

VILLAGE OF PALMETTO BAY

RESILIENCE ACTION PLAN

2025



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1.1 BACKGROUND

The Palmetto Bay Vulnerability Assessment and Resilience Action Plan is funded by the Florida Department of Environmental Protection's (DEP) Resilient Florida Program. The program is intended to enhance the State's efforts to protect waterways and coastlines and prepare communities for the impacts of sea level rise, intensified storms, and flooding. The statewide program was created by Florida Legislature in 2021 with the signing into law of Senate Bill 1954 and is overseen by the DEP's Office of Resilience and Coastal Protection.



Under these regulations Florida must assist communities in adapting critical and regionally significant assets and maintain a statewide vision for both coastal and inland communities. Funding for local vulnerability assessments is one facet of state support for community resilience. Local vulnerability assessments help identify, prepare for, and address the impacts of sea level rise, intensified storms, and flooding, and must meet requirements of Section 380.093, Florida Statutes.

Grant funding is available for analyzing and planning for vulnerabilities as well as for implementing projects for adaptation and mitigation. Local governments are eligible to apply for implementation project funding after conducting a vulnerability assessment that demonstrates a risk of flooding or risks due to sea level rise to a critical asset or the project area.

In 2023, the Village of Palmetto Bay received a Resilient Florida Program grant to prepare a community-wide vulnerability assessment. The village decided to expand this process and use the findings of the vulnerability assessment to develop an adaptation plan that will identify capital improvement projects and other adaptation strategies that could increase local resilience. The vulnerability assessment will fulfill a prerequisite for Resilient Florida Program implementation funding and the resilience action plan will identify eligible projects to pursue.

1.2 PROJECT OBJECTIVES

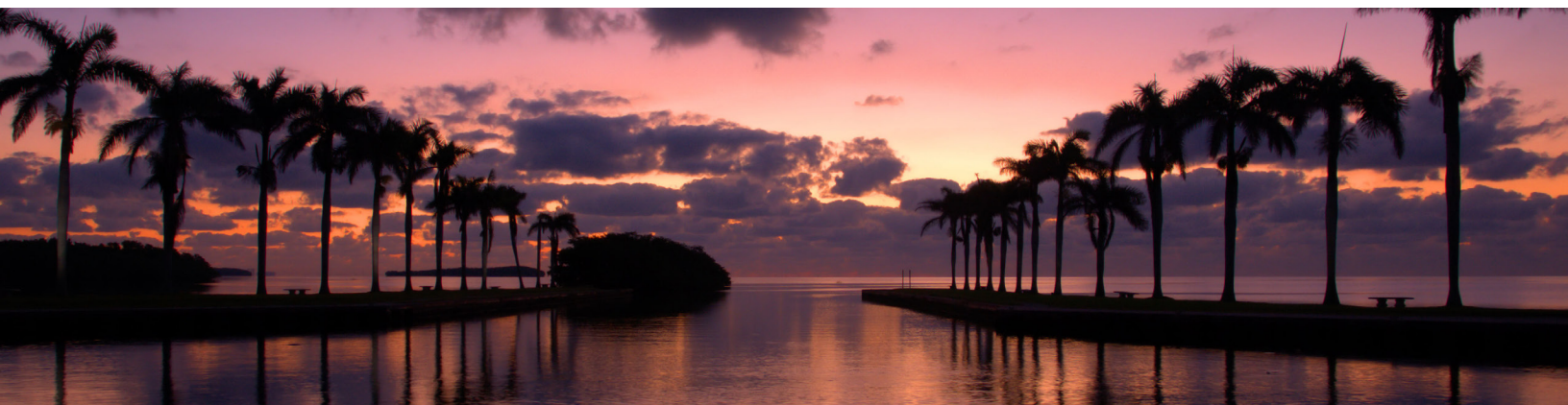
The Resilient Florida Grant Program legislation, 380.093, F.S., establishes requirements for state-funded vulnerability assessments. Per state statute, a vulnerability assessment must include the following, as applicable and practicable:

- An analysis of the vulnerability of and risks to critical assets, including regionally significant assets, owned or managed by the county or municipality.
- The depth of tidal flooding, including future high tide flooding, current and future storm surge flooding, rainfall-induced flooding, and compound flooding, as applicable.
- At least two sea level rise scenarios including the 2017 NOAA intermediate-low and intermediate-high projections.
- At least two planning horizons, including the years 2040 and 2070.
- A geographic display of the number of tidal flood days expected for each scenario and planning horizon.
- Local sea level data interpolated between the two closest NOAA tide gauges or the higher mean sea level from one gauge.
- Peril of flood comprehensive plan amendments that address 163.3178(2)(f) F.S. requirements.

To meet these requirements, this planning process followed the scope of work outlined in the Florida DEP Resilient Florida Program's *Standardized Vulnerability Assessment: Scope of Work Guidance May 2022* guide. The Village of Palmetto Bay expanded the vulnerability assessment to evaluate vulnerability to heat and evaluate 2030 as an additional time horizon. Additionally, the village sought to build upon the results of the vulnerability assessment and use this planning process to develop an Adaptation Plan with projects and strategies that can be implemented to reduce current and future risk and vulnerability and otherwise support local resilience. The combined scope of work is outlined below.

1. **Assemble a Steering Committee** of local government staff and stakeholders to assist in reviewing plan goals, reviewing draft materials, providing input for study direction, identifying relevant assets, and reviewing project findings and recommendations.
2. **Conduct Public Outreach** to allow the public to provide input during the data collection and asset identification process, review the results of the exposure analysis, sensitivity analysis, and draft vulnerability assessment, and assist in prioritizing focus areas for the development of adaptation strategies and resilience projects.
3. **Acquire Background Data** from a variety of sources including the state's Department of Environmental Protection Statewide Resilience Dataset, other state recommended resources, local planning and mitigation documents, and regional data from power companies and water management districts. Data required for the vulnerability assessment include critical and regionally significant assets, topographic data, and flood-scenario related data.
4. **Conduct an Exposure Analysis** to determine the depth of water caused by each sea level rise, storm surge, and compound flooding scenario and planning horizons. The objective is to determine which critical assets may be impacted or damaged by each flood scenario.
5. **Conduct a Sensitivity Analysis** to determine or measure the impact of flooding on the four types of critical assets identified in the Exposure Analysis and assign a risk level based on the percentages of land inundated (assets exposed) by the future flooding in the time horizons.
6. **Prepare a Final Vulnerability Assessment** to compile the combination of the steering committee and public engagement comments along with the results of the Exposure Analysis and Sensitivity Analysis. The assessment should at a minimum should include a list of critical assets that are impacted by flooding and specifying the assets impacted by the 2040 and 2070 planning timeline horizons.
7. **Identify Focus Areas** including locations or assets that are particularly vulnerable and require the development of adaptation strategies.
8. **Comply with Peril of Flood** requirements by updating the comprehensive plan coastal management language.
9. **Develop Adaptation Actions** that can be implemented to reduce current and future risk and vulnerability to future conditions.

The hazard identification for Palmetto Bay's vulnerability assessment includes rainfall-induced flooding, sea level rise, storm surge, and compound flooding which takes into account the combined impacts of multiple sources of flooding.



1.3 SCOPE

State funded Vulnerability Assessments are standardized to meet the requirements of statute s.380.093, F.S which ensures a coordinated approach to Florida's coastal and inland resilience. This plan is focused on risks, vulnerabilities, and opportunities for increasing resilience in the context of flood hazards and climate change. It was developed using criteria detailed in the *Standardized Vulnerability Assessment: Scope of Work Guidance, 2022* created by the Resilient Florida Program.

Geographically, this plan encompasses all areas within the Village of Palmetto Bay planning jurisdiction. This plan did not assess regionally significant assets outside of the village limits as Palmetto Bay may not have full authority to plan for these areas. The Resilience Steering Committee also determined that relevant assets have been assessed in the Miami-Dade County vulnerability assessment and would coordinate with the existing plan to address regional resilience.

1.4 PLANNING PROCESS

Steering Committee

A Steering Committee was formed to guide and oversee the development of this plan. The committee comprised key staff and leadership from several village departments as well as stakeholder agency and village committee representatives. Steering Committee members are listed in [Table 1-1](#) below.

The Steering Committee convened for four formal meetings over the course of the planning process, as detailed in [Table 1-2](#) below. These meetings were organized around key project milestones to review progress and findings and make decisions on plan goals and content. In addition to these formal meetings, the committee coordinated via email throughout the planning process.

Table 1-1: Steering Committee Membership

Member	Role/Organization Represented
Andrea Candelaria	Sustainability & Resilience Planner
Heidi Siegel	Community & Economic Development Director
Alexander Adams	Planning Division Director
Dionisio Torres	Public Services Director
Sussette Irizarry	Village of Palmetto Bay Resiliency Committee Representative
Don Pybas	Village of Palmetto Bay Tree Advisory Board Member
Julio Tejeda	South Florida Water Management District
Karina Castillo	Miami-Dade County Office of Resilience
Baldwyn English	Florida Power & Light External

Table 1-2: Steering Committee Meetings

Date & Format	Meeting Summary
Meeting 1 – Project Kickoff	
February 13, 2024 Microsoft Teams	Provided an overview of the project including the scope and projected timeline. Discussed preliminary hazard data, the asset inventory, and strategy for public and stakeholder engagement.
Meeting 2 – Steering Committee Meeting #2	
July 30, 2024 Palmetto Bay Village Hall	Reviewed findings from the Vulnerability Assessment (exposure, sensitivity, and risk), began to discuss Focus Areas.
Meeting 3 – Steering Committee Meeting #3	
September 25, 2024 Microsoft Teams	Reviewed results from the heat analysis, discussed plan goals, reviewed Focus Areas, discussed and developed adaptation actions.
Meeting 4 – Steering Committee Meeting #4	
December 10, 2024 Palmetto Bay Village Hall	Reviewed the draft plan and discussed adaptation strategies and project prioritization.
Meeting 5 – Steering Committee Meeting #5	
April 29, 2025 Microsoft Teams	Discussed project details and finalized adaptation strategies, project focus areas, and project prioritization.

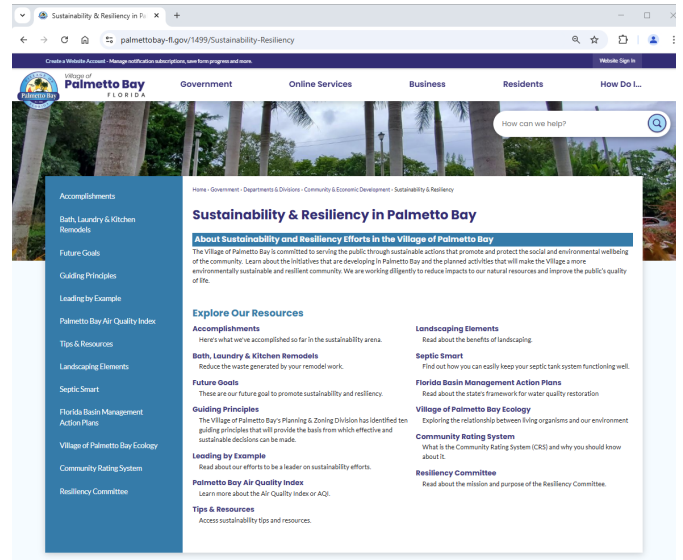
Public and Stakeholder Engagement

Public involvement in this plan’s development was sought throughout the planning process through a variety of methods, including a project website, public surveys, public workshops, and online announcements intended to publicize these opportunities for involvement.

Plan Website

To kick off the planning process, a project page was added to the Palmetto Bay Sustainability and Resiliency webpage. This project webpage served as a tool to educate and engage the public by providing ways to learn about the plan goals, get involved in the planning process, complete the public survey, and provide feedback to the Resilience Steering Committee. The website housed presentations and minutes from committee meetings and public workshops and shared links to key resources that supported and informed the planning process.

Figure 1-1: Palmetto Bay Sustainability and Resiliency Website



Public Survey

A key element of public engagement was the use of a web-based survey to gather public and stakeholder input.

The Steering Committee promoted the public survey to gather input on defining resilience, evaluating experiences with flooding, and understanding priorities for resilience objectives and strategies. Summary results from the public survey are provided below.

There were 118 responses to the public survey. Note that some questions allow for multiple responses and some respondents may have skipped questions on the survey.

1. What is your affiliation with Palmetto Bay?

Most responses, 92%, came from Palmetto Bay residents. Just under a quarter of respondents work in the village and another 23% shop or recreate in Palmetto Bay.

Figure 1-2: Affiliation with Palmetto Bay

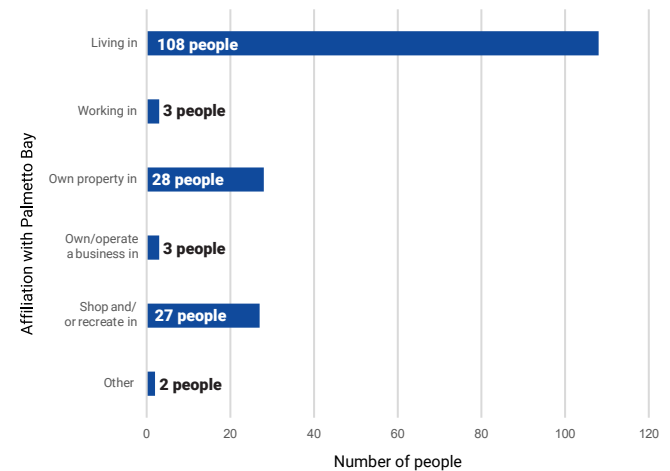


Table 1-3: Affiliation with Palmetto Bay

Affiliation with Palmetto Bay	Number of Responses
I live in Palmetto Bay	108
I work in Palmetto Bay	3
I own property in Palmetto Bay	28
I own/operate a business in Palmetto Bay	3
I shop and/or recreate in Palmetto Bay	27
Other	2

4. What are your department's top three strengths that could support resilience? What are your top three barriers to planning for resilience?

Strengths:

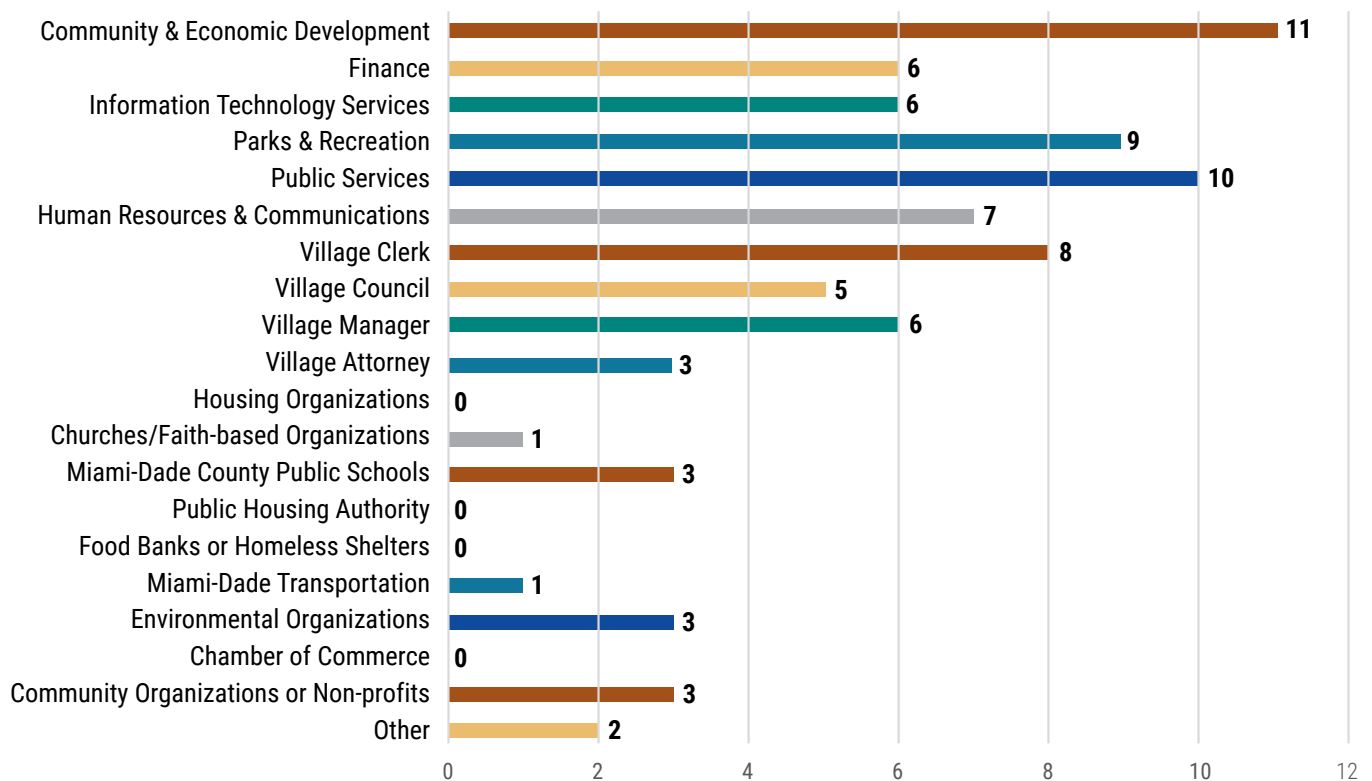
- Immediate response to events, consistent monitoring of site conditions, training for events
- Use of renewable resources to power computing and network hardware
- Assisting residents, solving issues before they become a concern
- Village Council's support of CRS, availability of sub-basin projects, and resiliency proposals from resiliency coordinator
- Teamwork, care for the community, and hard working
- Leadership and ability to plan ahead

Barriers:

- Proximity to floodplain, unpredictable weather events, public education
- Funding
- Lack of open space
- Not enough staff/capacity
- Computing system needs improvement
- Lack of urgency and resistance to change

5. What other departments or outside groups/organizations do you work with regularly?

Figure 1-6: Department Collaboration



6. Do you provide special accommodations/services for vulnerable communities/populations? If so, what vulnerable populations do you serve and how do you support them?

