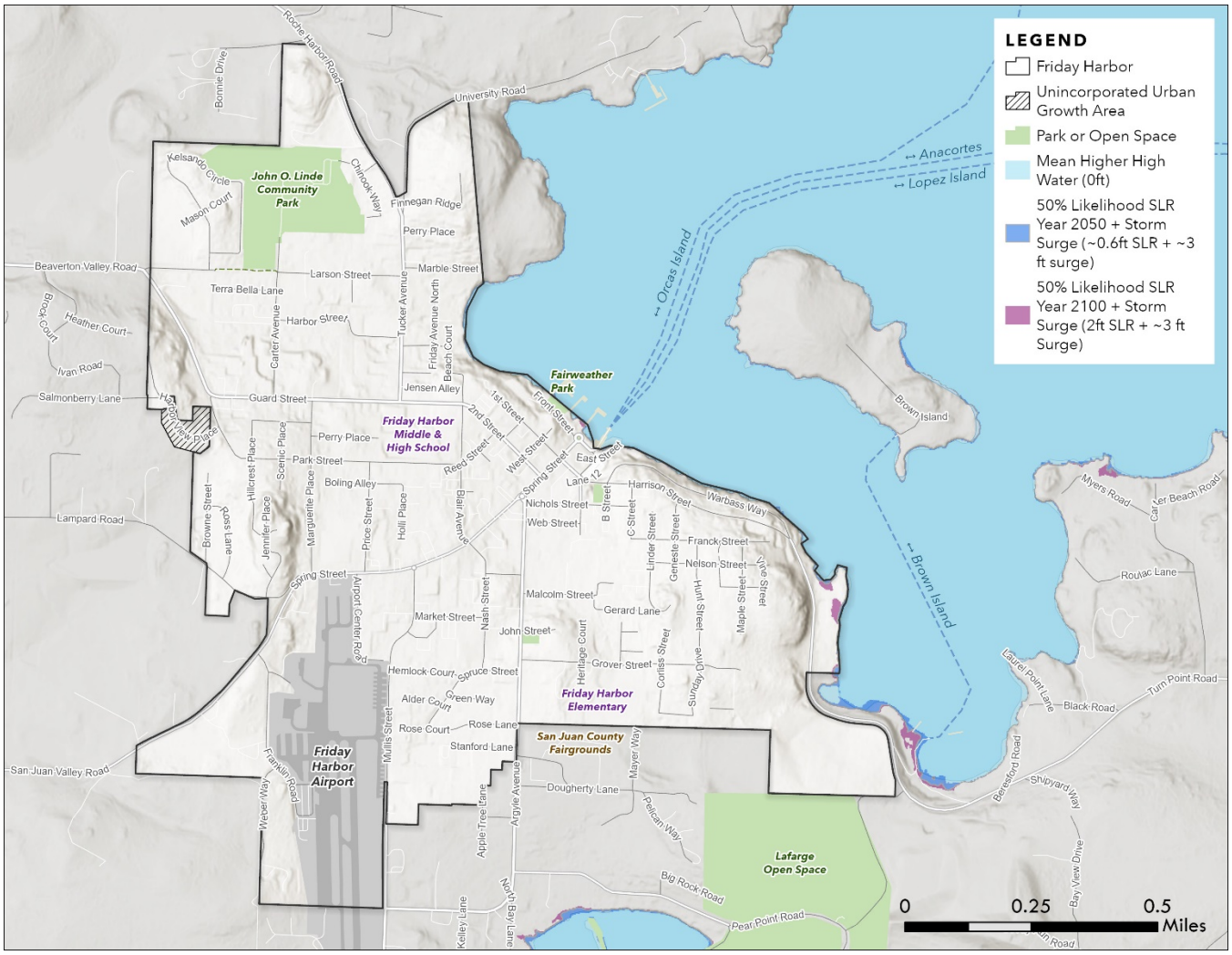


Sources: FEMA 2021, BERK Consulting, 2024.

Takeaways

- As is clear flood hazards are concentrated on the coastline with almost no additional surface water in town limits.
- 1% annual change of flood hazard presents most notable threat in southeast part of the town and ferry terminal and park access areas.

Exhibit 14. Sea Level Rise (NOAA) – Friday Harbor



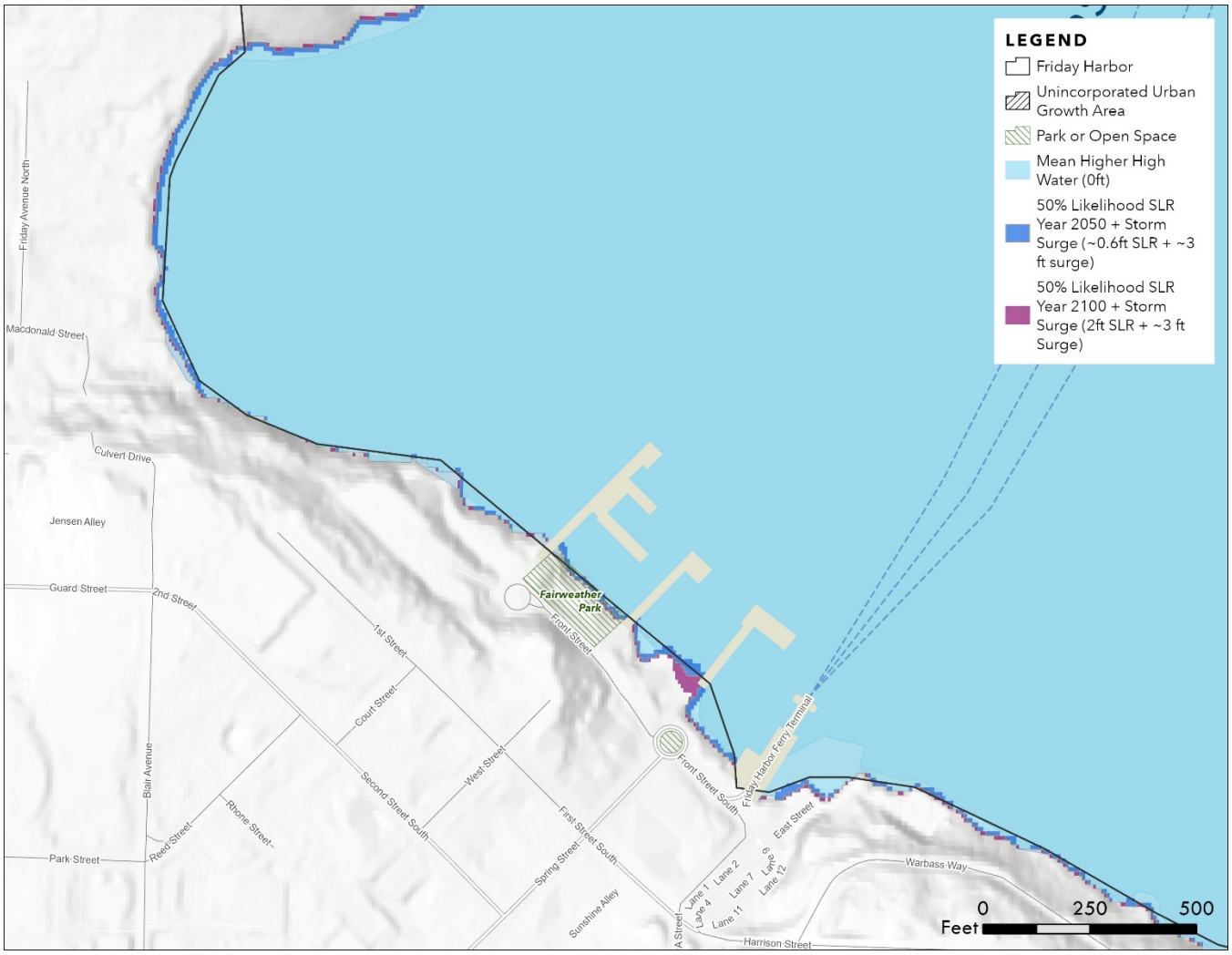
Source: NOAA,2024; BERK Consulting, 2024.