Fifteen respondents indicated no or not applicable. One respondent noted they will assist when contacted for help.

7. Are there any specific local or regional critical assets that you want the vulnerability assessment to address?

One respondent noted the need to protect the Village Hall data center and internet service at each public building. Another noted that properties with septic tanks should be examined for removal.

8. Are there any particularly vulnerable locations in Palmetto Bay that you want the vulnerability assessment to address?

- Thalatta Estate
- Public Services building
- Areas identified in the stormwater master plan
- Parks
- Properties with septic tanks
- Coastal and low-lying areas

9. Is there anything else you'd like the Steering Committee to know about flood risks and vulnerabilities?

- I think the Finance Department could help by preparing a budget for flood resilience programs.
- Implement a long-term plan and financial commitment to eliminate septic tanks.
- Stabilize canal banks.
- Upgrade code to require more native landscape throughout village, including residential districts. Buy coastal property to prevent development.

Public Workshops

To further engage the public and provide a forum for input on key planning milestones, Palmetto Bay held two public workshops throughout the planning process.

Table 1-4: Public Meetings

Date & Format	Meeting Summary
Public Meeting 1	
April 30, 2024 Palmetto Bay Village Hall	The planning team presented an overview of the Resilient Florida Program and the Resilience Action Plan project scope. Attendees reviewed preliminary data including flood hazards and asset identification. Strategies for public and stakeholder involvement were discussed.
Public Meeting 2	
December 11, 2024 Palmetto Bay Village Hall	The planning team presented an overview of the Vulnerability Assessment, went through the six sections of the plan, and reviewed responses from the public survey. The goals were highlighted, and the Adaptation Action Plan was discussed briefly.



1.5 DATA COLLECTION

Detailed data related to the village's assets and flood-related scenarios was required to assess exposure, sensitivity, and vulnerability. This section describes the data sources for the asset inventory and hazard scenarios. Further details on the asset inventory are provided in [Section 2](#) and [Appendix A](#).

Asset Data

Asset data was used to understand and determine what is at risk and the potential impacts from flooding. The [DEP Florida Statewide Resilience Dataset](#) was used to identify local assets as defined by F.S. 380.093. The spatial data for critical assets were sourced from state, federal, and regional datasets. The database is organized by four overarching asset groups: Critical Community and Emergency Facilities, Critical Infrastructure, Transportation and Evacuation Routes, and Natural, Cultural and Historical Resources. Spatial data sources used to develop the statewide dataset are listed in [Table 1-5](#). The planning team also worked with village officials, the Steering Committee, and the public to identify any important assets not included in the state inventory.

The planning team acquired, formatted, or created the geospatial asset data needed to conduct the vulnerability assessment. The data is comprised of multiple geometries depending on the asset type and data provided. Most assets are represented as point features, but the inventory also includes polygons and line features. The finalized asset data was compiled into a file geodatabase and supplied to Palmetto Bay as a deliverable along with associated metadata.

Table 1-5: Statewide Resilience Dataset Sources

Data Source
Bureau of Archaeological Research (BAR)
Department of Homeland Security (DHS)
Environmental Protection Agency (EPA)
Florida Division of Emergency Management (FDEM)
Florida Housing Data Clearinghouse (FHDC)
Florida Department of Environmental Protection (FDEP)
Florida Department of Transportation (FDOT)
Florida Fish and Wildlife Conservation Commission (FWC)
Florida Natural Areas Inventory (FNAI)
Northwest Florida Water Management District (NFWFMD)
South Florida Water Management District (SFWMD)
St. Johns River Water Management District (SJRWMD)
Southwest Florida Water Management District (SWFWMD)
US Army Corps of Engineers (USACE)
US Department of Transportation, National Transportation Atlas Data Base (USDOT- NTAD)
US Geological Survey (USGS) National Structures Dataset (NSD)
USGS National Transportation Dataset (NTD)
USGS National Hydrography Dataset (NHD)



Datums and Coordinate Reference Systems

All analysis was completed in either NAD83 (horizontal datum) and NAVD88 (vertical datum).

Topographic Data

Ground elevation data was collected from the USGS 2019 Florida Peninsular Digital Elevation Model (DEM) derived from Light Detection and Ranging (LiDAR) datasets. The GIS team processed the dataset to a 3-meter grid size within the project's study area. The planning team used this processed DEM to collect ground elevation data.

Flood Scenario – Related Data

Flood Hazard Areas

Regulated floodplains are illustrated on inundation maps called Flood Insurance Rate Maps (FIRMs). It is the official map for a community on which FEMA has delineated both the SFHAs and the risk premium zones applicable to the community. Flood prone areas were identified within Palmetto Bay using the Effective FIRMs dated 9/11/2009. This data was downloaded from the FEMA Flood Map Service Center.

Sea Level Rise Data

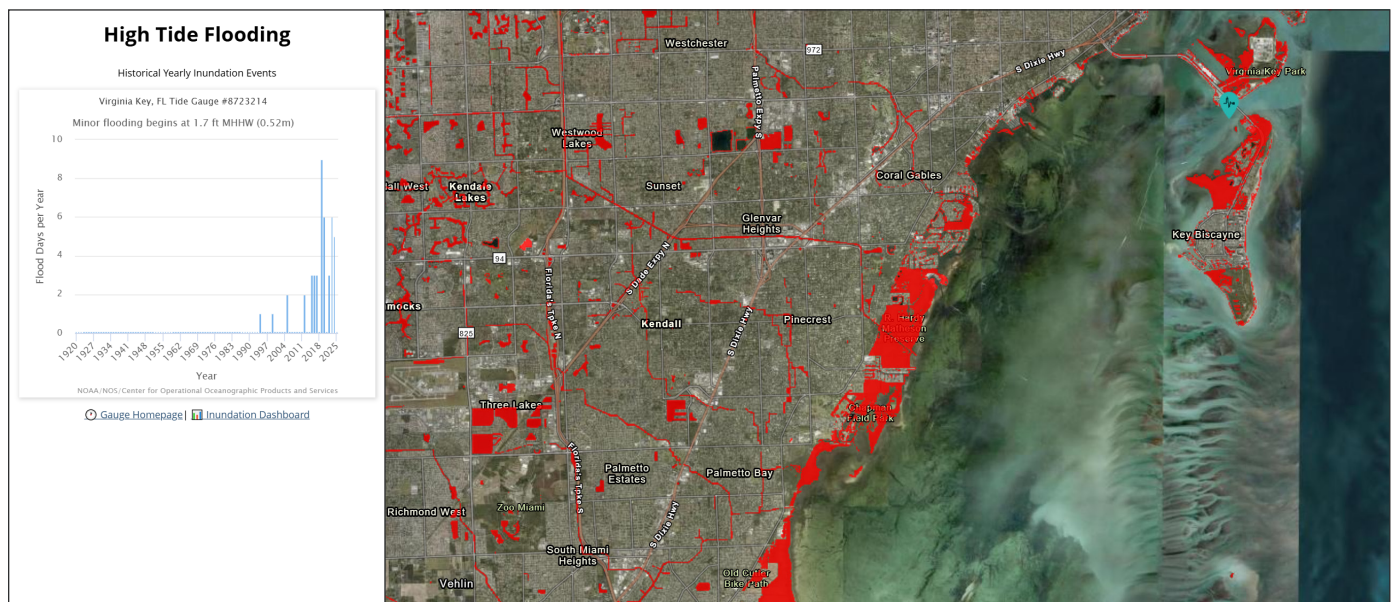
Sea level rise data for current and future scenarios (2030, 2040, 2070, intermediate low and intermediate high) were retrieved from NOAA Office for Coastal Management's (OCM) Digital Coast Sea Level Rise Viewer. This data allows users to determine the depth of water for a given scenario.

The sea level rise metrics from this site can be used to explore five relative sea level rise scenarios. As defined by Resilient Florida and F.S. 380.093, this plan used the 2017 Technical Report Scenarios to assess sea level rise in Palmetto Bay. The closest gauge with the highest sea level rise scenario is Virginia Key, FL. These scenarios begin in the year 2000 (versus 1992 in the previous version) and take into account global mean sea level rise, regional changes in ocean circulation, changes in Earth's gravity field due to ice melt redistribution, and local vertical land motion.

High Tide Data

High tide data was also sourced from the NOAA OCM Digital Coast Sea Level Rise Viewer. This data allows users to view areas currently susceptible to high tide flooding, often called "recurrent of nuisance flooding", and the number of historical flood events that have occurred in a given area (flood days per year). The Virginia Key, FL tidal gauge #8723214 was used to collect data for this plan. Gauge information, flood days per year, and the MHHW (1.74ft) from NOAA is provided in the graphic below.

Figure 1-7: Historical Yearly Inundation Events



Source: NOAA Digital Coast Sea Level Rise Viewer

The flood thresholds used in these plots are derived from national flood thresholds from [NOAA Technical Report NOS CO-OPS 086: Patterns and Projections of High Tide Flooding Along the U.S. Coastline Using a Common Impact Threshold](#). The derived thresholds that are used provide a national definition of coastal flooding and impacts for quantifying and communicating risk.

Storm Surge Data

Storm surge scenarios were evaluated using data from U.S. Army Corps of Engineers (USACE) [South Atlantic Coastal Study's \(SACS\) Coastal Hazard System \(CHS\)](#). CHS is a national coastal storm hazard data resource for probabilistic coastal hazard assessment (PCHA) results and statistics, storing numerical and probabilistic modeling results including storm surge, astronomical tide, waves, currents, and wind. This assessment evaluated the 5, 100, and 1,000-yr storm surge event. Future scenarios examine storm surge coupled with sea level rise and show even larger flood extents.

Precipitation Data

South Florida Water management District's (SFWMD) [Flood Protection Level of Service \(FPLOS\) Program](#) creates basin studies that evaluate structures and canals in the selected watersheds and provide a framework for establishing the level of service.

The mission of this program is to identify and prioritize long-term infrastructure improvement needs, and to develop an implementation strategy to assure that each basin can maintain its designated FPLOS, in a technical and cost-effective manner, in response to population growth, land development, sea level rise and climate conditions change.

The WSP team worked with SFWMD technical staff to obtain relevant precipitation data for this assessment. This assessment examined the 25yr rain event also coupled with one and two feet of sea level rise.

NOAA Atlas 14 data was also used to explore current and future precipitation scenarios. NOAA Atlas 14 is a project of the National Weather Service's (NWS) Hydrometeorological Design Studies Center (HDSC) that provides precipitation frequency data for U.S. states and territories to estimate future extreme rainfall changes based on future climate scenarios. Using the

Atlas 14 precipitation estimates provided by NOAA and the Florida Statewide Resilience Dataset, precipitation estimates for Palmetto Bay were analyzed for a 24-hr storm event and various frequencies (25, 50, 100, 500-yr storm event).

SFWMD's Rainfall Change Factors GIS Dashboard produces rainfall change factors that are applied to NOAA's Atlas 14 precipitation frequency estimates. A change factor value is produced for events of a given duration and return period and are applied to multiply the equivalent NOAA Atlas 14 precipitation frequency estimates to determine increasing or decreasing future rainfall. Change factor data was retrieved from the SFWMD Resilience Metrics Hub.

Heat Assessment Data

The heat vulnerability assessment in this plan is based on the [Miami-Dade County Heat Vulnerability Assessment](#). The study was developed to help prevent heat related illnesses and deaths in communities throughout the county and to understand how health risk varies across the county.

The study evaluated a range of variables and datasets to examine heat vulnerability, exposure, and sensitivity. The study relied on demographic data, health statistics, geographic, and environmental data to complete the assessment. Datasets include the following: emergency room visits and hospitalizations from Florida Department of Health; land surface temperatures from NASA MODIS 2002 – 2021; land cover statistics from National Land Cover Database (NLCD) (2019); and demographic data from the American Community Survey 5-year estimates 2015- 2019. The full report including detailed methodology and results can be found in the [Miami-Dade Extreme Heat Vulnerability Mapping Report](#) (Uejio and Ahn, 2022).

1.6 COMMUNITY PROFILE

Overview of the Community

The Village of Palmetto Bay, situated in the Southeastern coast of Florida, is a small coastal village in Miami-Dade County Florida. The village has a total land area of approximately 8.29 square miles and is located alongside Biscayne Bay and the Cutler Channel. The northern portion of the village is directly inland from King's Bay and Deering Bay coastal communities. The village is served by U.S. Highway 1. US-1 connects Palmetto Bay to the City of Miami and the Village of Pinecrest directly north. The Town of Cutler Bay is directly south, and South Miami Heights is just southwest. FL-992 connects Palmetto Bay west to the Towns of Richmond Heights and Palmetto Estates. According to the U.S. Census Bureau's American Community Survey, the village had an estimated population of 24,267 in 2022.

Figure 1-9 reflects the Village of Palmetto Bay's location within Miami-Dade County and in relation to the surrounding cities and towns.

Geography and Environment

The Village of Palmetto Bay has a generally flat topography with elevation ranging between 0 and 161 feet above sea level – average elevation is 23 ft. The village has a moderate climate; Miami-Dade County's average annual temperature is 74.3 degrees Fahrenheit and average annual precipitation is approximately 55.49, as measured by NOAA climate data.

Palmetto Bay is located completely within the Florida Southeast Coast sub-basin and split between the Coral Gables watershed and the South Biscayne Bay watershed. The Coral Gables watershed covers 379 square miles, and the South Biscayne Bay watershed covers 314 square miles.

The USGS uses a hydrologic unit code (HUC) system to classify land by differing hierarchies of hydrologic features. The HUC-12 classification identifies sub-watersheds. The Coral Gables and South Biscayne Bay watersheds contain several HUC-12 sub-watersheds; Palmetto Bay straddles four sub-watersheds: Cutler Drain Canal, Coral Gables Canal, Black Creek Canal, and South Biscayne Bay. Most of Palmetto Bay is within the Cutler Drain Canal sub-watershed. **Figure 1-10** illustrates the HUC-12 drainage sub-watersheds in and around Palmetto Bay. Drainage is also controlled by the canal system, illustrated in **Figure 1-8**.

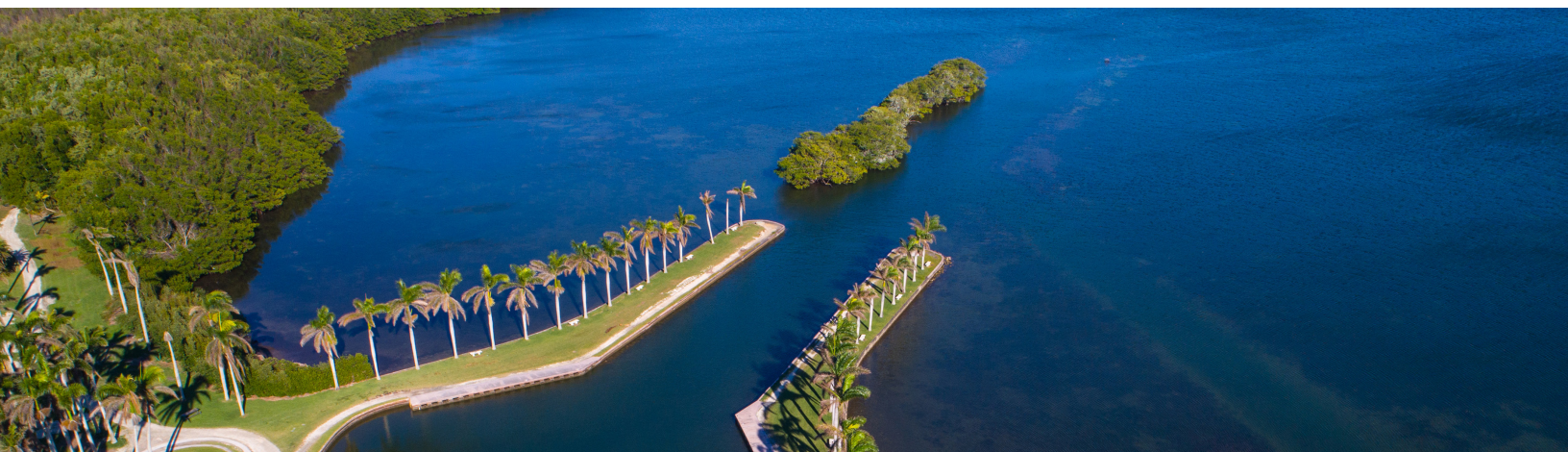
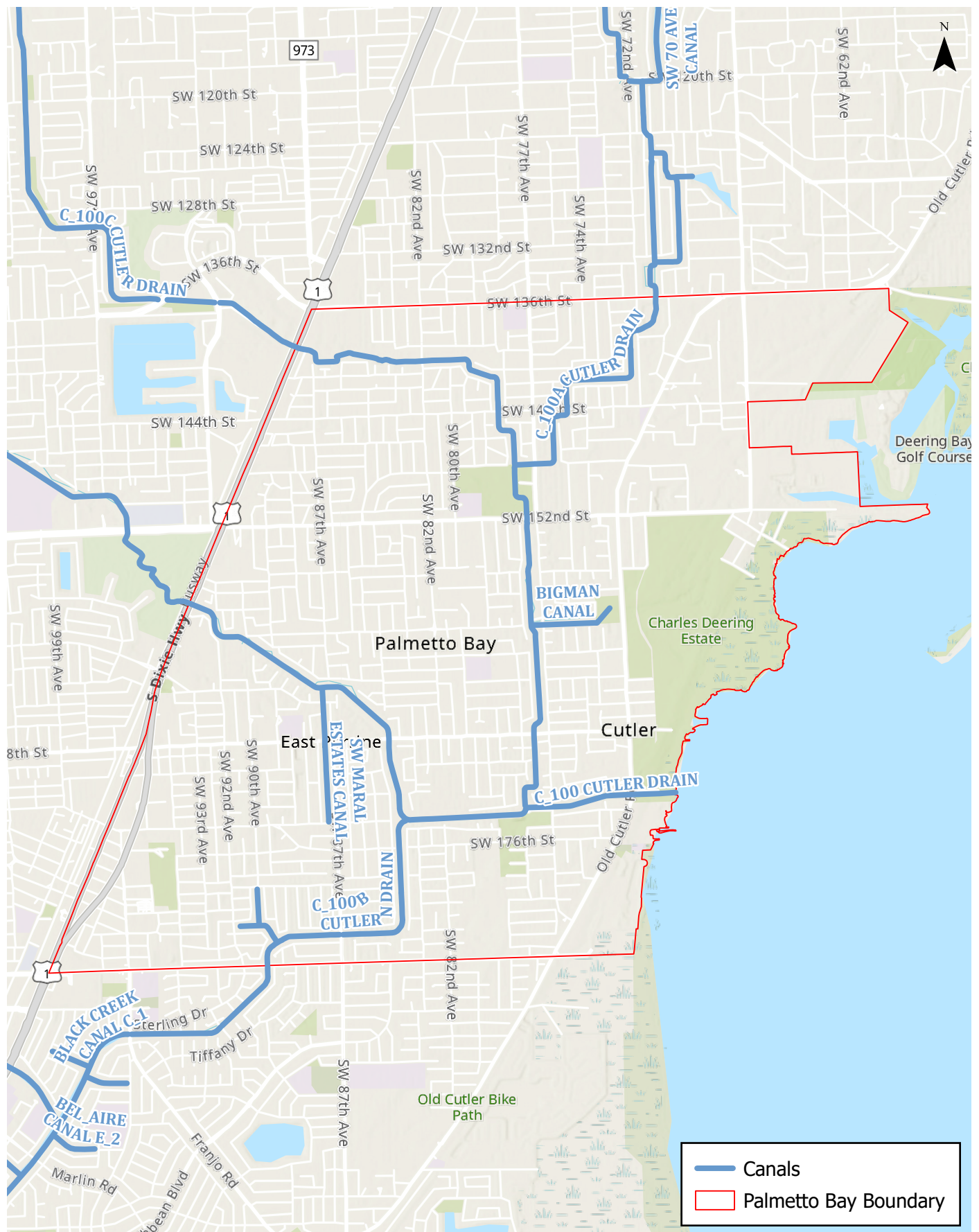


Figure 1-8: Palmetto Bay Region Canal System



Source: South Florida Water Management District

Figure 1-9: Location Map

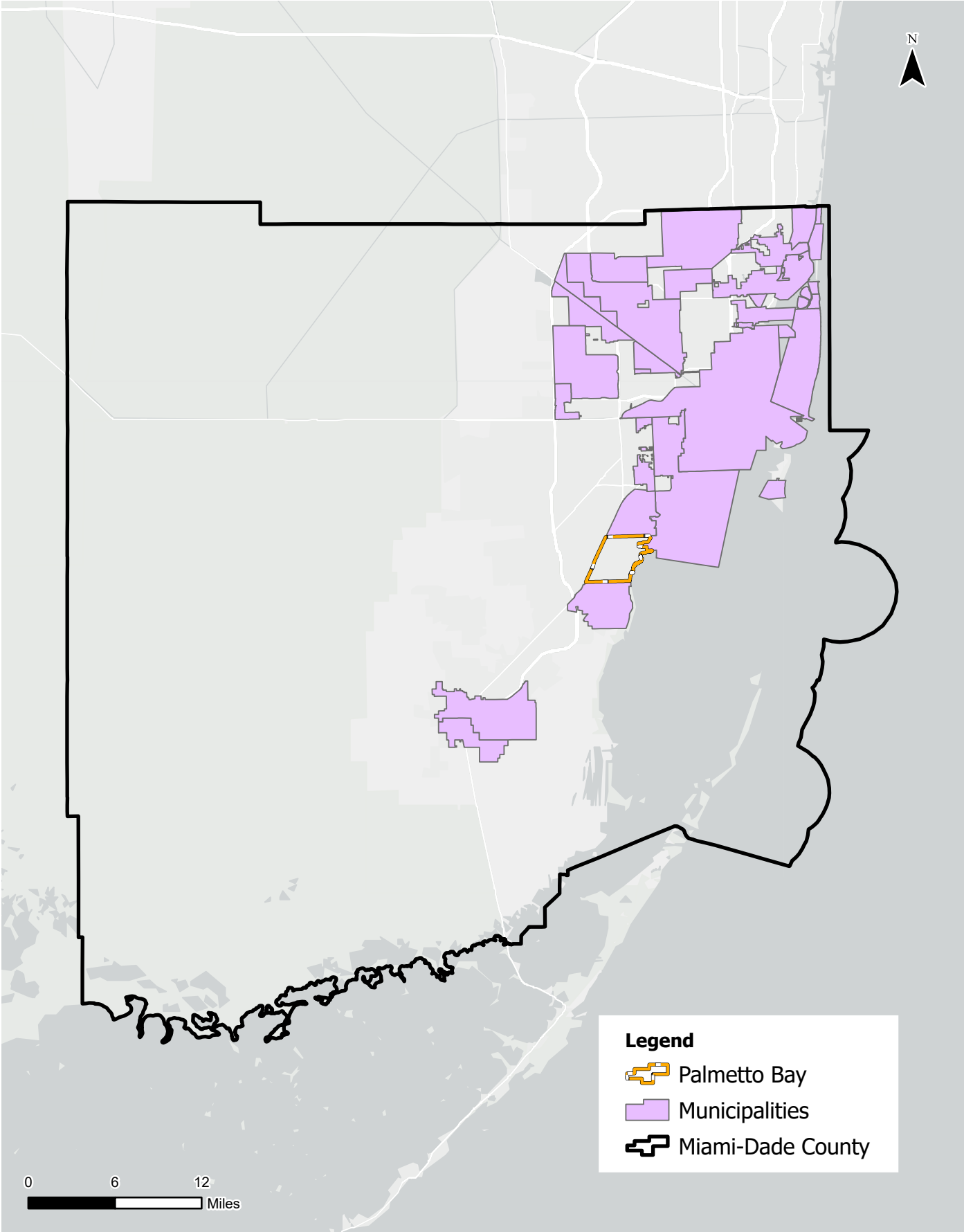
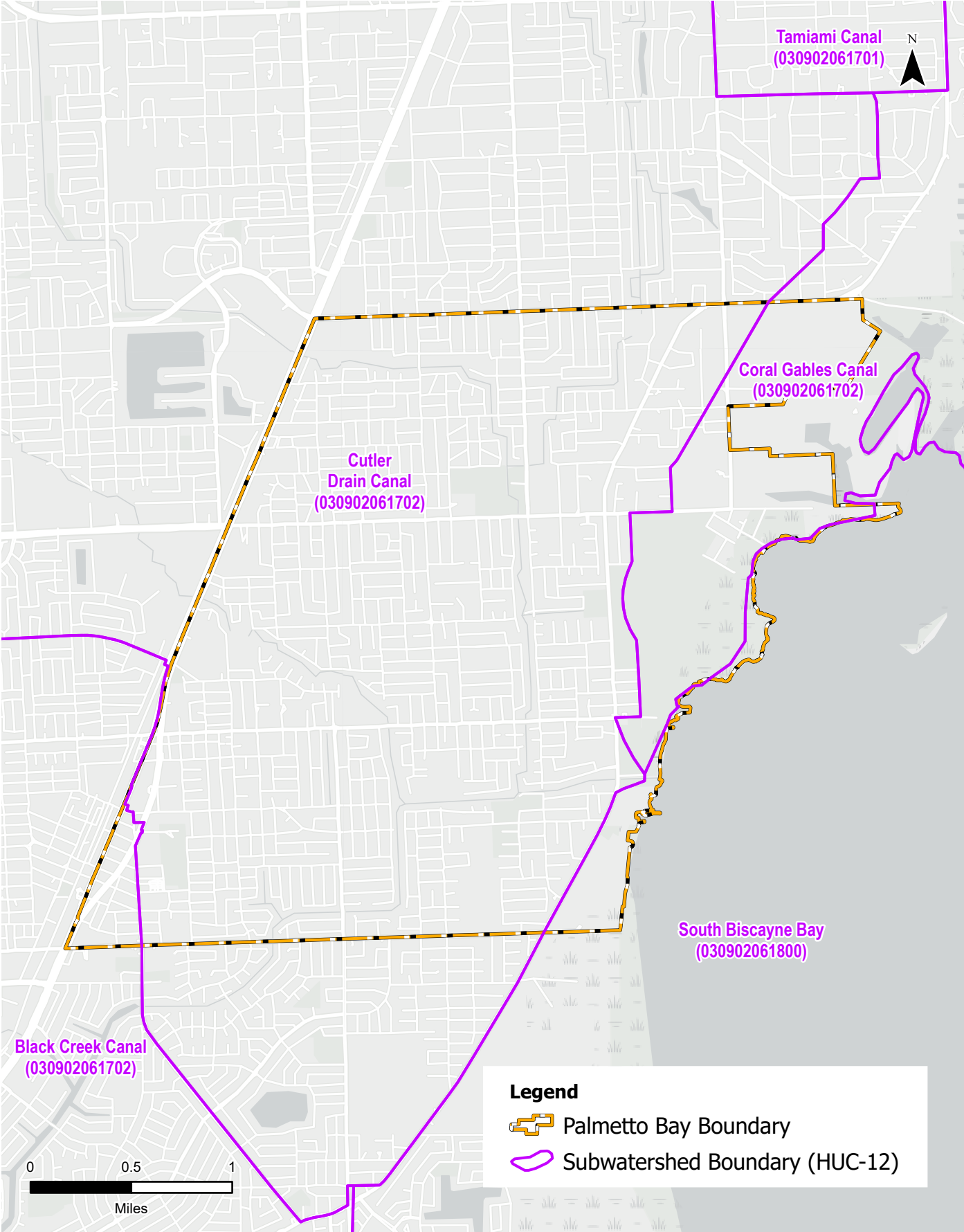


Figure 1-10: HUC12 Watershed



Employment and Industry

Palmetto Bay is primarily a residential area; however, the village does have a downtown and business district that sits along the western border of the village along Route 1 (S Dixie Highway). There is also another commercial area along Old Cutler Road. The local economy is critical to the well-being and resilience of the community, providing employment as well as goods and services, and serving as the foundation for the local tax base.

Shocks or disruptions to the economic base of an area during a hazard event can make it difficult for a community to recover. Impacts to the local economy can cause job loss and economic hardship during a time when financial stability is essential for recovery. Small businesses are also vulnerable to hazard events because they are frequently uninsured or underinsured, may have limited resources to recover, and their profits depend on the local community who, during disaster recovery, may not have financial capacity to spend money like they typically do. The village has a Business Improvement Grant Program that offers assistance to qualified businesses and commercial properties in Palmetto Bay in order to stimulate and incentivize private sector investment, beautification, economic growth, and job creation and retention in the village.

Table 1-6 shows employment and unemployment rates along with industry employment by major classification for the village. Major employers for Miami-Dade County are listed in **Table 1-7**.

Table 1-6: Employment and Occupation Statistics

Employment Status	Percentage
In labor force	60.0
Employed	65.7
Unemployed	2.4
Armed Forces	0.0
Not in labor force	31.8
Occupation	
Management, business, science and arts	56.7
Service	11.2
Sales and office	19.8
Natural resources, construction and maintenance	2.3
Production, transportation and material moving	6.7

Source: U.S. Census Bureau, 2018-2022 ACS 5-year Estimates

Current and Future Land Use

A land use plan is intended to provide a framework that will guide local government officials and private citizens as they make day-to-day and long-term decisions affecting growth and development. The Comprehensive Plan Land Use Plan serves as an overall "blueprint" for the development of Palmetto Bay that when implemented results in the most suitable and appropriate use of the land and protection of the village's natural resources.

Existing Land Use

The National Land Cover Database summarizes existing land cover across the U.S. and is a useful resource to distinguish between developed and undeveloped land. **Figure 1-11** shows land cover in Palmetto Bay as of 2019 and **Table 1-8** summarizes the acreage in each land cover category. Around 86.4% of the land in the village is developed, much of that development is throughout the entire planning area. Widespread development equates to a concentration of impervious surface, which means stormwater runoff is likely to contribute to flooding issues in these areas.

Table 1-7: Major Employers in Miami-Dade County

Corporation/Organization	Service/Product by SIC Code	# of Employees
Baptist Health South Florida	Health Care	10,000+
University of Miami	Education	10,000+
American Airlines	Aviation	10,000+
Florida Power & Light Company	Utility	1000+
Carnival Cruise Lines	Hospitality and Tourism	1000+
Mount Sinai Medical Center	Health Care	1000+
Miami Children's Hospital	Health Care	1000+
Royal Caribbean International/Celebrity Cruises	Hospitality and Tourism	1000+
Bank of America	Banking and Finance	1000+
Wells Fargo	Banking and Finance	1000+

Source: Miami-Dade Beacon Council, 2017

Table 1-8: Land Cover in Palmetto Bay, FL

NLCD Category	Acreage	Percent of Total (%)
Open Water	17.1	0.3%
Developed, Open Space	1,078.8	20.0%
Developed, Low Intensity	2,949.0	54.7%
Developed, Medium Intensity	441.9	8.2%
Developed, High Intensity	190.1	3.5%
Barren Land (Rock/Sand/Clay)	1.6	0.0%
Deciduous Forest	2.2	0.0%
Evergreen Forest	171.2	3.2%
Mixed Forest	0.9	0.0%
Shrub/Scrub	85.2	1.6%
Grassland/Herbaceous	18.7	0.3%
Pasture/Hay	12.7	0.2%
Cultivated Crops	5.3	0.1%
Woody Wetlands	332.0	6.2%
Emergent Herbaceous Wetlands	87.6	1.6%
Total	5,394.4	--

Source: National Land Cover Database, 2024

According to the NLCD data, vacant or undeveloped land, including open water, makes up approximately 14% of the total area within the Palmetto Bay planning jurisdiction. Table 1-9 shows that approximately 68% of land within the Palmetto Bay planning jurisdiction is zoned for residential use. Commercial uses represent approximately 8.4% of existing land use. Agriculture represents approximately 1.1% of land use, and Parks, Public Facilities, and open space make up about 6.5% of the planning area. Figure 1-9 below shows the current land use for each parcel in the planning area.

Table 1-9: Existing Land Use Zoning (Acreage)

Existing Land Use Category	Acreage	Percent of Total (%)
Agricultural	61.5	1.1%
Apartment Residential	27.9	0.5%
Business District	128.8	2.4%
Downtown	290.2	5.4%
Estate Single Family	3,367.2	62.4%
Interim District	270.3	5.0%
Multi-Family Residential	18.7	0.3%
Office District	8.9	0.2%
Parks and Public Facilities	83.2	1.5%
Planned Area Development	15.9	0.3%
Single Family Residential	244.7	4.5%
Townhouse Residential	16.8	0.3%
Village Mixed Use	24.9	0.5%
Total	4,559.0	--

Source: Village of Palmetto Bay

Future Land Use

The purpose of the Future Land Use Map is to graphically depict Palmetto Bay's policies for growth and land development and the projected patterns of future land use. The Future Land Use Map was prepared with consideration given to land development objectives and policies, natural constraints and limitations, overall land suitability, and the ability to provide the infrastructure to support growth and development. It should be noted that the village is currently updating its comprehensive plan. [Figure 1-12](#) reflects the current future land use map – a new future land use map reflecting 2043 land use will be approved with the comprehensive plan update.

The village's Future Land Use Map classifications include the following categories and subcategories:

- Residential
 - » Estate Density Residential
 - » Low Density Residential
 - » Low-Medium Density Residential
 - » Medium Density Residential
 - » Medium-High Residential and Hotel
 - » Office and Residential
 - » Business and Office
- Institutional and Public Facility Use
 - Civic Use
 - Village Mixed Use
 - Franjo Activity Center
 - Environmental Protection
 - Parks and Recreation
 - Environmentally Protected Parks
 - Agricultural Use
 - Water Bodies

Generally, growth and land development is anticipated to occur in all future land use categories except for the Environmental Protection classification and only resource-enhancing facilities are allowed in the Environmentally Protected Parks classification. The type and intensity of projected development varies within each future land use map classification. Future land use projections are delineated in [Figure 1-12](#).

According to village staff, there are no plans for new village-owned facilities for construction within the next five years. However, private development is expected. There are four known mixed-use and residential projects that will be developed within the next five years, all of which are located in the village Downtown District. Parkview Mixed-Use, Vista Mixed-Use, Addison Landing Mixed-Use, and Palmetto Bay Development Mixed-Use.