The consultant for San Juan County created initial sea level rise maps but there were some errors. Overall the County said that BERK could take a look at it but should not be using their data until it is cleaned up (around the end of May 2024). We are using the NOAA data in the near term and then switching to the more granular data long term.

Takeaways

- Within town limits, a notable area that is at heightened risk of sea level rise is the area at the eastern part of town on Warbass Way.
- This map shows that while sea level rise is a risk with critical facilities such as the ferry terminal area and some parkland, Friday Harbor has fewer residential areas that are at risk.

Exhibit 15. Sea Level Rise (NOAA) – Ferry Terminal

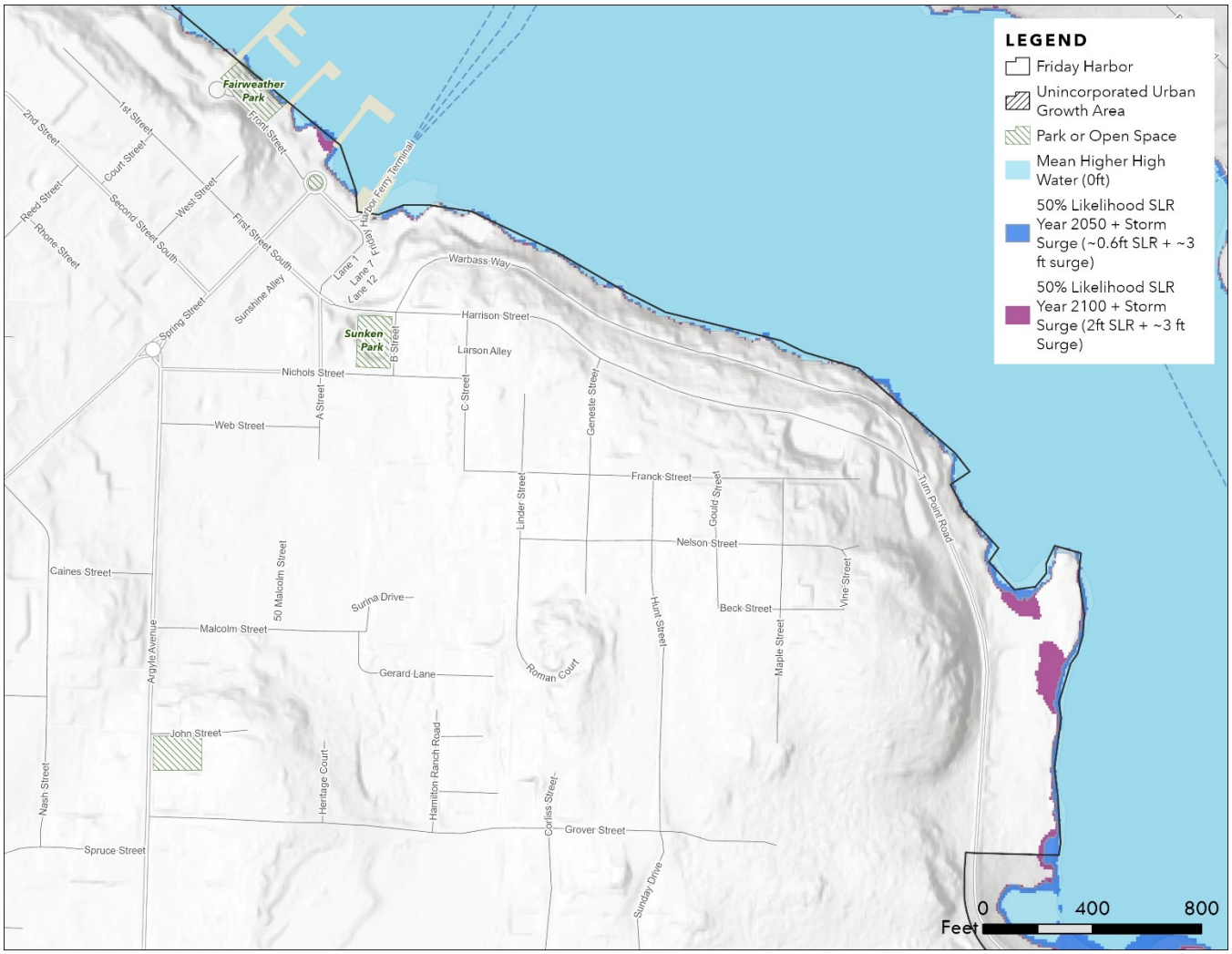


Source: NOAA, 2024; BERK Consulting, 2024.

Takeaways

- A zoomed in map of the ferry terminal highlight a slightly higher resolution of sea level rise data.
- Part so the ferry terminal and associated marina are at risk of inundation during storm surges based on FEMA 50% estimates of 2100 sea level rise parts of town.