Figure 1-11: Land Cover in Palmetto Bay, FL

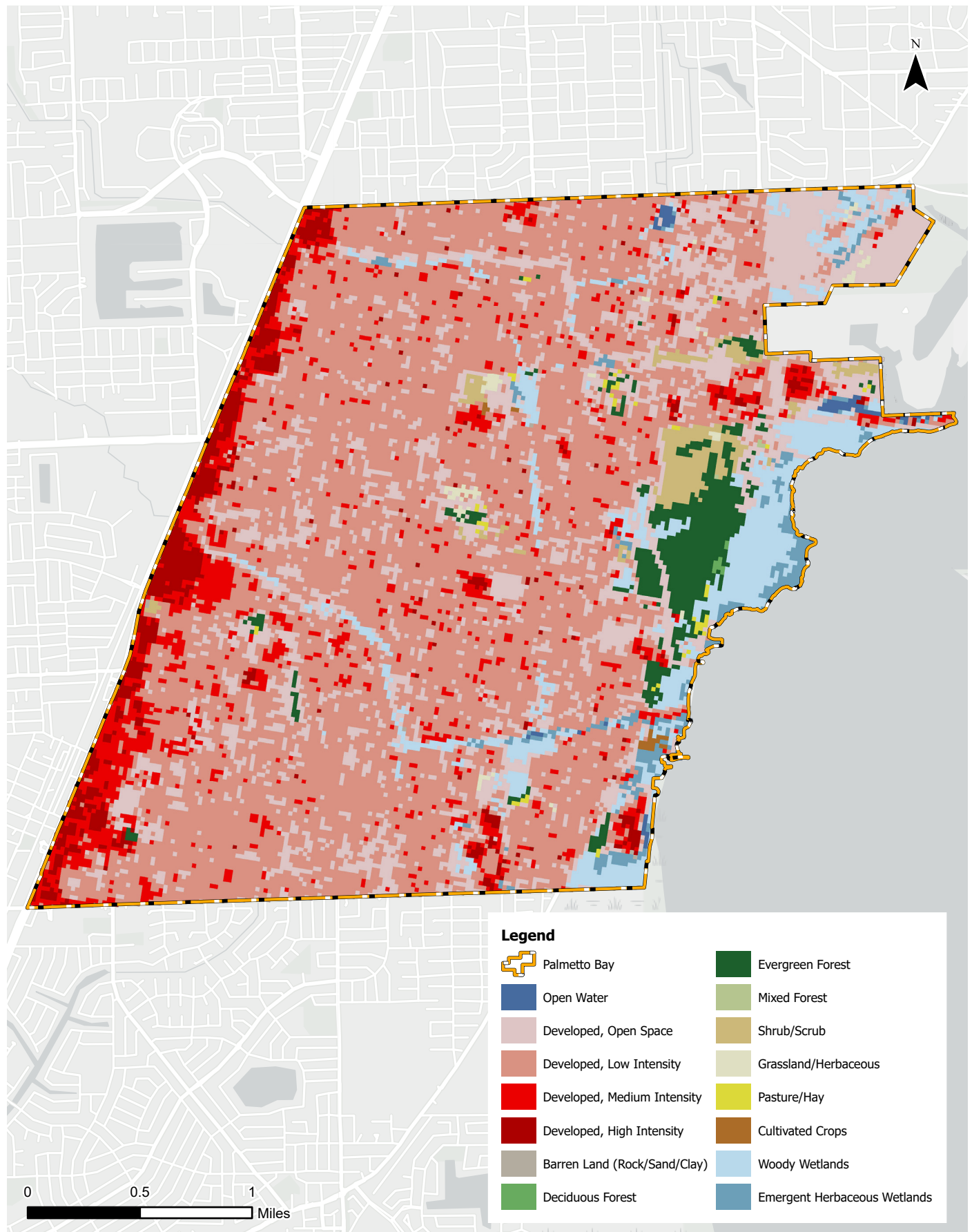
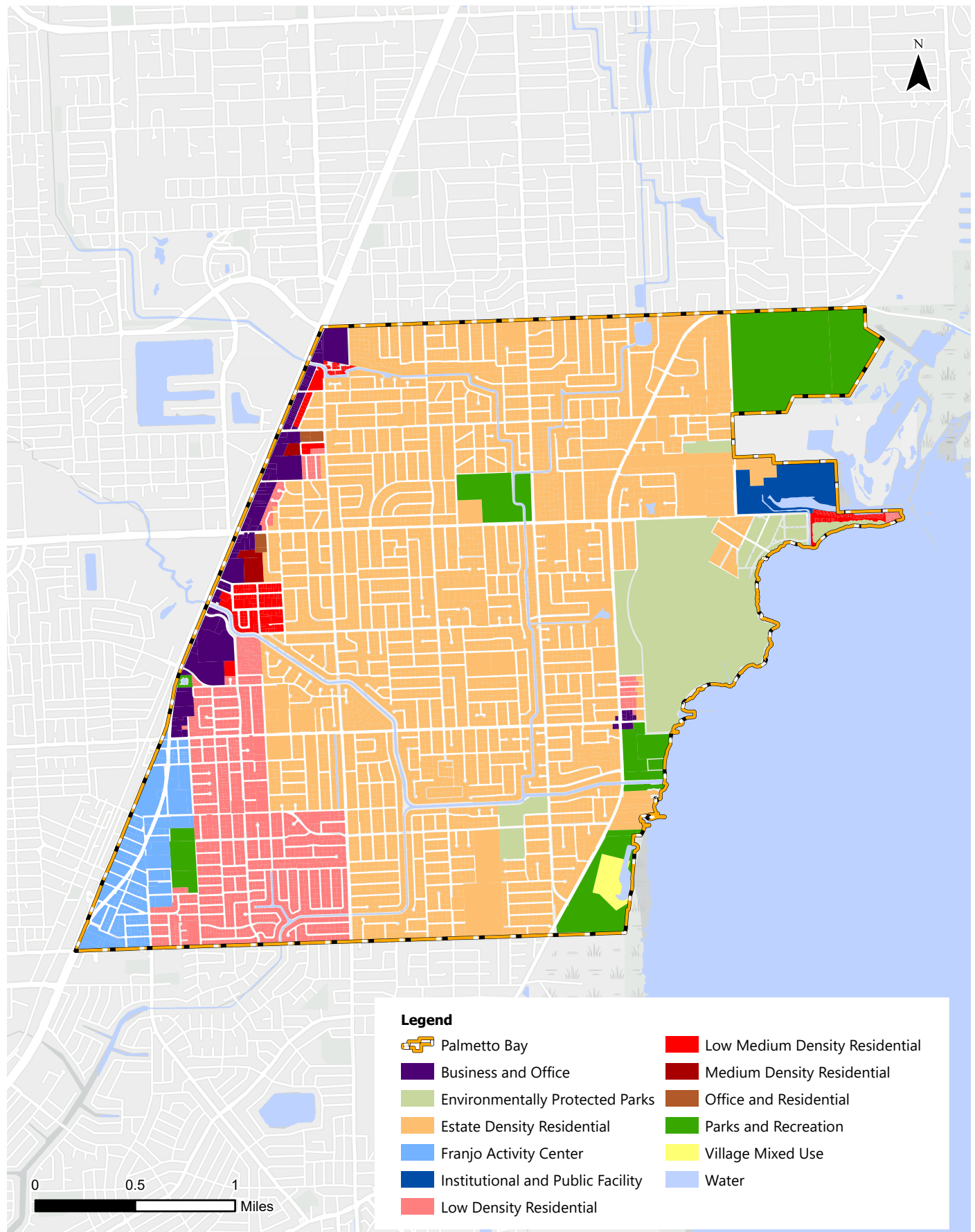


Figure 1-12: Future Land Use



Social Vulnerability

Social vulnerability refers to a community or an individual's capacity to prepare for and respond to the stress of hazard events. Social vulnerability is often discussed in terms of the characteristics that have historically made certain groups of people more at risk when they are exposed to the impacts of a hazard (Cutter, 2010; Berke et al., 2019). Even if different groups share similar exposure to a hazard, some groups may have a greater capacity to anticipate, cope, and recover from a disaster than others. Common and determining characteristics include age, gender, income, race, and ethnicity, and language capacity (Cutter et al., 2003; Berke et al., 2015). However, additional characteristics can include social networks, education, cultural knowledge, and political power (Otto et al., 2017).

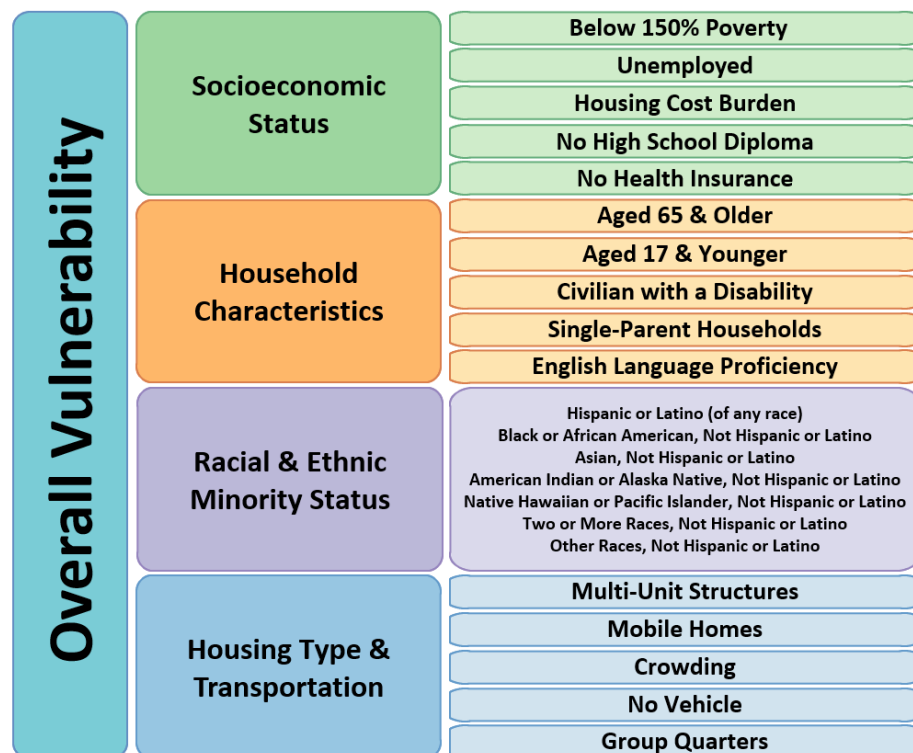
The Center for Disease Control and Prevention's (CDC) social vulnerability index (SVI) measures relative social vulnerability at the Census tract level based on 16 social factors some of which include unemployment, housing cost burden, education, age, disability, household composition, and minority status. Communities and individuals throughout Palmetto Bay may have varying levels of vulnerability based on these and other

characteristics, and the Steering Committee recognized that adaptation strategies to address some aspects of social vulnerability must be communitywide.

The 16 social factors can be categorized into four themes, socioeconomic status, household characteristics, racial and ethnic minority status, and housing type and transportation. **Figure 1-13** shows which social vulnerability variables fall under each of the themes.

Results are presented via a score that ranges from 0 (lowest vulnerability) to 1 (highest vulnerability). The average SVI score for the Village of Palmetto Bay is 0.29 which indicates a low-medium level of vulnerability. Within the village, the area with the highest SVI rating (0.79) is located in the southwestern corner of the village. The two additional census tracts that make up the western border of the village have low-medium SVI scores, 0.33 and 0.43. The remaining three tracts have low scores ranging from 0.03 – 0.09. Overall Palmetto Bay has generally low social vulnerability according to these indicators. **Figure 1-14** displays the overall SVI results for the village. **Figure 1-15** through **Figure 1-18** display SVI maps for the four themes.

Figure 1-13: Social Vulnerability Variables



Source: CDC SVI Documentation 2022

Figure 1-14: Overall Social Vulnerability

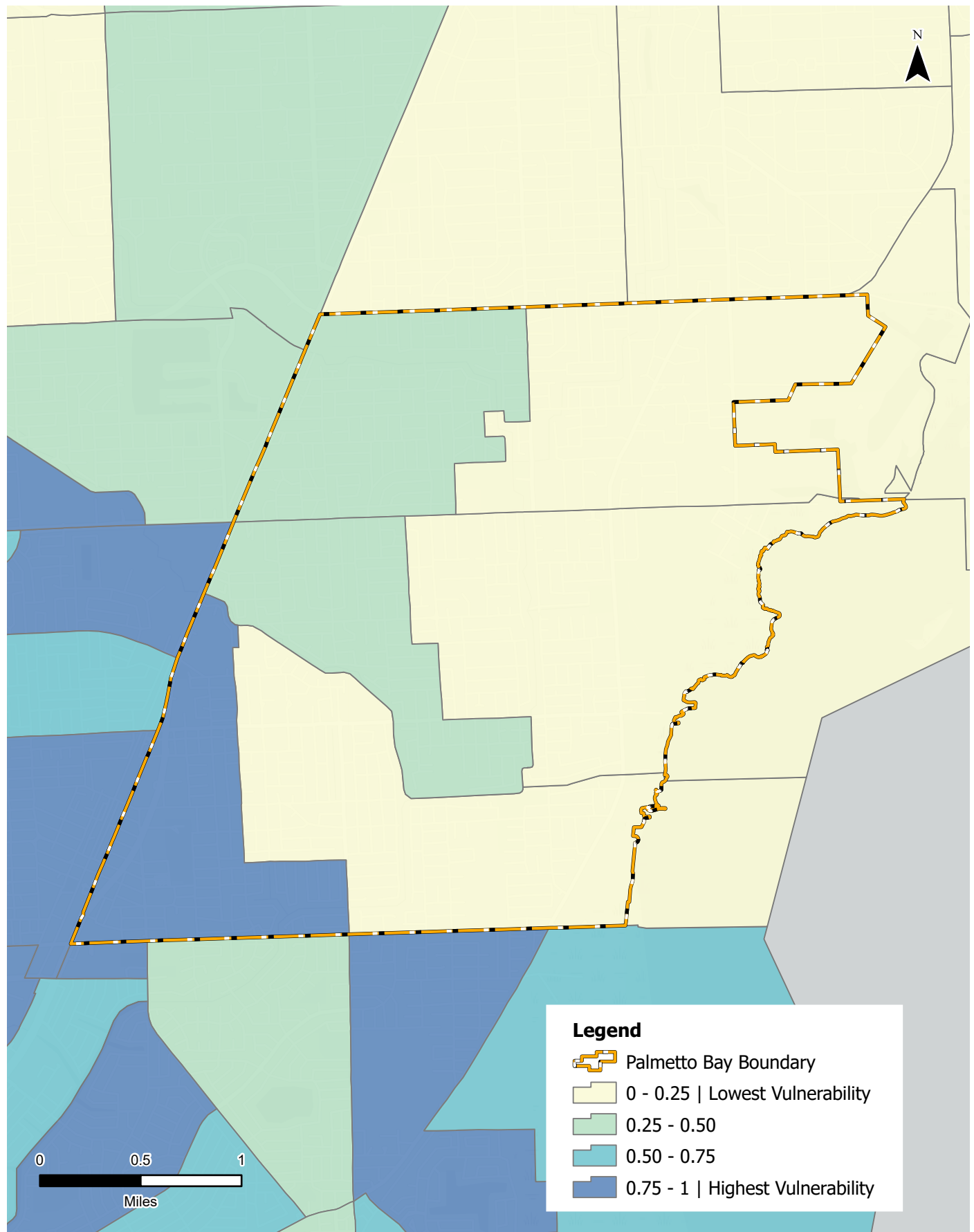


Figure 1-15: SVI: Socioeconomic Status

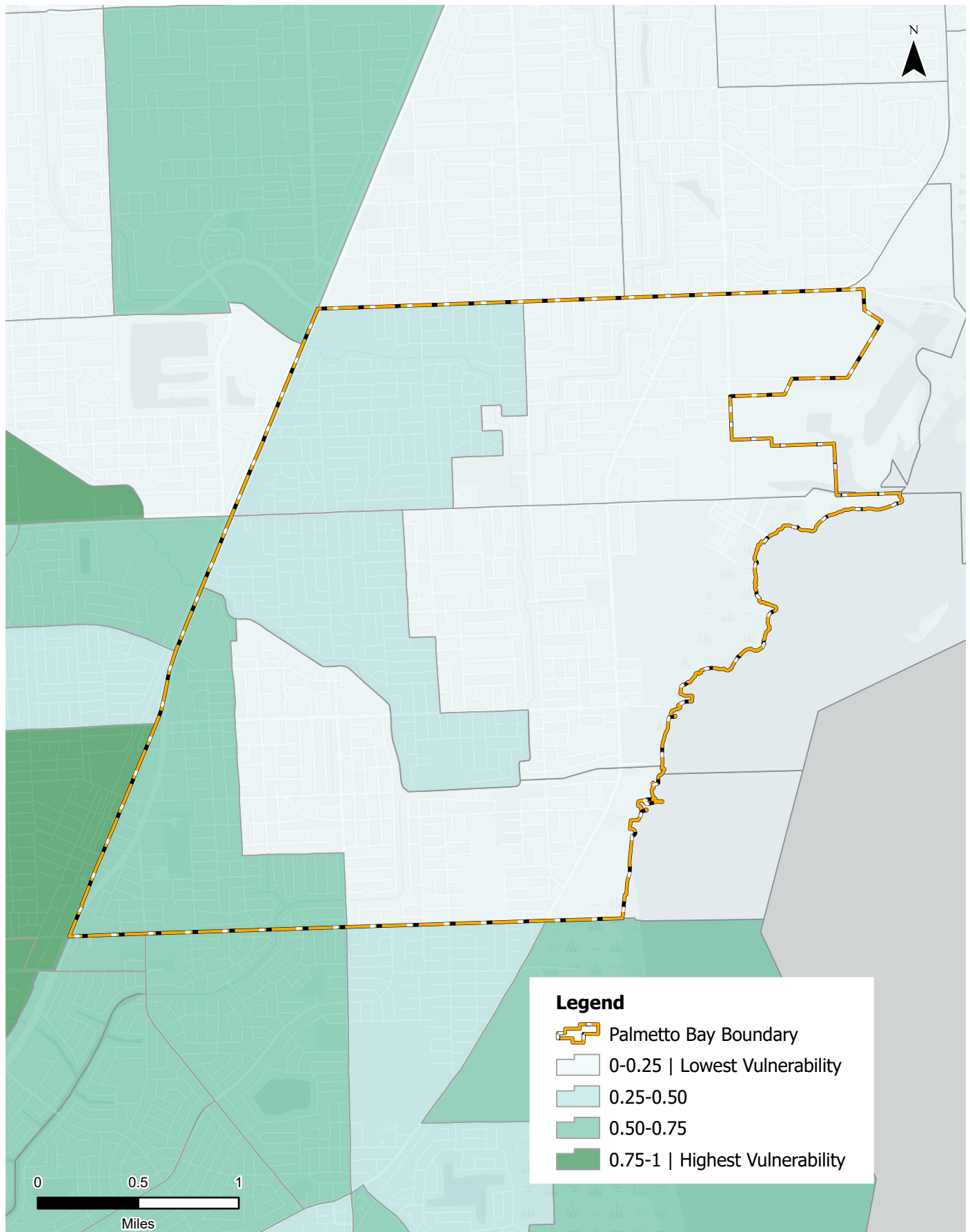


Figure 1-16: SVI: Household Characteristics

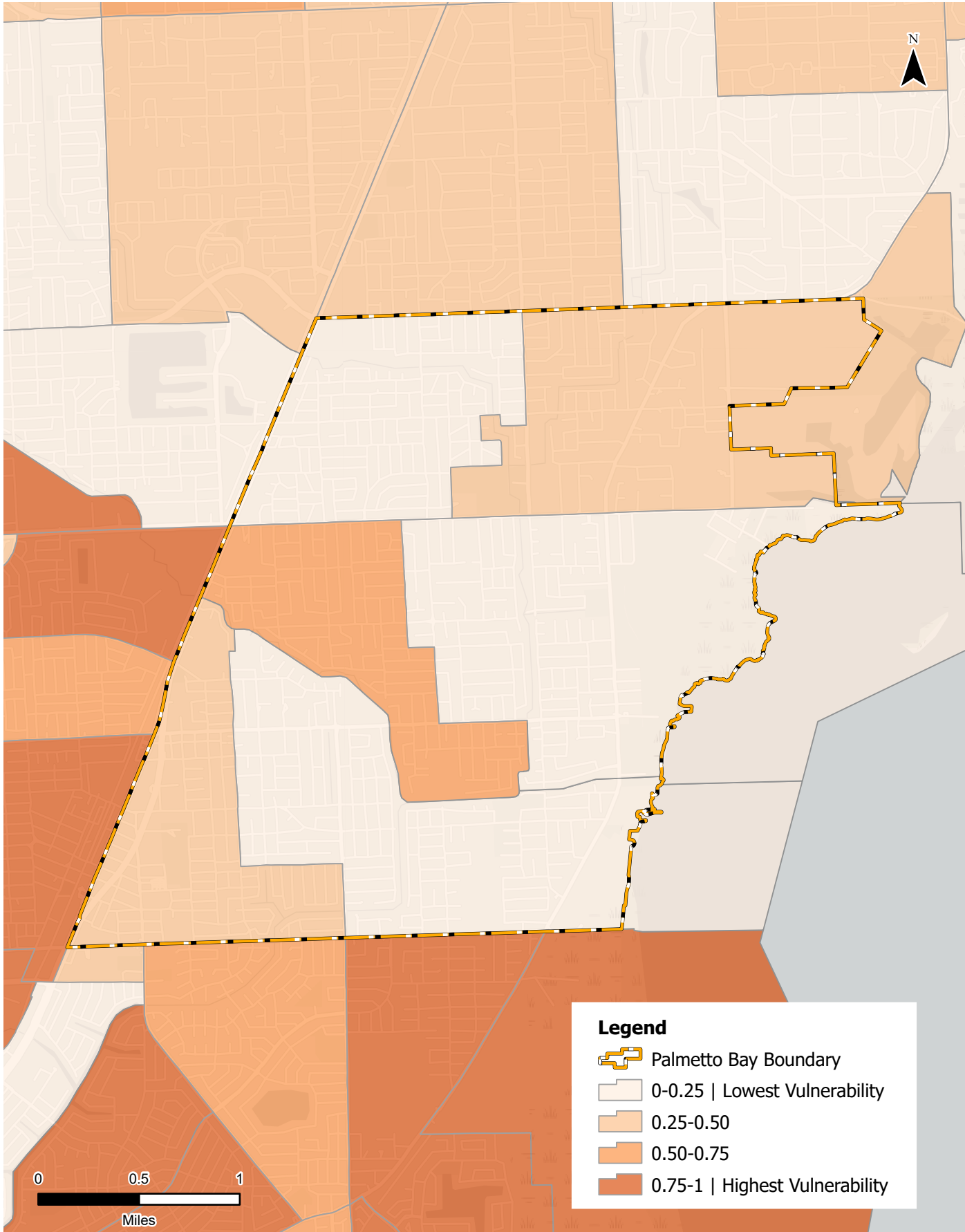


Figure 1-17: SVI: Racial and Ethnic Minority Status

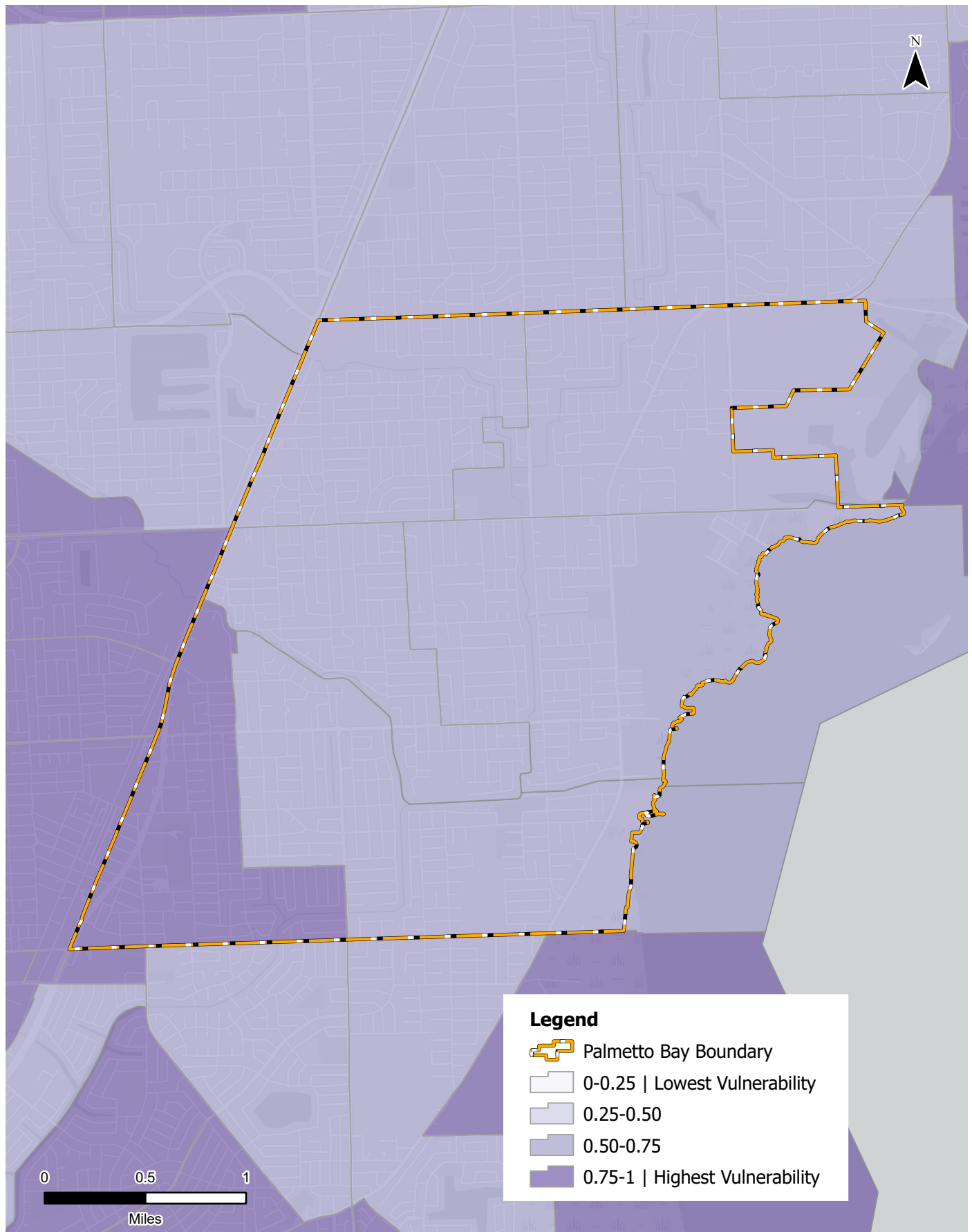
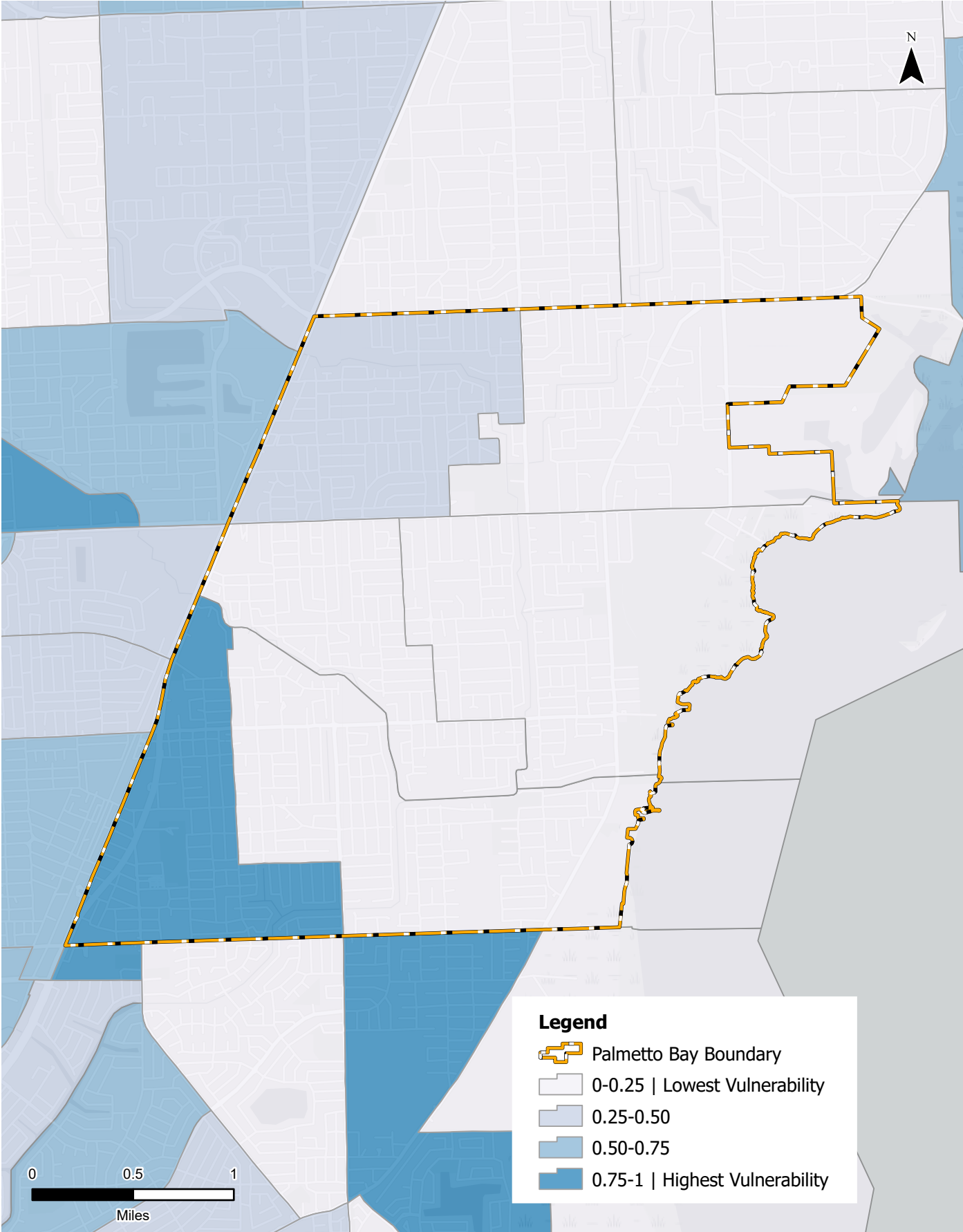
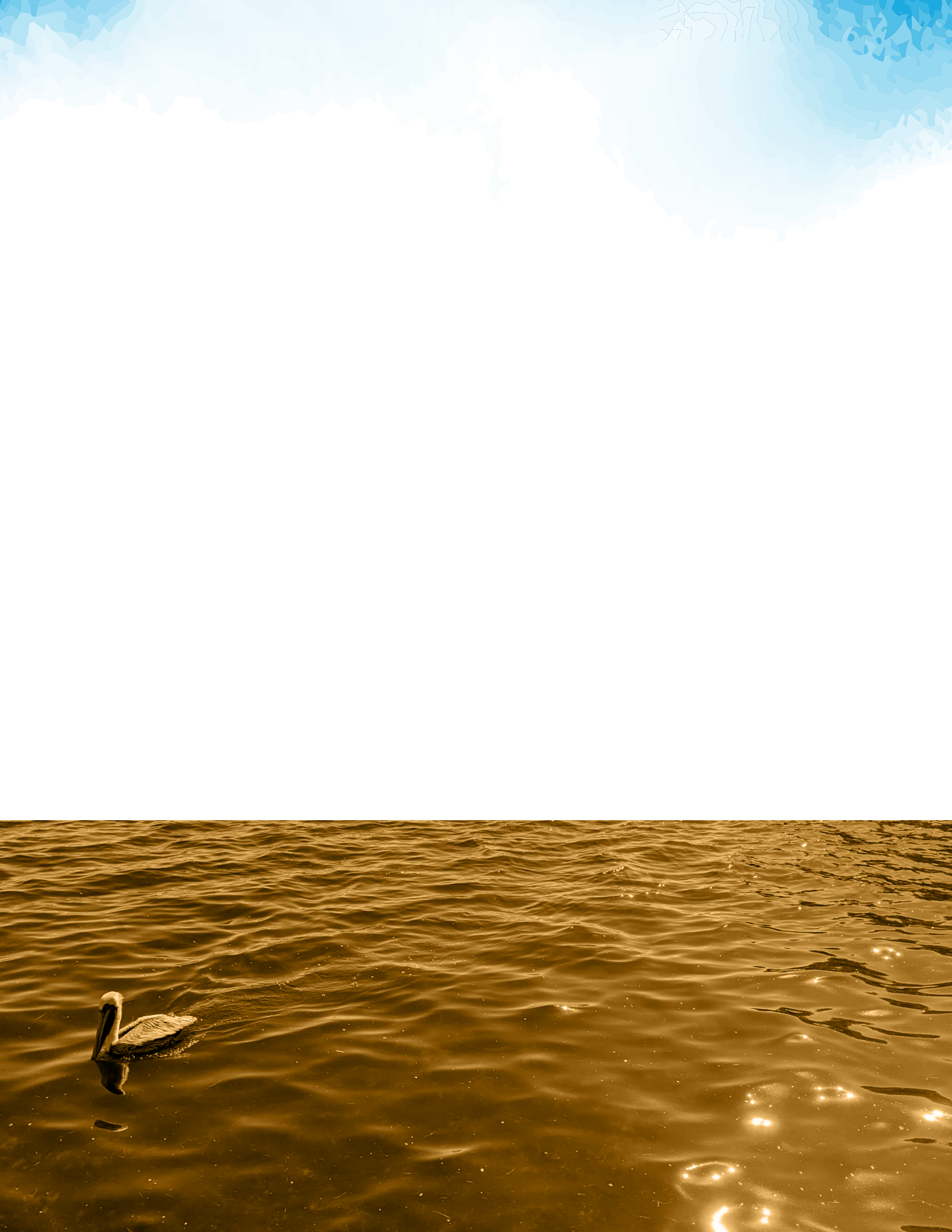


Figure 1-18: SVI: Housing Type and Transportation





2.1 OVERVIEW

Assets are the people, infrastructure, and services within the planning area that are exposed and vulnerable to the flood hazards assessed in this plan. Assets can be tangible and intangible things that people and the community value.

The asset inventory includes local assets within Palmetto Bay that are essential to Palmetto Bay government and business functions, security, public health and safety, the economy, flood and storm protection, water quality management, and wildlife habitat management.



As described in [Section 1.5](#), the Florida Department of Environmental Protection developed a Statewide Resilience Dataset which consists of spatial data sourced from state, federal, and regional datasets to provide a comprehensive statewide inventory that can be utilized by communities throughout Florida. Assets are organized into the following four categories defined by the State of Florida and outlined in 380.093, F.S:

- Critical Community Emergency Facilities
- Critical Infrastructure
- Natural, Cultural and Historical Resources
- Transportation and Evacuation Routes

The Statewide Dataset was used as a starting point for the asset identification process. Input from the Steering Committee and public helped to amend and refine the inventory. [Table 2-1](#) displays the four asset groups and examples of the types of assets required by the Resilient Florida Program, where applicable:

Table 2-1: Asset Groups and Asset Types

Asset Group	Asset Type
Critical Community & Emergency Facilities	Schools, colleges, universities, community centers, correctional facilities, disaster recovery centers, emergency medical service facilities, emergency operation centers, fire stations, health care facilities, hospitals, law enforcement facilities, local government facilities, logistical staging areas, affordable public housing, risk shelter inventory, and state government facilities
Critical Infrastructure	Wastewater treatment facilities and lift stations, stormwater facilities and pump stations, drinking water facilities hazardous waste facilities, military installations, communications facilities, and disaster debris management sites
Transportation & Evacuation Routes	Airports, bridges, bus terminals, ports, major roadways, marinas, rail facilities, and railroad bridges
Natural, Cultural, and Historical Resources	Conservation lands, parks, shorelines, surface waters, wetlands, and historical and cultural assets

This section reviews all critical assets identified for analysis in this plan. The following sub-sections provide a summary of all critical and regionally significant assets analyzed in this plan. A detailed list of assets analyzed in this plan can be found in [Appendix A](#).