Exhibit 16. Sea Level Rise (NOAA) – Warbass Way, Turnpoint Road



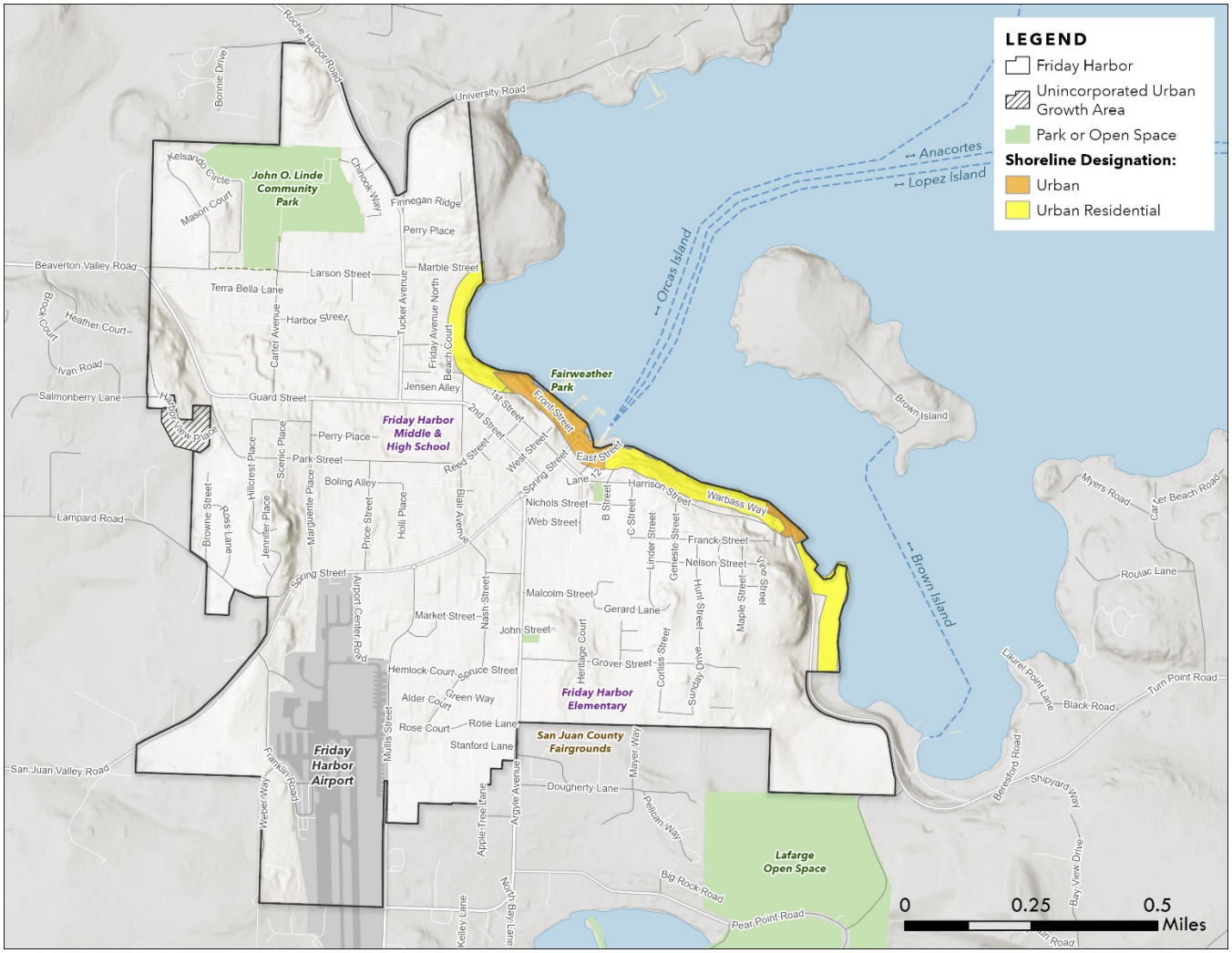
Source: NOAA, 2024; BERK Consulting, 2024.

Takeaways

- A zoomed in map of the Warbass Way area highlights a slightly higher resolution of sea level rise data.
- The area near Warbass Way following southeast to Turn Point Road is exposed sea level rise both in the 2050 and 2100 FEMA estimates.

Land and Shoreline Use

Exhibit 17. Shoreline Designations – Friday Harbor

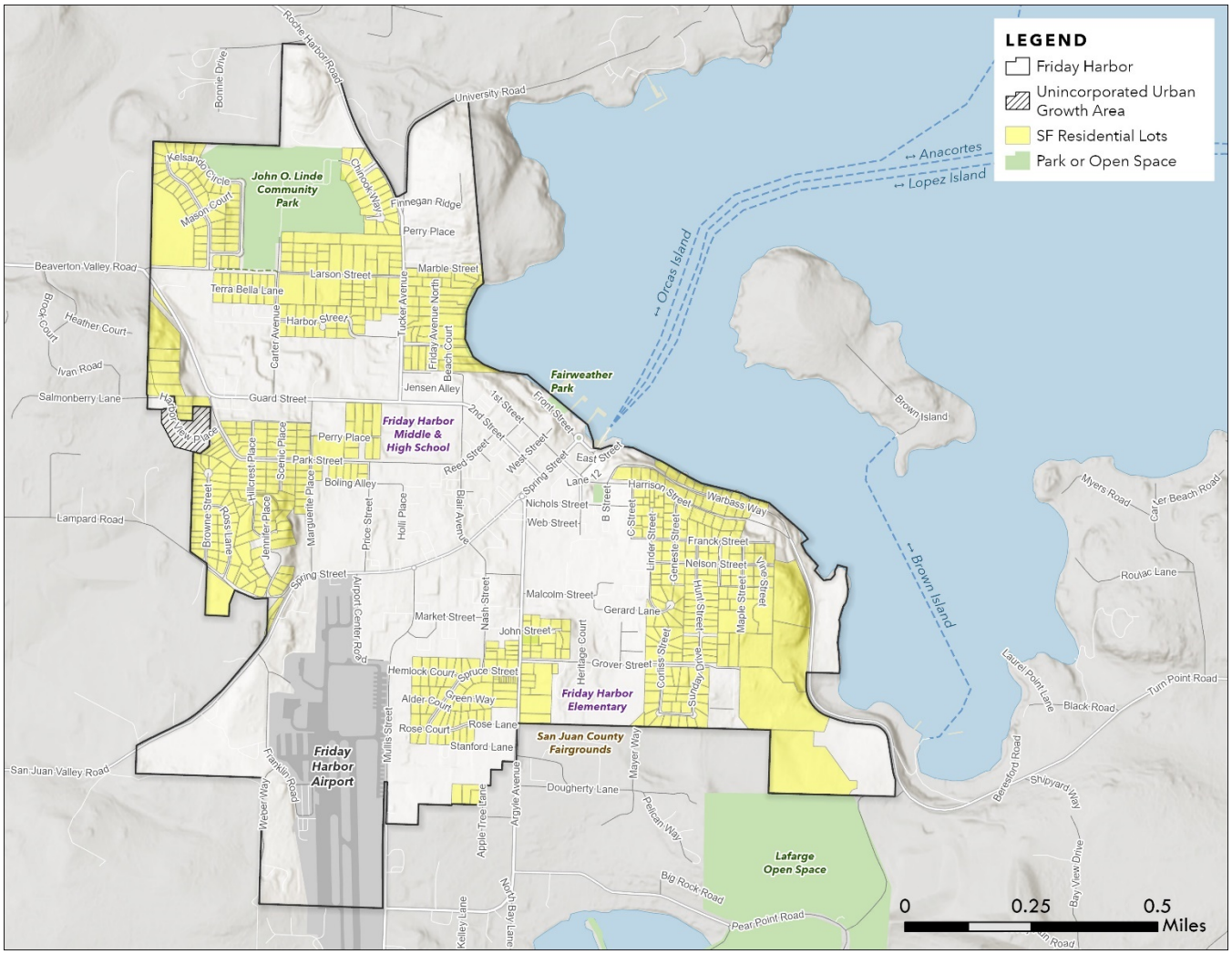


Sources: Town of Friday Harbor, 2024; BERK Consulting, 2024.

Takeaways

- Large parts of the shoreline in Friday Harbor are urban residential and while inundation may present a small relative threat of negative impact, other shoreline concerns may impact these areas, such as extreme precipitation events.
- Urban areas on this map are predominantly designated for commercial or ferry uses and may be negatively impacted by extreme precipitation events as well.

Exhibit 18. Single Family Residential Lots – Friday Harbor



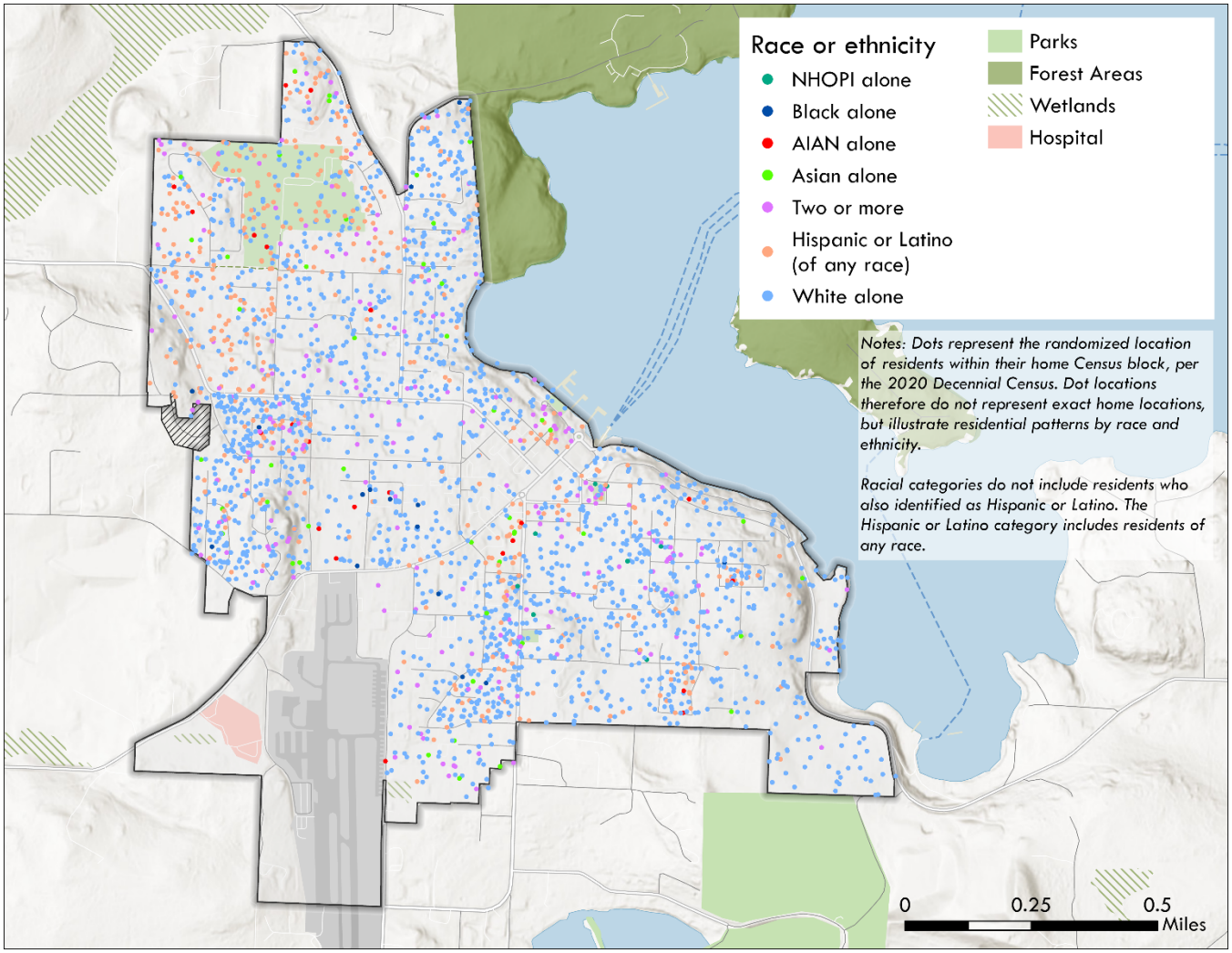
Sources: Town of Friday Harbor, 2024; BERK Consulting, 2024.

Takeaways

- Much of the Town is in use as single family residential uses.
- These areas have a higher exposure to urban heat islands and other climate hazards such as extreme precipitation and wildfire danger .
- Single family lots can also be exposed to erosion, stormwater runoff, and water quality. These uses can also be hampered by limited transportation choices contributing to greenhouse gas emissions.