2.2 ASSETS

Critical Community and Emergency Facilities

Critical community and emergency facilities are buildings and assets that are essential to government and emergency operations, support the provision of essential services, or are otherwise integral to protecting health and safety and other key functions of the community. For this vulnerability assessment 51 critical facilities were identified within the village. These facilities are summarized in [Table 2-2](#). A map of the facilities by type is shown in [Figure 2-1](#).

Table 2-2: Critical Community and Emergency Facilities by Type

Asset Type	Data Type	Asset Count
Affordable Housing	Point	1
Schools	Point	22
Law Enforcement Facilities	Point	2
Healthcare Facilities	Point	22
Fire Stations	Point	2
Community Centers	Point	1
Local Government Facilities	Point	1



Critical Infrastructure

These assets are elements and networks of infrastructure critical to providing public utility services and maintaining essential services throughout the village. This includes electrical utilities, water and drainage management infrastructure, communication infrastructure, and waste facilities. For this vulnerability assessment 27 infrastructure assets were identified in the village. These assets are summarized in [Table 2-3](#) below. A map of critical infrastructure by type is shown in [Figure 2-2](#).

Table 2-3: Critical Infrastructure by Type

Asset Type	Data Type	Asset Count
Radio Communication Towers	Point	1
Post Office	Point	1
Electric Substations	Point	1
Electric Transmission	Line	7
Wastewater Treatment/Lift Stations	Point	1
Solid and Hazardous Waste Facilities – Municipal (FDEP)*	Point	3
Solid and Hazardous Waste Facilities – Small Quantity Generators (SQG)	Point	136
Stormwater Ponds	Polygon	6
SFWM Infrastructure (culverts w/ risers)	Point	3
Canals and Levees	Line	35
Outfalls	Point	77

*Also used as Disaster Debris Management Sites

Figure 2-1: Critical Community & Emergency Facilities

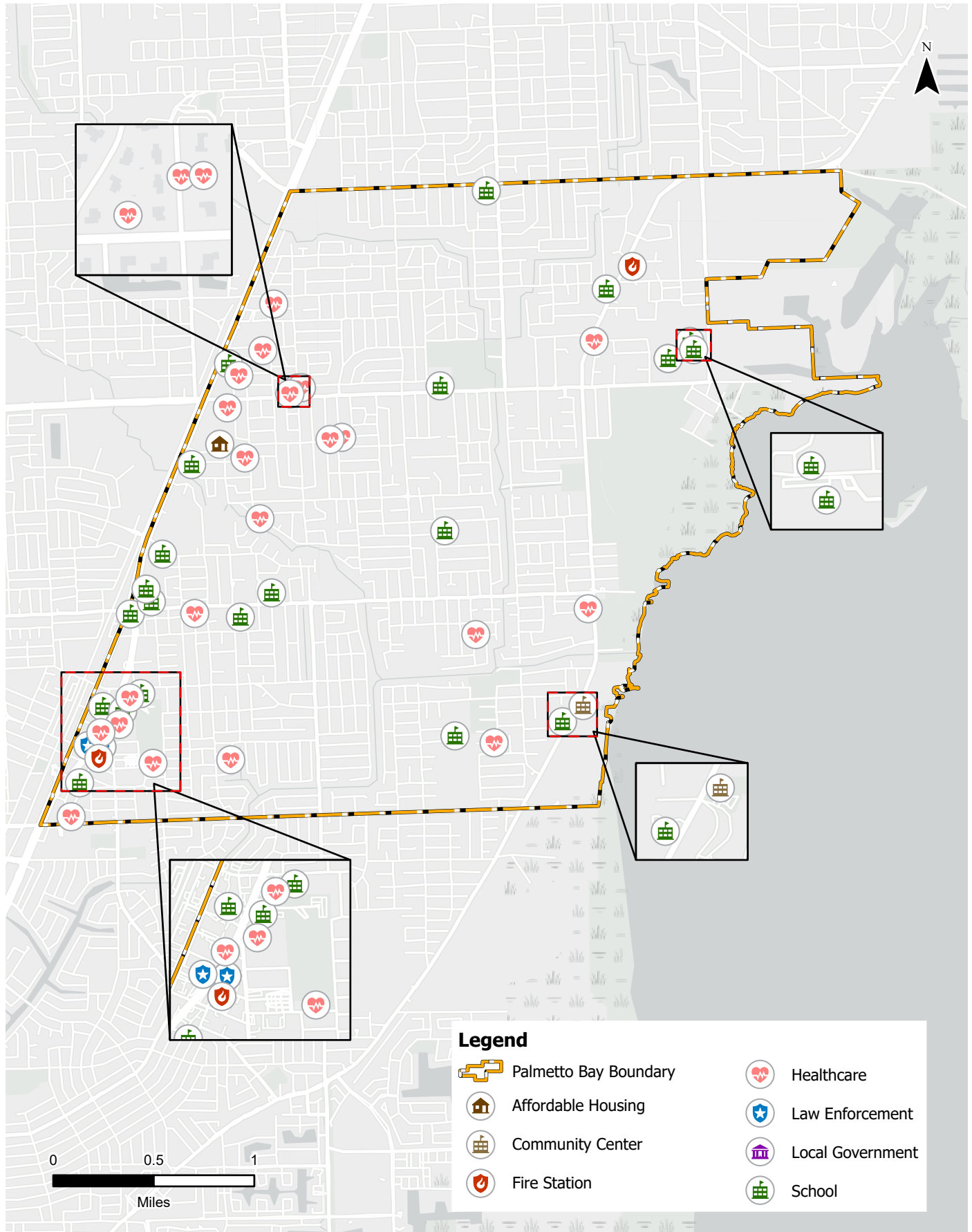
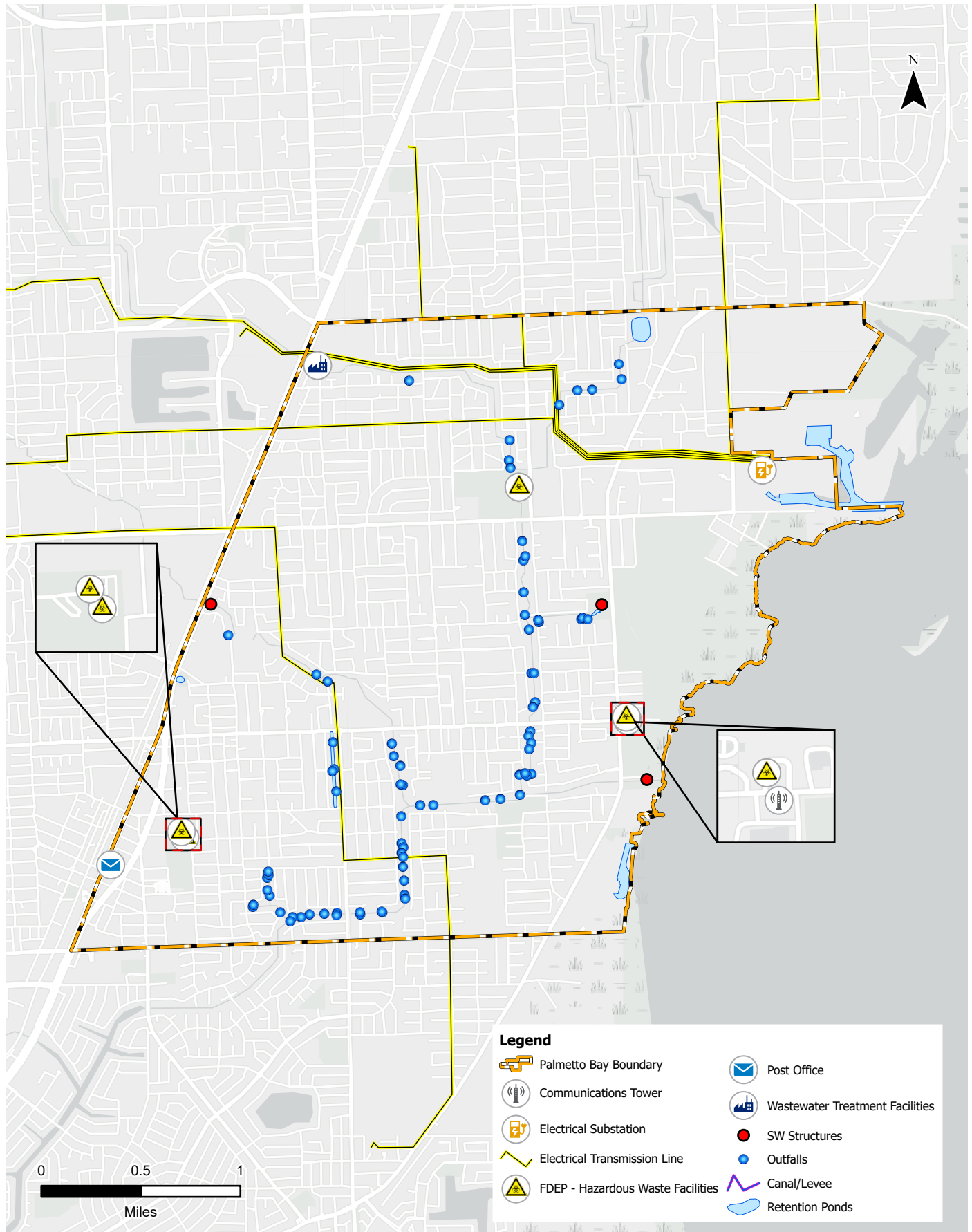


Figure 2-2: Critical Infrastructure



Transportation & Evacuation Routes

This asset category includes a range of transportation routes, elements, and networks key to maintaining transportation connectivity throughout the village and planning region. [Figure 2-3](#) shows the transportation infrastructure that runs throughout the village including local road segments from the USGS National Transportation Dataset (NTD) and major roads and bridges from Florida Department of Transportation (FDOT). This is not an exhaustive list of roads and road segments in the planning area. Ensuring that these transit routes remain open, and outside of known hazard areas is essential to maintaining a safe and reliable way to get around the village for individuals who rely on these services.

For this vulnerability assessment 17 transportation assets and 1,252 road segments were identified in the planning area. These facilities are summarized in [Table 2-4](#). A map of the facilities by type is shown in [Figure 2-3](#).

FDEM has designated evacuation routes based on the most up-to-date regional evacuation studies and should be used as a general reference. A map of the evacuation routes for Miami-Dade County are shown in [Figure 2-4](#).

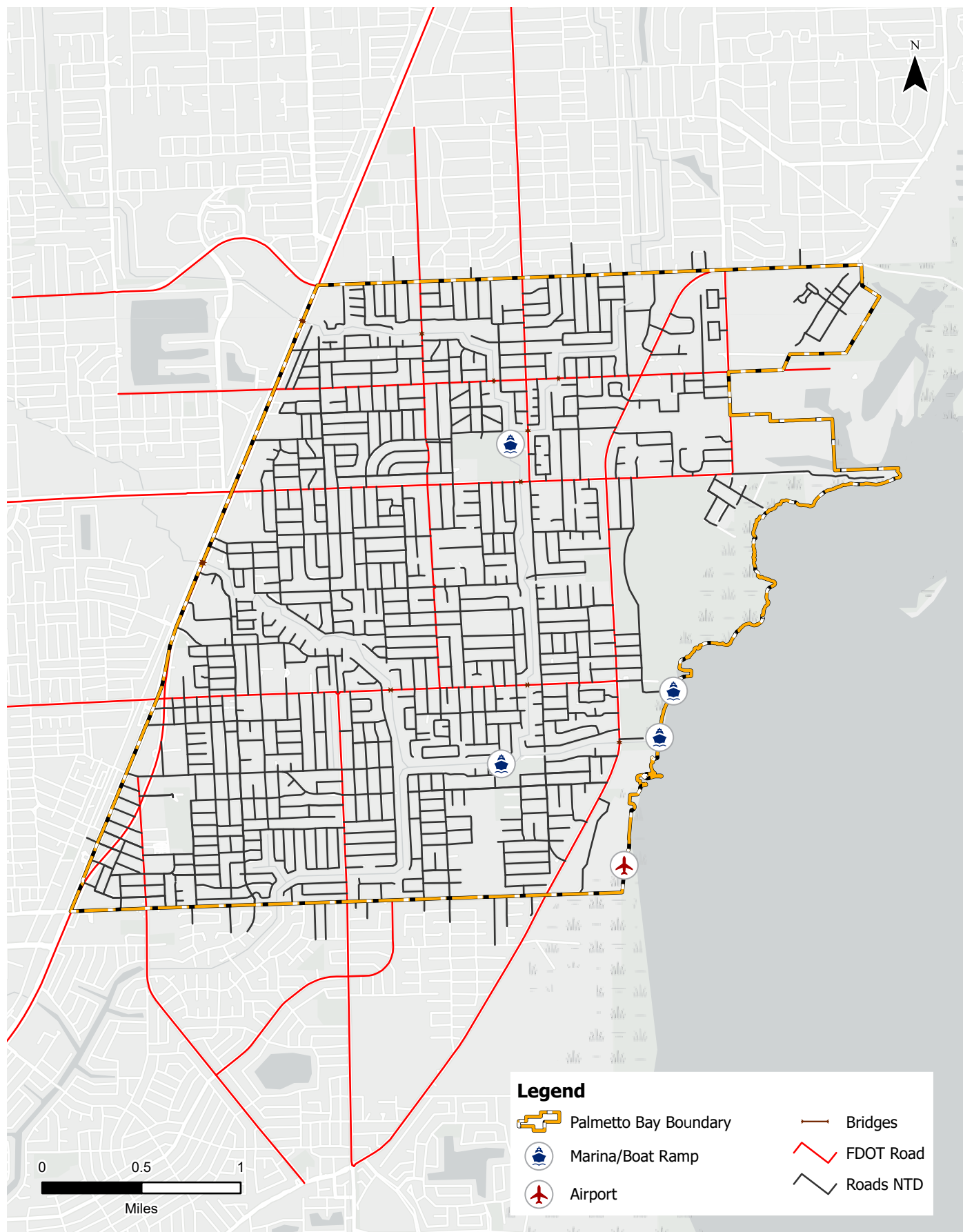
One road, Route 1 (S Dixie Highway), designated in Miami-Dade County's evacuation map, runs along the western border of the Palmetto Bay village boundary. The village falls within evacuation zones A, B, and C. Residents should consult Miami-Dade County Emergency Management for evacuation orders.

Table 2-4: Transportation and Evacuation Routes by Type

Asset Type	Data Type	Asset Count
Bridges	Line	12
Airports	Point	1
Major Roadways – NTD	Line	1,232
Major Roadways – FDOT	Line	20
Marinas and Boat Ramps	Point	4



Figure 2-3: Transportation Assets





Natural, Cultural, & Historical Assets

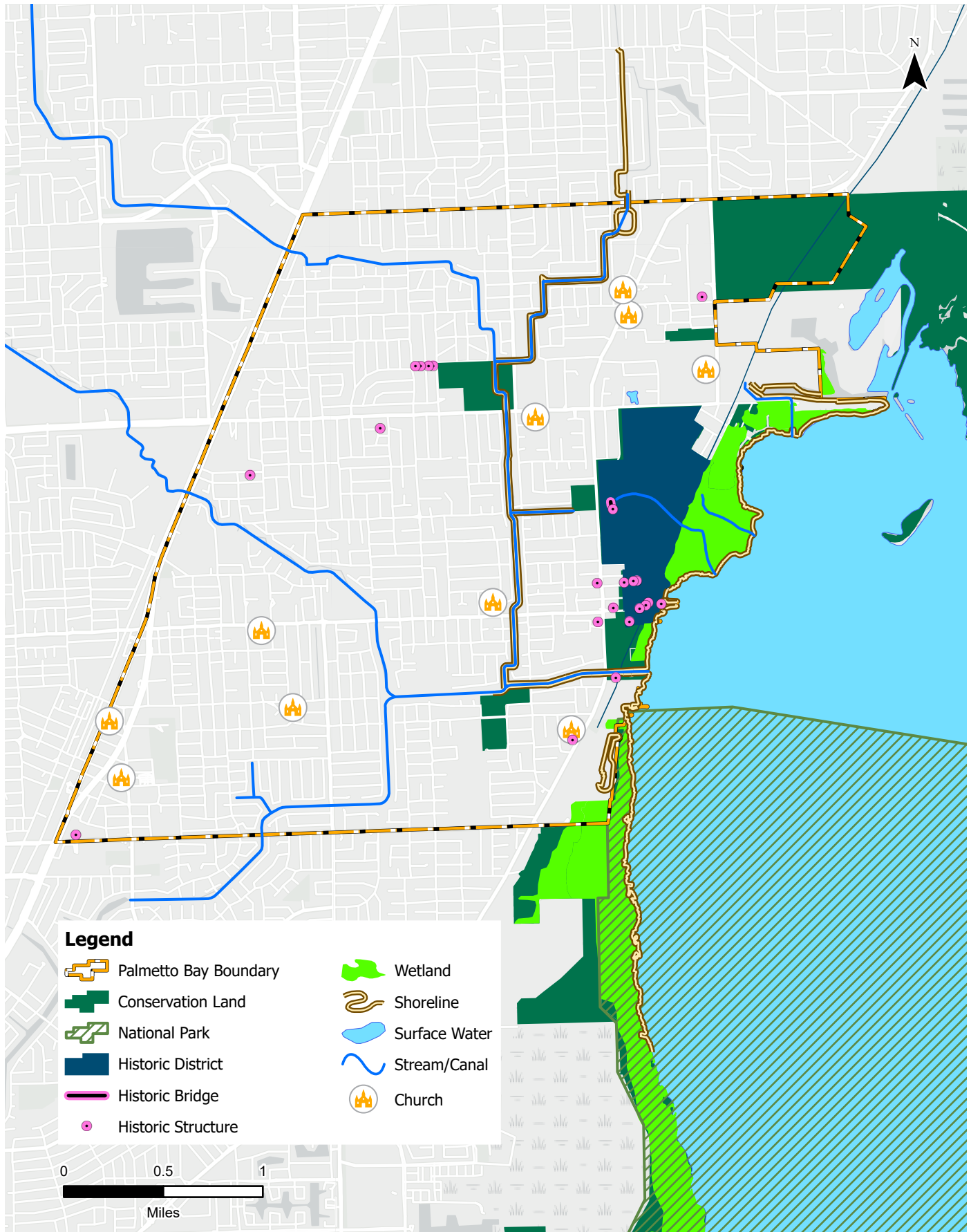
Natural, Cultural, and Historical assets include parks, wetlands, conservation land, waterbodies, and historic resources including buildings, districts, and places with cultural or historic significance. Cultural and historical assets often provide cities with character, can generate tourism, and may be a fundamental component of the community's identity. Parks and wetlands play an important role in disaster management and resiliency because they can mitigate flooding if located in flood prone areas by providing a development-free area for floodwater infiltration.