Socioeconomics

Exhibit 19. Population and Race Dot Density (US Census) – Friday Harbor

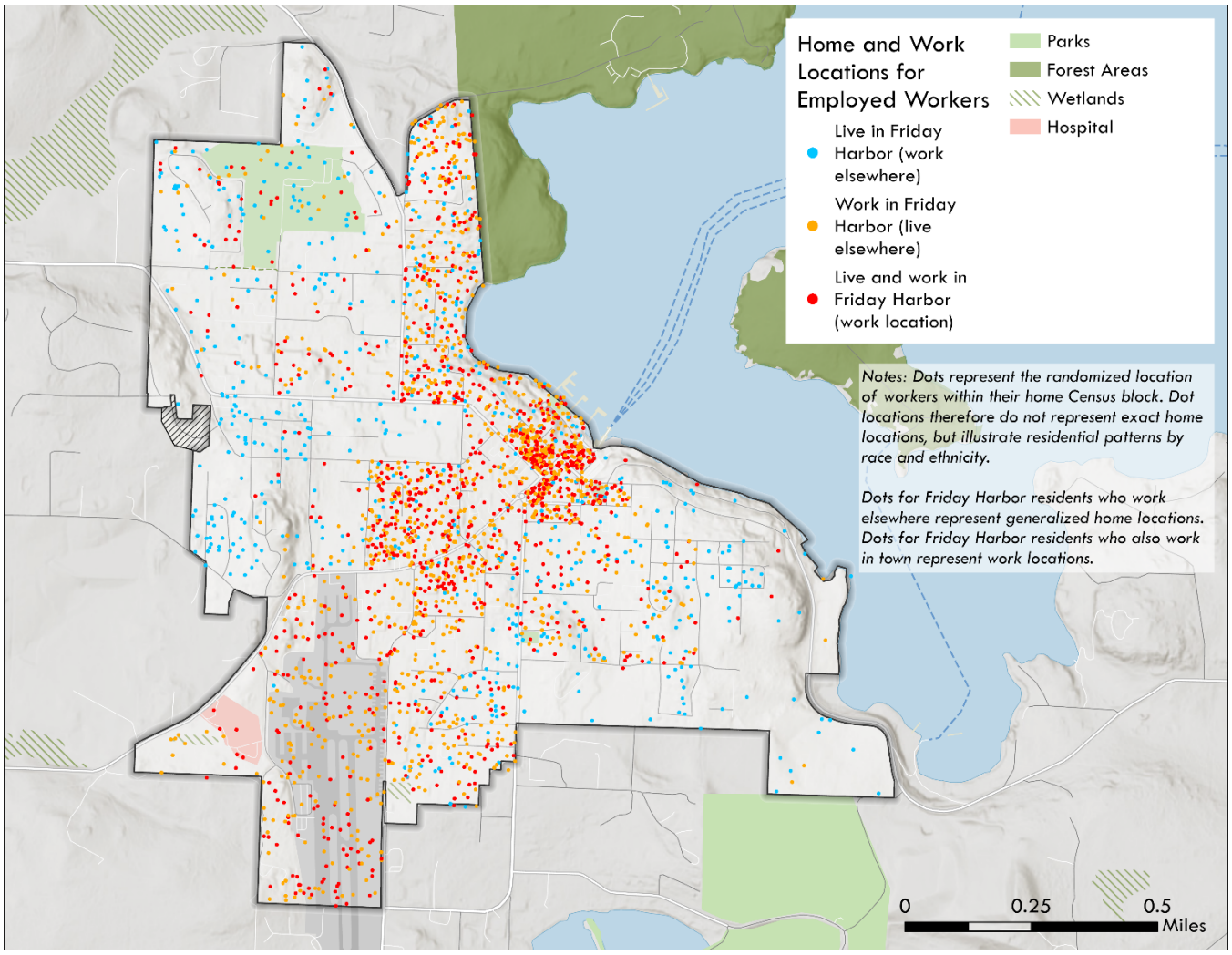


Sources: US Census (2020); BERK 2024.

Takeaways

- The vast majority residents in Friday Harbor identify as “White Alone” the second largest group are those who identify as Hispanic or Latino of any race with a fair consistent distribution throughout the town except for a centration in the northernmost neighborhoods.
- There are few ethnic or racial enclaves for those of any other race or ethnicity.

Exhibit 20. Employment Density (US Census LEHD, 2021) – Friday Harbor



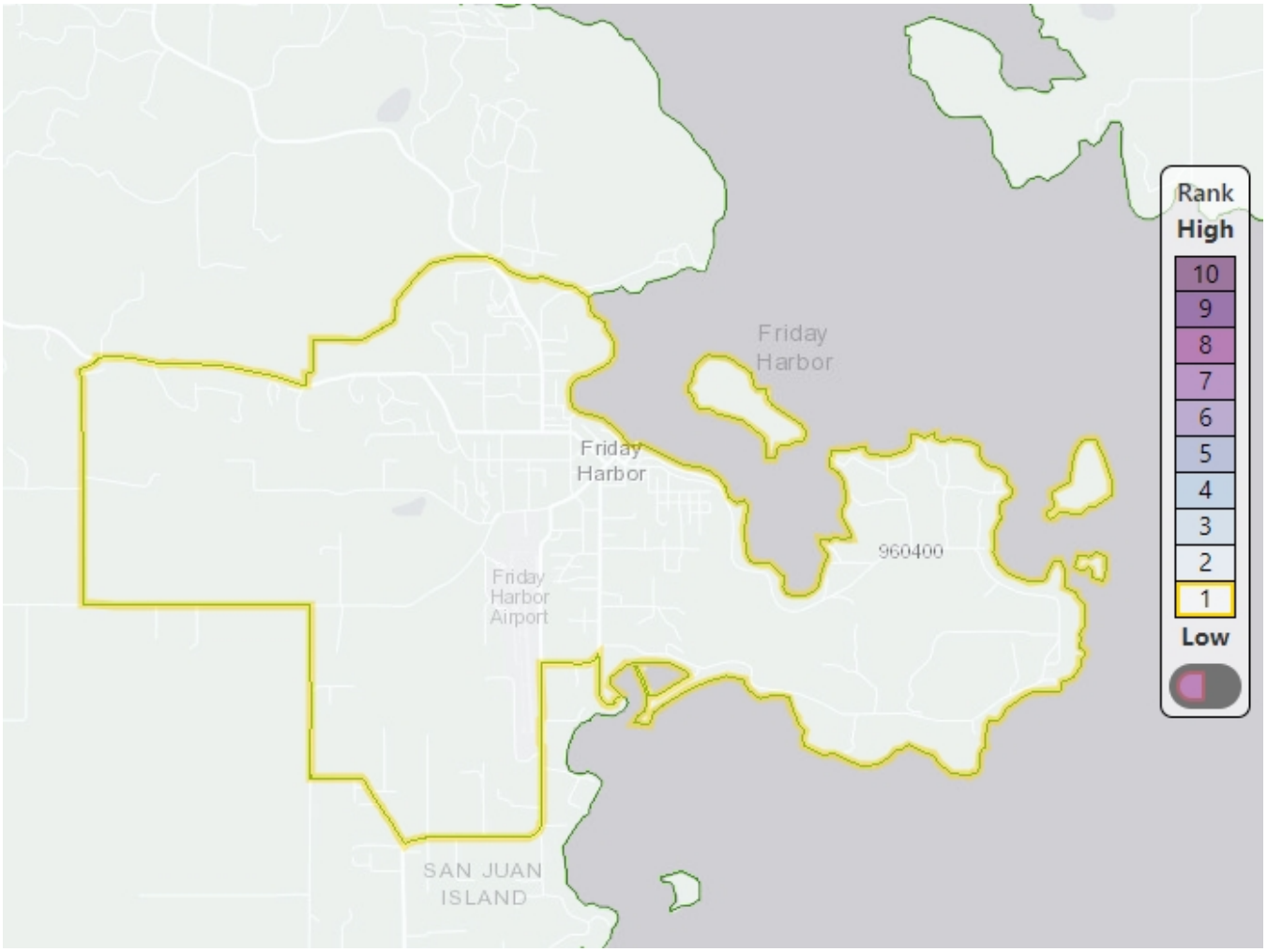
Sources: US Census LEHD, 2021, BERK 2024.

Takeaways

- Employment within Friday Harbor is concentrated predominantly in the downtown with a large number of these workers living and working in town limits.
- Those who work elsewhere but live in Friday Harbor are clustered outside of the downtown.
- A very small number of residents near the airport or the shoreline work outside of the town.

Appendix B. Department of Health - Environmental Health Disparities Maps

Exhibit 21. Environmental Health Disparities – Low – Friday Harbor Area

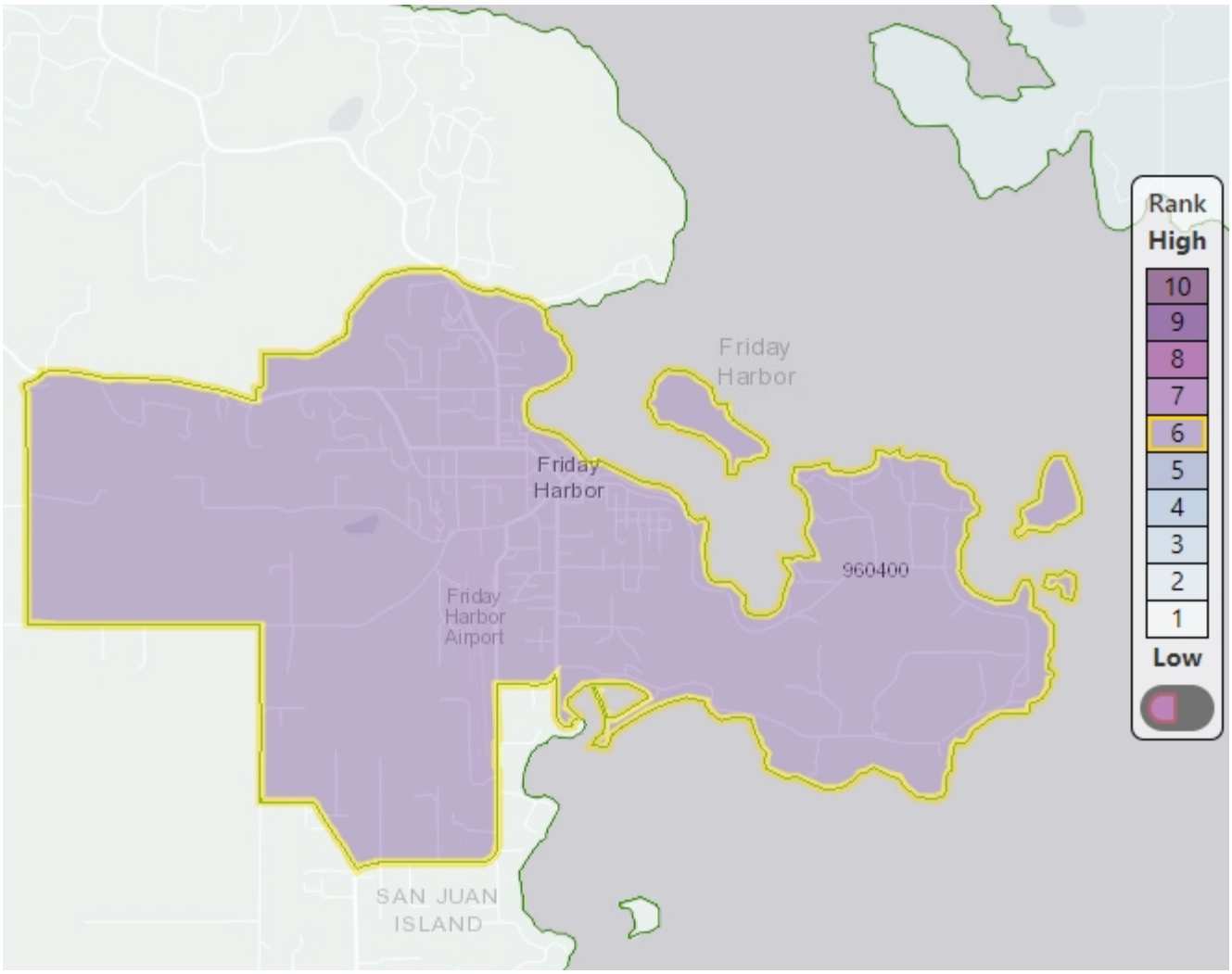


Source: Washington Department of Health, 2022

Takeaways

- Relatively to the rest of the State of Washington, The town has very low overall environmental health disparities.

Exhibit 22. Socioeconomic Factors – Medium – Friday Harbor Area



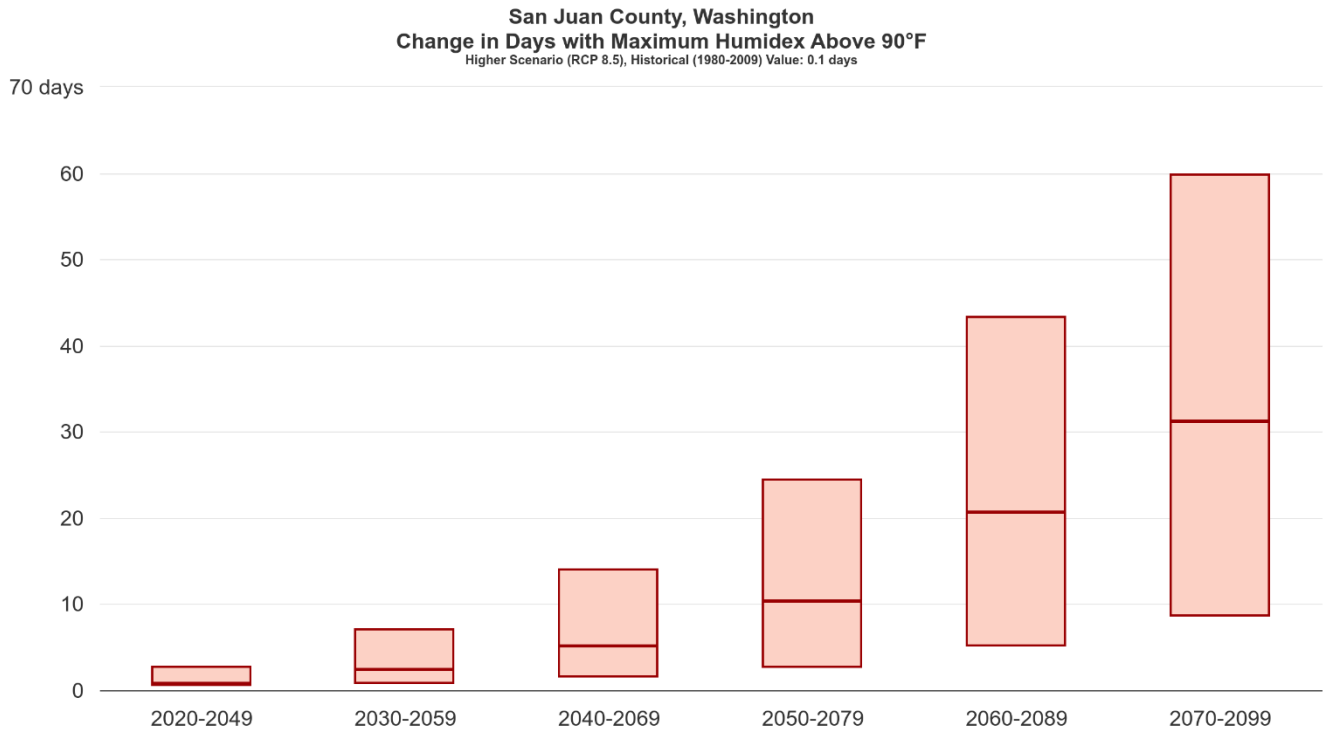
Source: Washington Department of Health, 2022

Takeaways

- Relatively to the rest of the State of Washington, Friday Harbor and the surrounding area rank very high in overall socioeconomic factors leading to health risk (e.g. an aging population) though as shown in the prior map, the Town has limited negative environmental exposures.