For this vulnerability assessment 247 natural, cultural, and historical assets were identified. These assets are summarized in [Table 2-5](#) below. A map of the assets by type is shown in [Figure 2-5](#).

Table 2-5: Natural, Cultural, and Historical Assets by Type

Asset Type	Data Type	Asset Count
Historic Resources	Polygon/Linear	4
Historic and Cultural Structures	Point	22
Churches	Point	10
National Parks	Polygon	1
Shorelines	Linear	40
Wetlands	Polygon	7
Surface Flowlines	Line	189
Surface Waters	Polygon	2
Conservation Lands	Polygon	12

Figure 2-5: Natural, Cultural, & Historical Assets





3.1 OVERVIEW

As defined by the Resilient Florida guidelines, this plan must assess flood hazards with potential impacts to the planning area and its people and assets. With guidance from the Steering Committee, the following sources of flooding were identified: rainfall-induced flooding, sea level rise, storm surge, and stormwater flooding. Each of these flood sources were evaluated individually and in the context of compound flooding as they often occur at the same time and have mechanisms that interact and frequently lead to more severe flooding.



This section also evaluates climate change projections for Palmetto Bay and the larger planning region to better understand future flood conditions in the village and surrounding area.

State guidance requires at least two planning horizons that include projections for the years 2040 and 2070.

This plan will also evaluate 2030 projections. Using the best available climate data, this section explains the expected impacts of climate change to the Palmetto Bay region, and how these changes influence the identified flood hazards and extreme heat.

The following summaries of each hazard provide a brief description and local context, including a review of past occurrences, influences of climate change, and potential impacts to the Palmetto Bay planning area.

Climate Change

Climate change refers to long-term shifts in temperature and weather patterns. The recent and rapid warming of the earth that has been observed over the past century has been cause for concern, as this shift is due to the accumulation of human-caused greenhouse gases, such as CO₂, in the atmosphere (IPCC, 2007). Human-caused climate change has already begun to affect many weather and climate extremes throughout the

world which has led to adverse impacts and damages to vulnerable communities. Approximately 3.3 to 3.6 billion people live in a region that is highly vulnerable to climate change (IPCC, 2023).

Global average temperature is estimated to have increased by about 1 degree Celsius since the pre-industrial period, and it is currently increasing by about 0.2 degrees Celsius per decade. Additionally, global surface temperature was 1.09 degrees Celsius higher in 2011-2020 than 1850-1900, with larger increases over land than over the ocean (IPCC, 2023).

After the UN Paris Agreement, adopted in 2015, the global goal to limit warming to 2.0 degrees Celsius, and preferably to 1.5 degrees Celsius, above pre-industrial levels (1850-1900) has been established to avoid the worst impacts from a changing climate. According to a 2023 study led by NASA, without significant climate action, global mean temperatures are expected to reach the 2 degrees Celsius (3.6°F) threshold by the 2040s.

This global increase in temperatures is having a broad range of effects on global, regional, and local climates. According to the IPCC, the extent of climate change effects on individual regions will vary over time and with the ability of different societal and environmental systems to mitigate or adapt to change.

IPCC has created climate change scenarios, called Representative Concentration Pathways (RCPs), to explore different future developments in the global environment with reference to the production of greenhouse gas emissions and concentrations in the atmosphere. RCP emissions scenarios can be incorporated into climate models to account for factors that alter the earth's climate system. These scenarios can be used to make projections about future climate and to understand potential vulnerabilities to climate change. There are four primary RCP scenarios, all of which are considered possible depending on the amount of greenhouse gases emitted in the years to come:

- **RCP 2.6:** This scenario is characterized as having very low greenhouse gas concentration levels. It is a “peak-and-decline” scenario and assumes that greenhouse gases are reduced substantially over time and aim to keep global warming below 2 degrees Celsius.
- **RCP 4.5:** This scenario is one of two intermediate scenarios. This scenario reflects reductions in CO₂ emissions from current levels and assumes a stabilization will occur shortly after 2100.
- **RCP 6.0:** This is intermediate scenario assumes more emissions than RCP 4.5. It assumes an increase in greenhouse gas emissions followed by stabilization occurring shortly after 2100 through the application of a range of technologies and strategies for reducing greenhouse gas emissions.
- **RCP 8.5:** This scenario is characterized by increasing greenhouse gas emissions over time, and factors in the highest greenhouse gas concentration levels of all the scenarios by 2100.



3.2 SEA LEVEL RISE

Sea level rise is the increase in sea levels as a result of atmospheric and oceanic warming which causes water expansion as well as ice melt from ice sheets and glaciers.

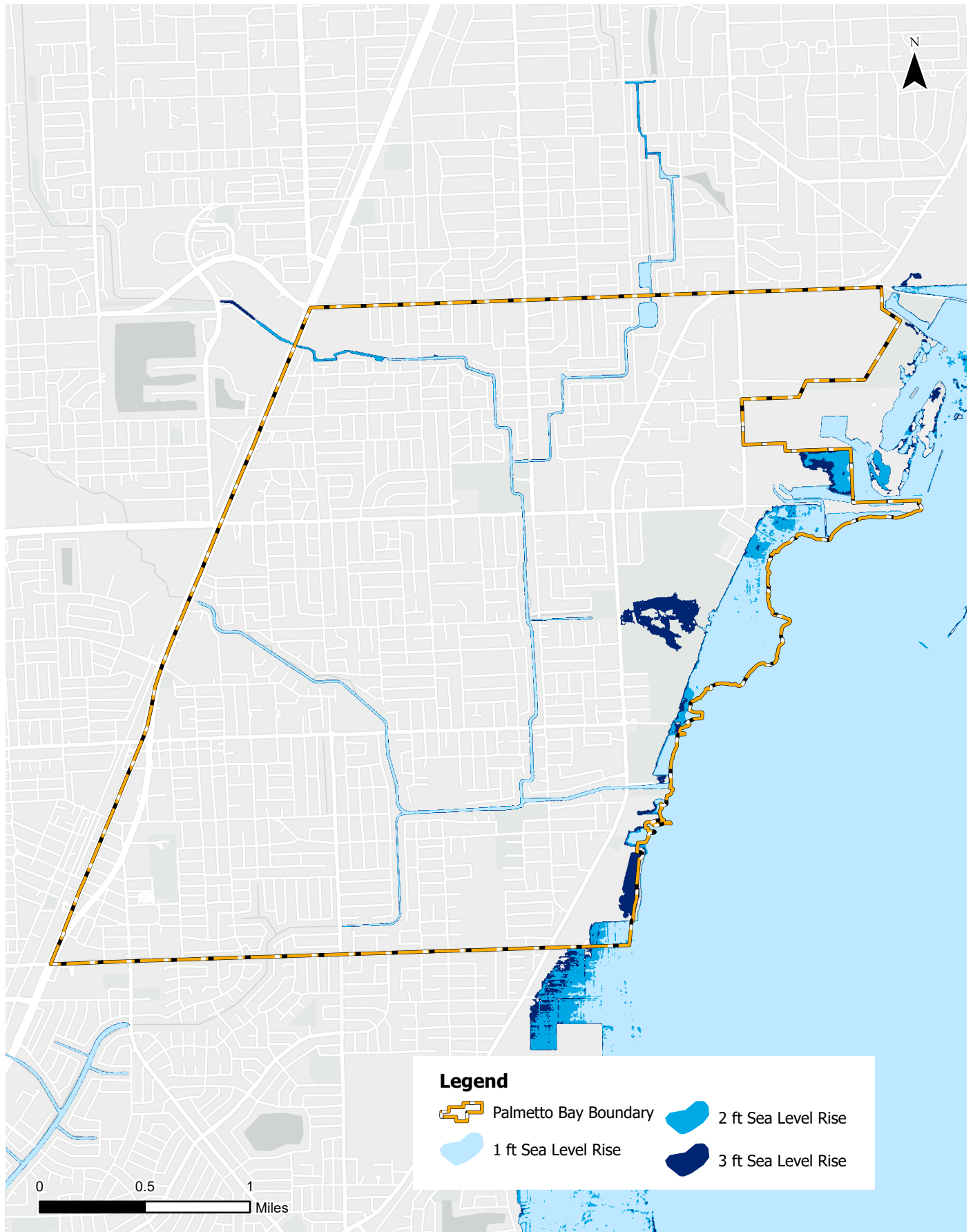
Global sea level rise is likely caused by a combination of these two mechanics and can be exasperated on the local level by factors such as erosion and subsidence. The rate of sea level rise has varied throughout geologic history, and studies have shown that global temperature and sea level are strongly correlated.

Sea level rise is generally measured by the number of feet of relative rise and the areas that such rise would inundate. The estimated impacts of 1-foot, 2-foot, and 3-foot, sea level rise are shown in [Figure 3-1](#) according to data from the NOAA Sea Level Rise viewer. This map of estimated sea level rise shows inundation above mean higher high water (the average of each day's higher high tide line).

The village of Palmetto Bay is particularly vulnerable to the effects of sea level rise, due to its coastal location, subtropical environment, and low topography. Sea level rise can occur anywhere along the coast in Palmetto Bay and may have direct localized impacts, such as inundation of land and property, as well as broader indirect impacts, such as interruption of transportation networks, the village's canal system, or other infrastructure. Sea level rise will likely affect coastal marsh lands as well as land along rivers, canals, and their tributaries. In addition to inundation of low-lying lands, sea level rise will likely increase future risk of flooding from the other flood hazards, as more land will have a lower elevation relative to sea level.



Figure 3-1: Sea Level Rise Extent

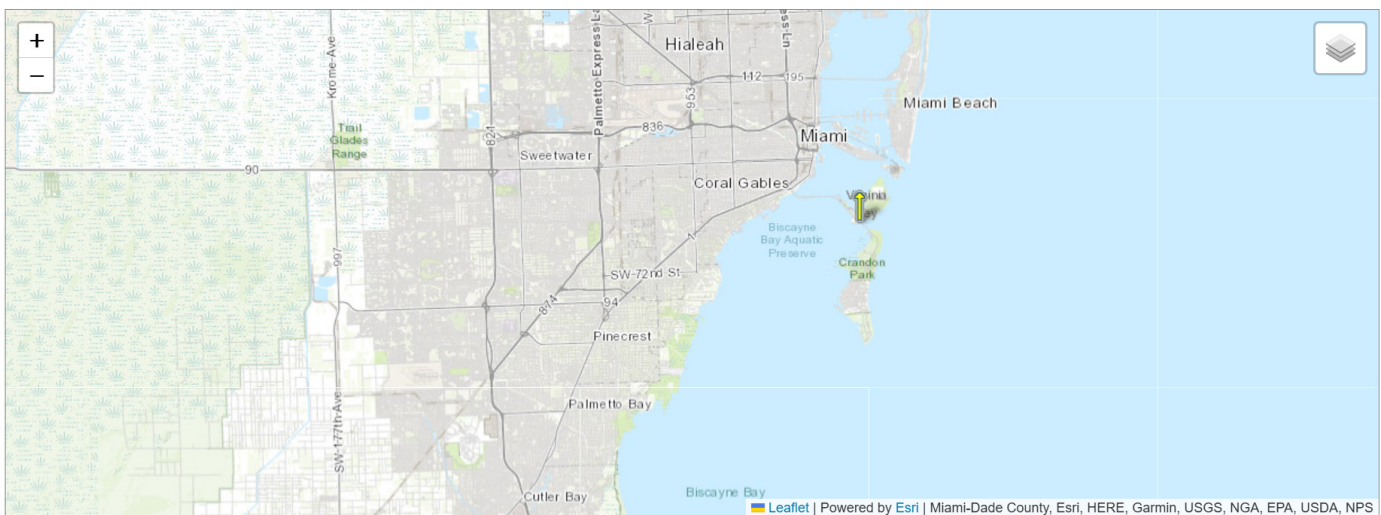


Historic trends in local mean sea level (MSL) are best determined from tide gauge records. The Center for Operational Oceanographic Products and Services (CO-OPS) has been measuring sea level for over 150 years, with tide stations operating on all U.S. coasts. Changes in MSL, either a sea level rise or sea level fall, have been computed at 128 long-term water level stations using a minimum span of 30 years of observations at each location. These measurements have been averaged by month to remove the effect of higher frequency phenomena (e.g. storm surge) in order to compute an accurate linear sea level trend. **Figure 3-2**, illustrates regional trends in sea level from NOAA.

At the Virginia Key, FL station (indicated by the yellow arrow just south of the City of Miami), the relative sea level trend is 3.16 mm/year with a 95% confidence interval of +/- 0.22 mm/year based on monthly mean sea level data from 1931 to 2023 which is equivalent to a change of 1.04 feet in 100 years.

Figure 3-3 shows the monthly mean sea level at NOAA's Virginia Key, FL station without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The long-term linear trend is also shown, including its 95% confidence interval. The plotted values are relative to the most recent Mean Sea Level datum established by CO-OPS.

Figure 3-2: Sea Level Trends, Miami-Dade County, FL

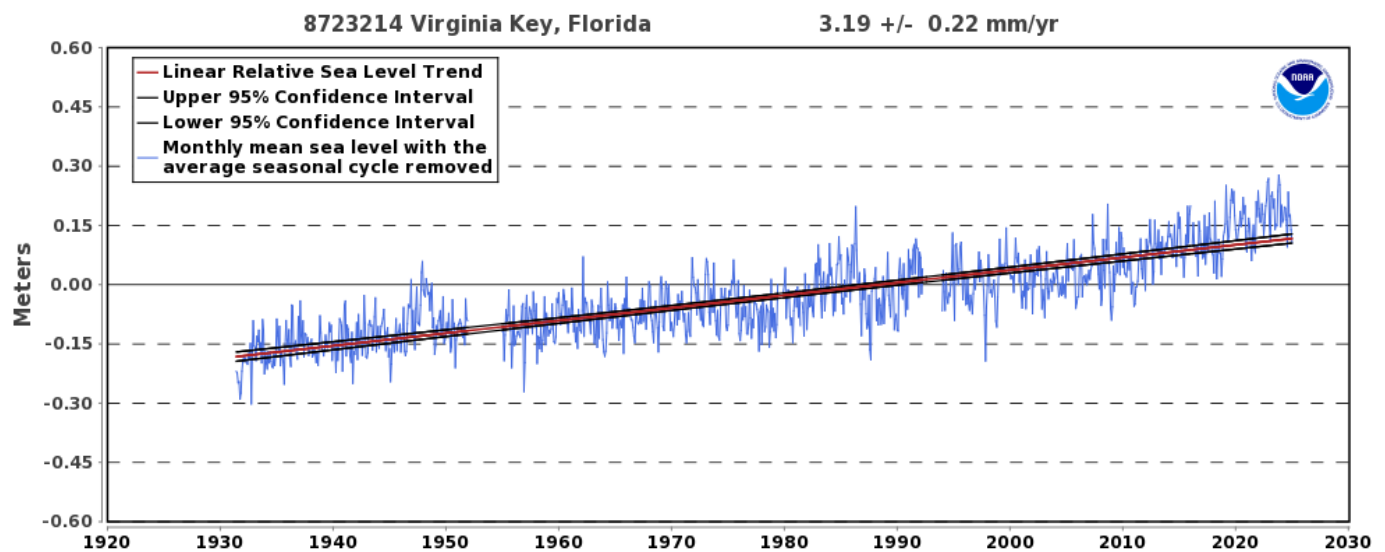


The map above illustrates relative sea level trends, with arrows representing the direction and magnitude of change. Click on an arrow to access additional information about that station.