Appendix C. Climate Impacts Group Resilience Information: San Juan County

90 Degree Maximum Humidex Days (RCP 8.5) – San Juan County

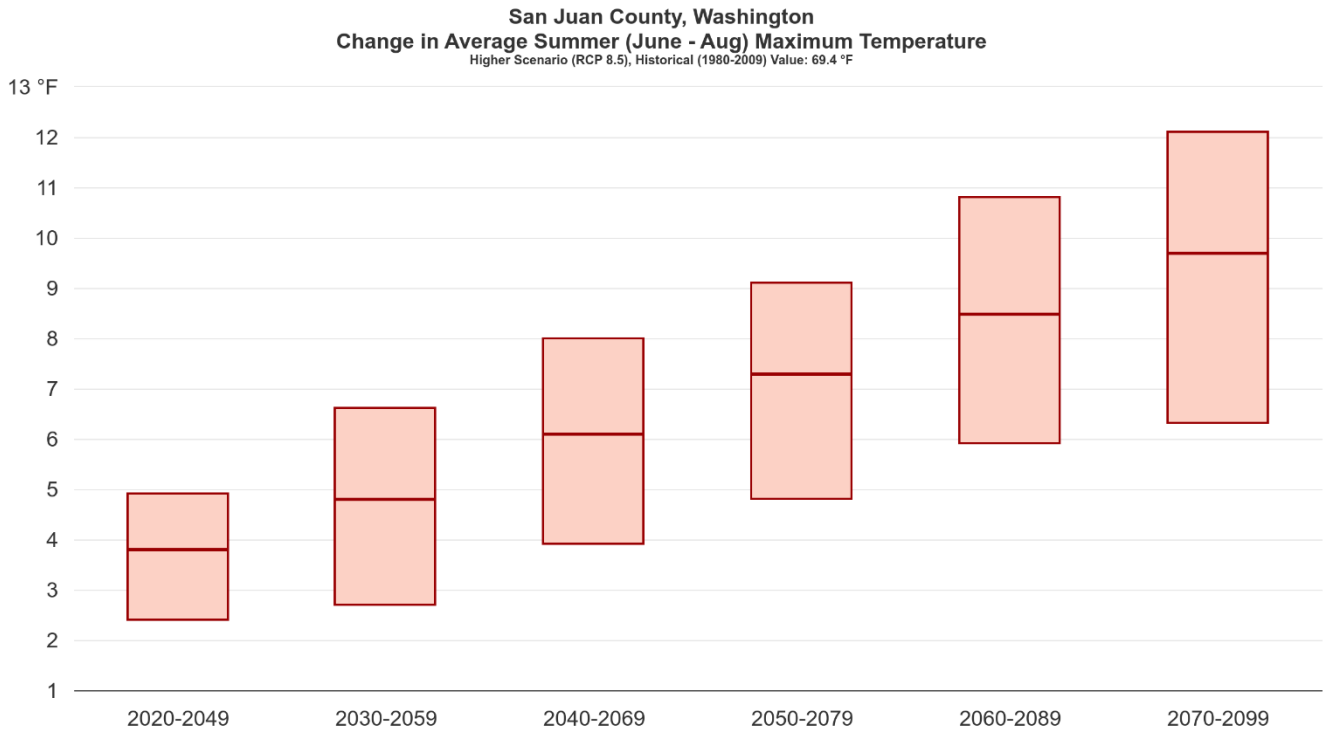


Sources: UW CIG, 2024; BERK, 2024

Takeaways

- The overall number of Humidex days is set to increase at each of these time scales with increasing ranges of uncertainty, which is expected, but a baseline that increases year over year.

Summer Maximum Temperature (RCP 8.5) – San Juan County

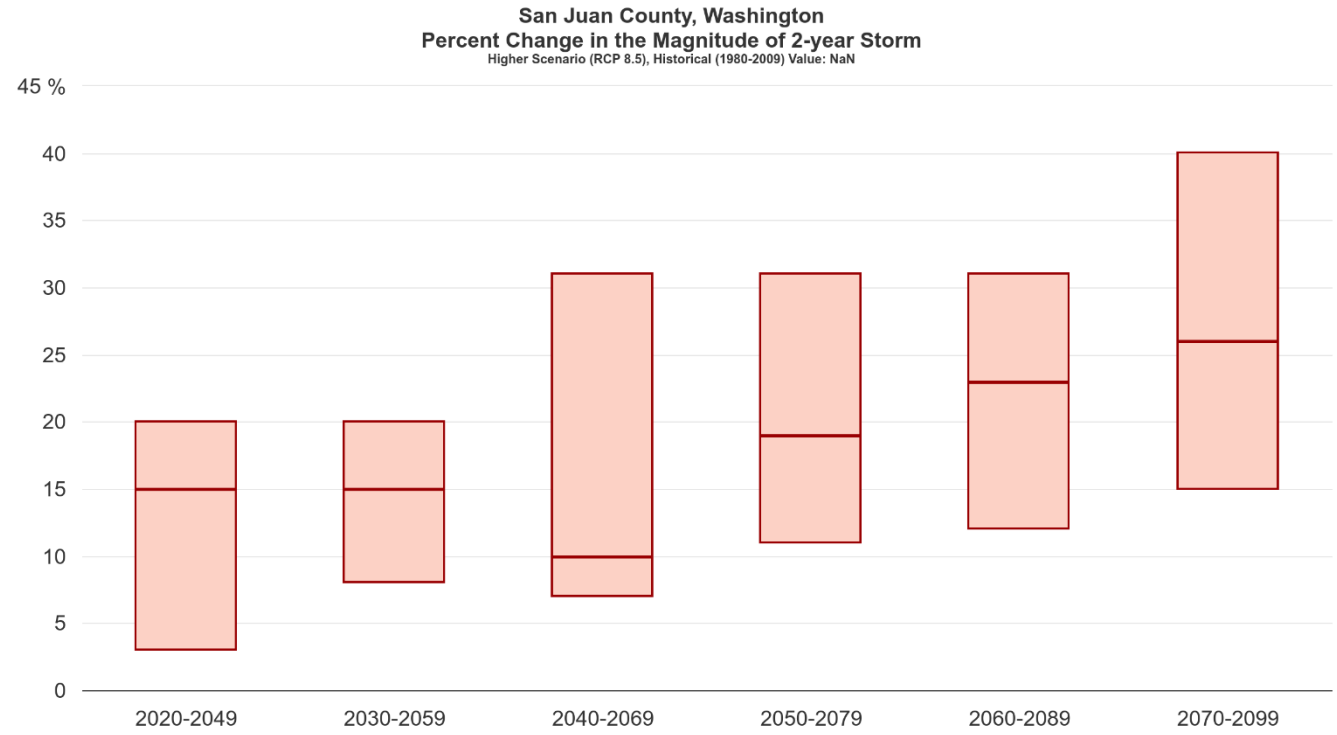


Sources: UW CIG, 2024; BERK, 2024

Takeaways

- The overall Summer Maximum Temperatures is predicted to increase at each of these time scales with increasing ranges of uncertainty but a baseline that increases over each period.
- Change in maximum temperature can severely negatively impact overburdened and health vulnerable communities.

Heavy Precipitation Magnitude Data (RCP 8.5) – San Juan County

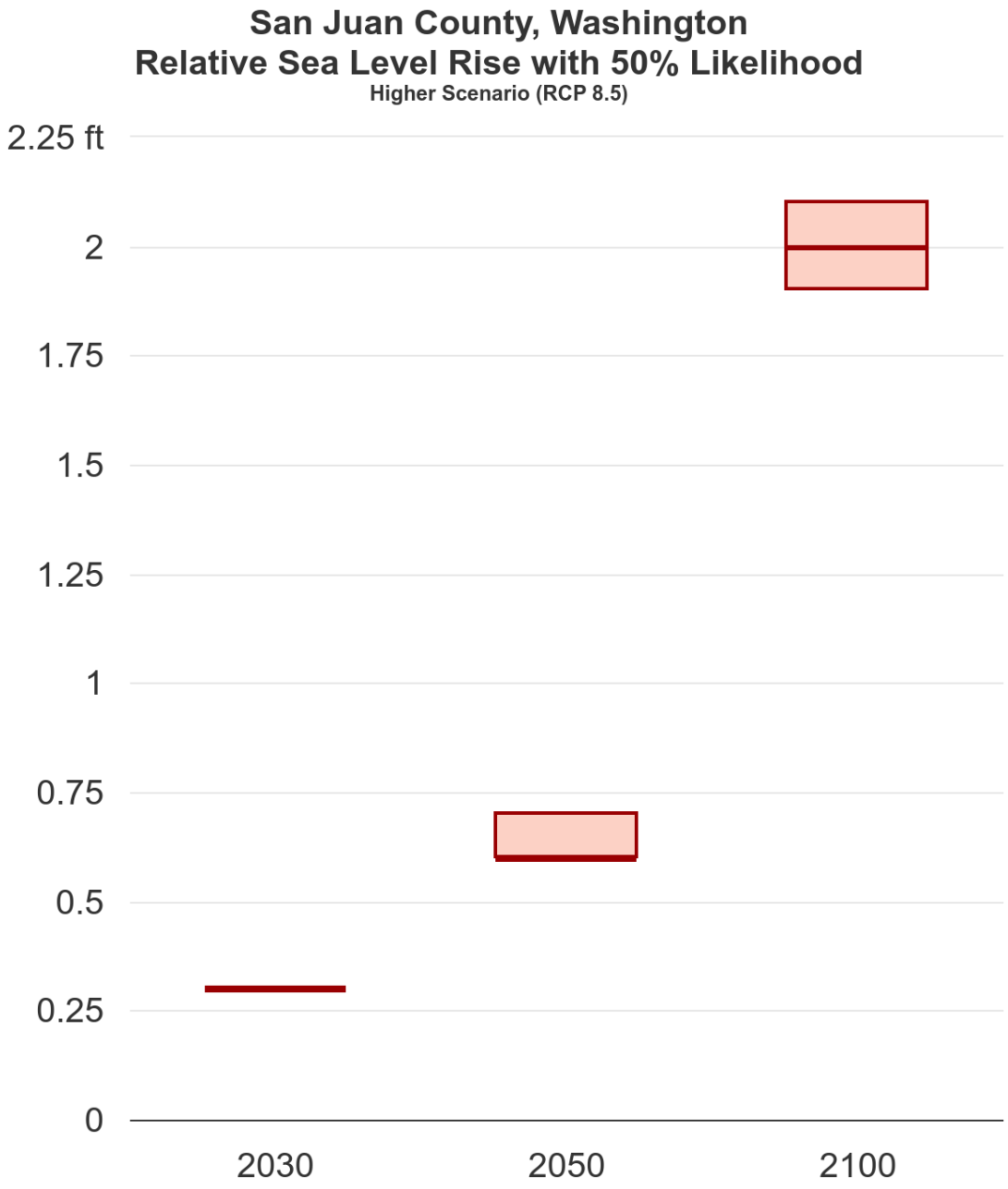


Sources: UW CIG, 2024; BERK, 2024

Takeaways

- Magnitude of severe storms and precipitation events is predicted to vary widely between 2020 and 2099.
- Heavy precipitation can damage infrastructure and make transportation more dangerous.
- This climatic shift can also hurt ecosystem resilience over time due to erosion and water quality deterioration.
- Increases in severity of precipitation can stifle economic growth by hindering the towns' existing tourism economy.

Likely Sea Level Rise (RCP 8.5) – San Juan County



Sources: UW CIG, 2024; BERK, 2024

Takeaways

- Sea level rise is predicted to increase significantly between 2030 and 2100.
- A sea level rise of nearly two feet can impact the Puget Sound ecosystem as well as negatively impact coastline infrastructure in the town and hurt the town's maritime economic sector.

Appendix D. Definitions

See: https://toolkit.climate.gov/content/glossary.

Adaptation: The process of adjusting to new (climate) conditions in order to reduce risks to valued assets.

Adaptive capacity: The ability of a person, asset, or system to adjust to a hazard, take advantage of new opportunities, or cope with change.

Assets: People, resources, ecosystems, infrastructure, and the services they provide. Assets are the tangible and intangible things people or communities value.

Climate stressor: A condition, event, or trend related to climate variability and change that can exacerbate hazards.

Exposure: The presence of people, assets, and ecosystems in places where they could be adversely affected by hazards.

Hazard: An event or condition that may cause injury, illness, or death to people or damage to assets.

Impacts: Effects on natural and human systems that result from hazards. Evaluating potential impacts is a critical step in assessing vulnerability.

Mitigation: Processes that can reduce the amount and speed of future climate change by reducing emissions of heat-trapping gases or removing them from the atmosphere.

Resilience: The capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption.

Risk: The potential for negative consequences where something of value is at stake. In the context of the assessment of climate impacts, the term risk is often used to refer to the potential for adverse consequences of a climate-related hazard. Risk can be assessed by multiplying the probability of a hazard by the magnitude of the negative consequence or loss.

Sensitivity: The degree to which a system, population, or resource is or might be affected by hazards.

Vulnerability: The propensity or predisposition of assets to be adversely affected by hazards. Vulnerability encompasses exposure, sensitivity, potential impacts, and adaptive capacity.

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