Source: <https://tidesandcurrents.noaa.gov/sltrends/sltrends.html>

Figure 3-3: Mean Sea Level Trend for Virginia Key, FL



Source: NOAA Trends & Currents, Sea Level Trends, August 2023

The data above relies on a linear trend over more than a decade. As such, the trend misses subtle variations and especially larger increases as climate change and CO₂ levels have increased in recent years. The Earth's changing climate has led to nonlinear trends in sea level that deviate from historic trends. This is especially pertinent in the coastal communities of South Florida on the frontlines of climate change and sea level rise.

The Southeast Florida Regional Climate Change Compact's Unified Sea Level Rise Projection points out that there has been an increase in sea level above linear trends, especially in the last decade. Recent analyses of tide gauge records acquired along the United States Atlantic coast indicate year-to-year acceleration in the rate of sea level rise. A 2017 study conducted by

Valle-Levinson et al., *Spatial and temporal variability of sea level rise hot spots over the eastern United States*, found that during 2010-2015, accelerated sea level rise at rates five times the global average was observed between Key West and Cape Hatteras, and is attributed to the warming of the Florida Current. Another study by Shimon Wdowinski, *Coherent spatio-temporal variations in the rate of sea level rise along the US Atlantic and Gulf coasts*, analyzed the Virginia Key tide gauge record (near Miami, just north of Palmetto Bay) and found a significant acceleration in the rate of sea level rise since 2006. The average rate of regional sea level rise since 2006 was 9 ± 4 millimeters per year, significantly higher than the global average rate, which has been estimated to be in the range of 4-5 millimeters per year for the post-2006 period (Wdowinski et al., 2016).



Figure 3-4 shows regionalized sea level rise scenarios for the Virginia Key, Biscayne Bay tide station, indicating the range in sea level rise that may occur based on climate projections. The figure shows the station's annual mean sea level since 1960 and five regionalized sea level rise scenarios plotted relative to a 1996-2014 baseline period, with the year 2005 as the 'zero' for the figure. The projections were released in 2022 by a U.S. interagency task force in preparation for the Fifth National Climate Assessment. The results are summarized in the [2022 Sea Level Rise Technical Report](#).

Note that this vulnerability assessment is based on the 2017 Technical Sea Level Rise Report in order to meet state requirements. Sea level rise extent for each required climate projection is shown in [Figure 3-5](#) and [Figure 3-6](#). Sea level rise projections from the two technical reports vary slightly and can be compared using the [NOAA Sea Level Rise Viewer](#).

Using the intermediate-low and intermediate-high scenarios, projections for. Using the intermediate-low and intermediate-high scenarios, projections for the Palmetto Bay area are outlined below. Sea level rise extent for each projection is shown in [Figure 3-5](#) and [Figure 3-6](#).

Intermediate-Low

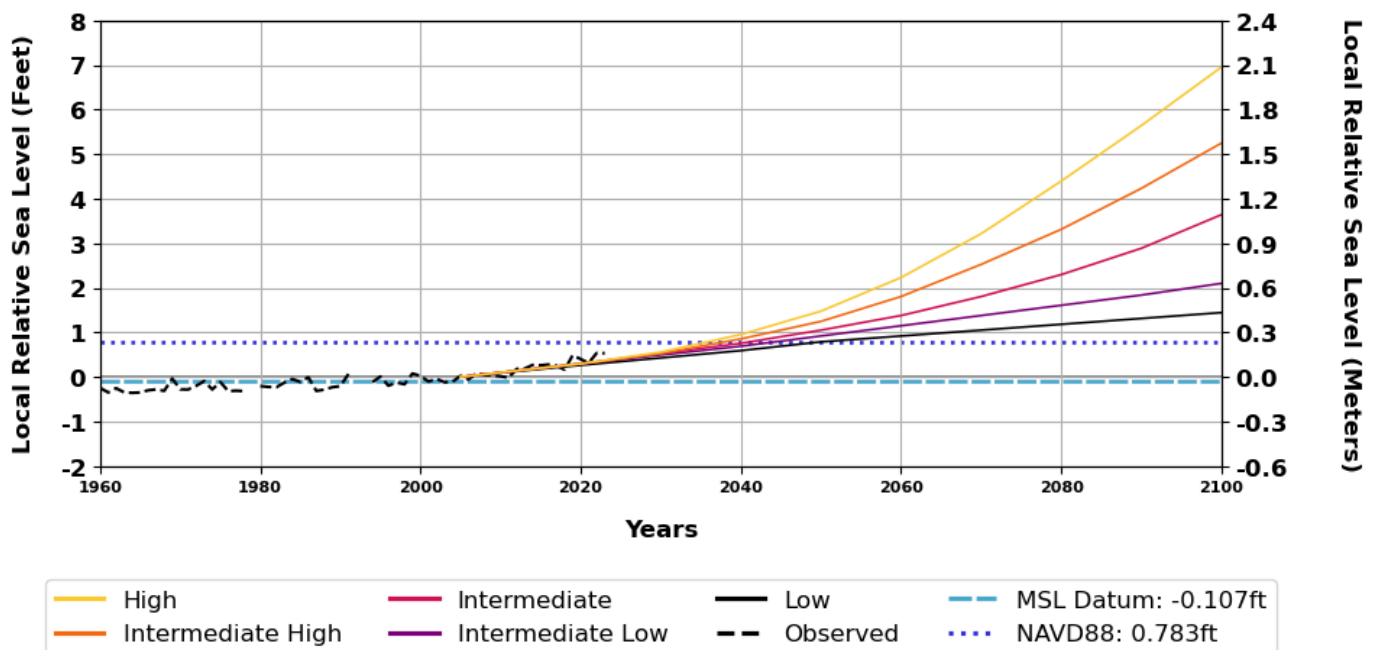
- **2030:** Sea level in the region is projected to rise almost 0.49 feet (5.88 inches).
- **2040:** Sea level in the region is projected to rise almost 0.69 feet (8.28 inches).
- **2070:** Sea level in the region is projected to rise almost 1.25 feet (15.00 inches).

Intermediate-High

- **2030:** Sea level in the region is projected to rise almost 0.98 feet (11.76 inches).
- **2040:** Sea level in the region is projected to rise almost 1.41 feet (16.92 inches).
- **2070:** Sea level in the region is projected to rise almost 3.28 feet (39.36 inches).

Figure 3-4: Regional Sea Level Scenarios at Virginia Key, FL Station

Annual Relative Sea Level Since 1960 and Projections 8723214 Virginia Key



Source: NOAA Tides and Currents, Sea Level Trends

Figure 3-5: Sea Level Rise Projections – Intermediate Low

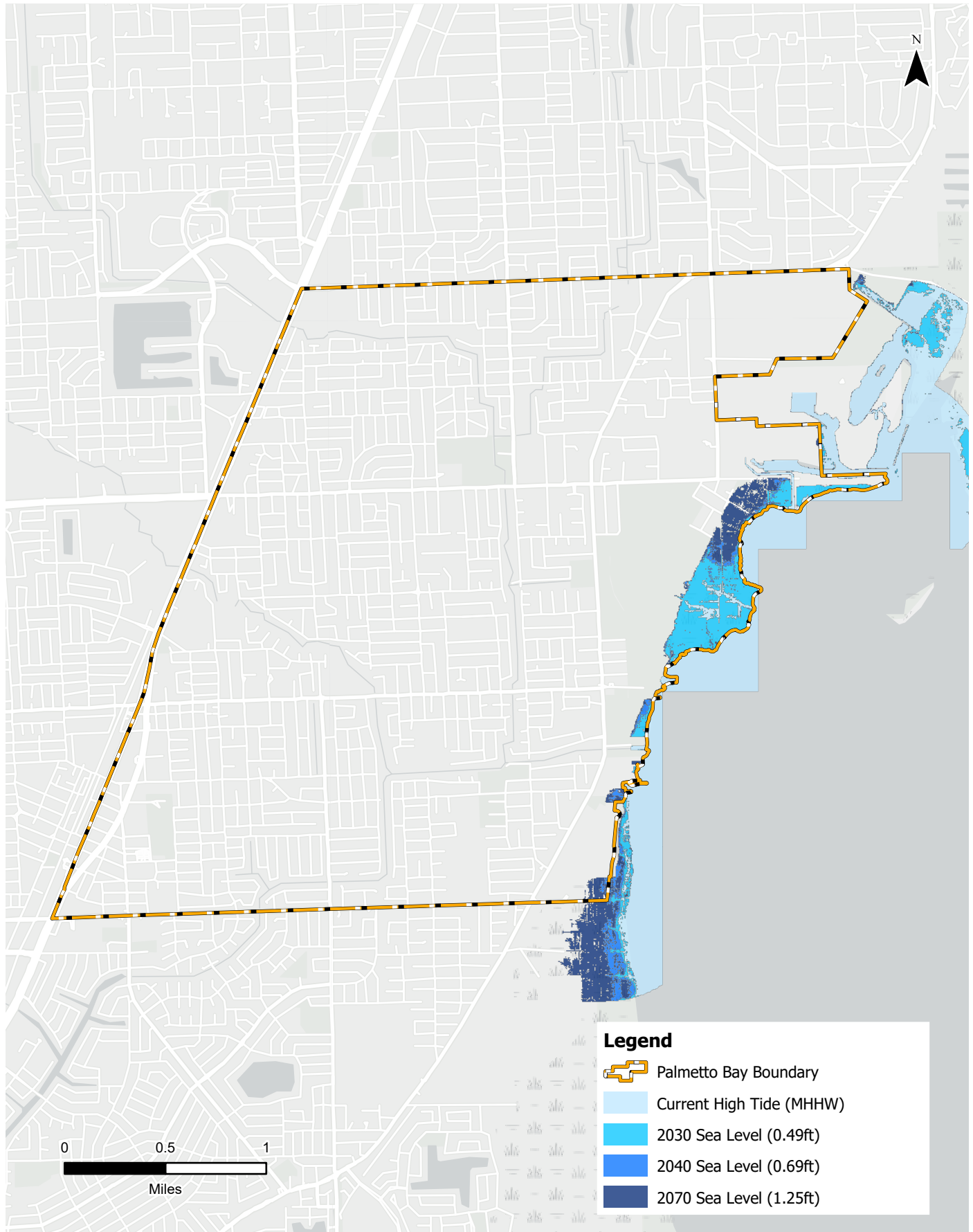
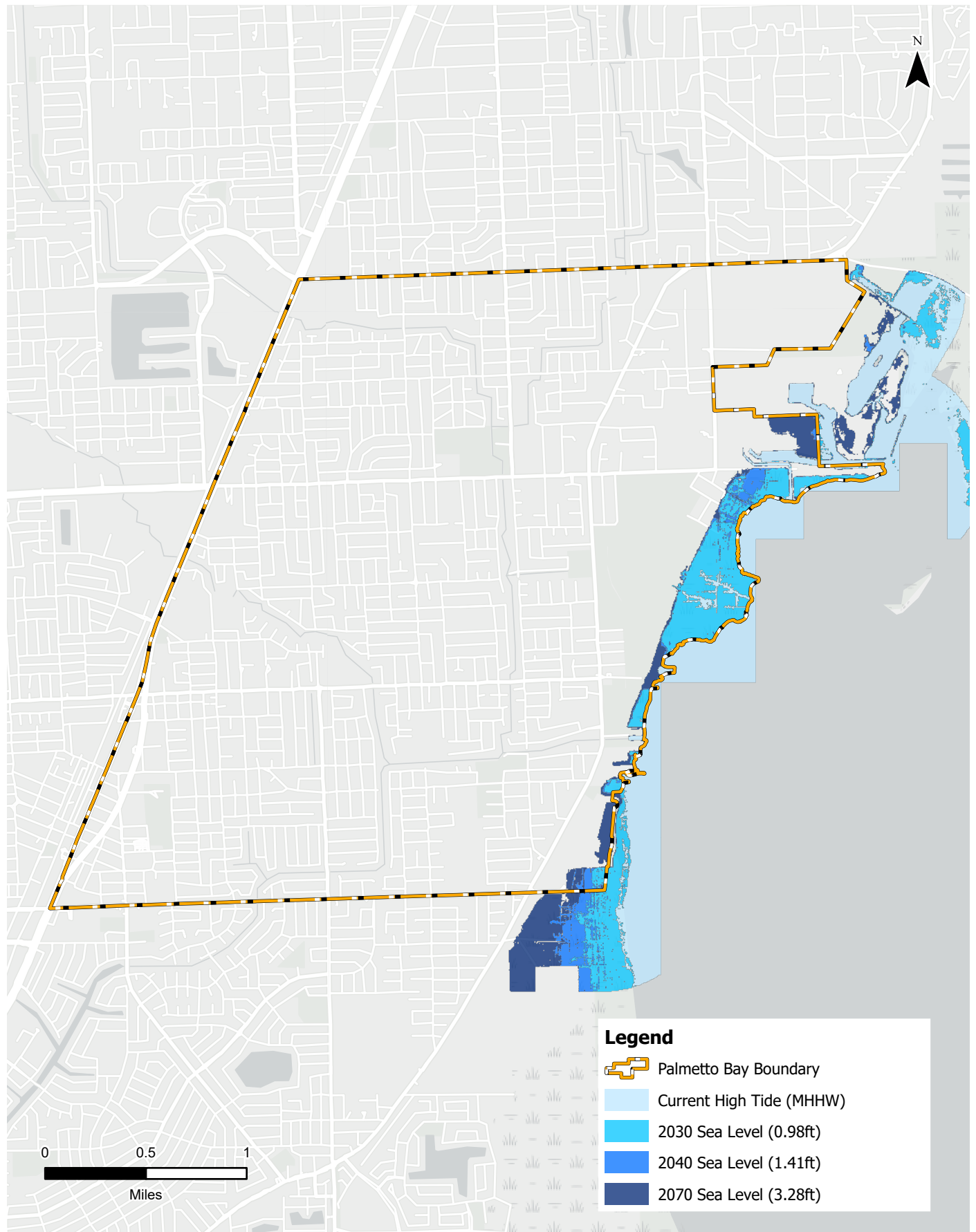


Figure 3-6: Sea Level Rise Projections – Intermediate High



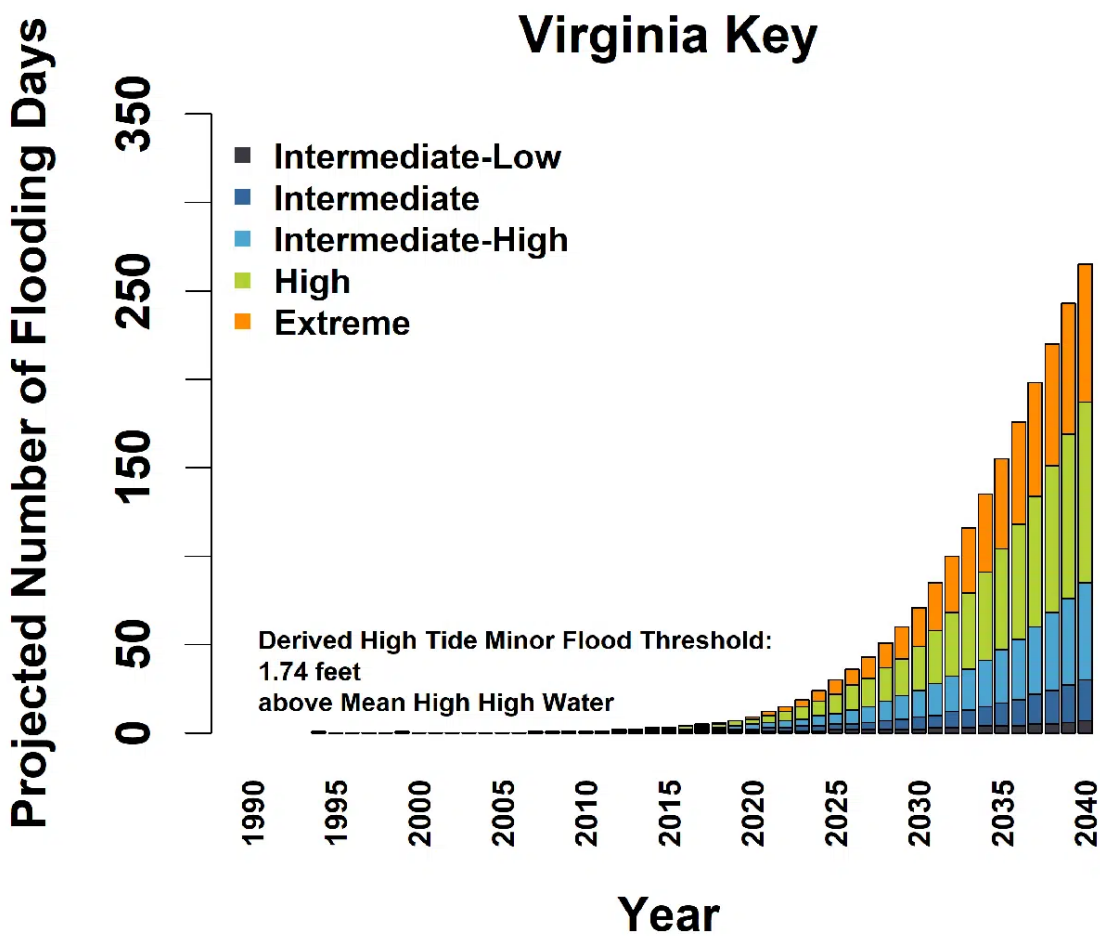
High Tide Flooding

Sea level rise is a slow onset hazard, and because the full extent of anticipated sea level rise has not yet been realized, the effects of sea level rise have not yet been fully felt. However, sea level rise has already begun to cause “clear sky” or “nuisance” flooding, which is brought on by high tides rather than storm or rain events. Tidal flooding causes temporary inundation of low-lying areas during high-tide events. While tidal flooding is not caused by sea level rise itself, a 2015 tidal flooding report published by NOAA notes that tidal flood rates are steadily increasing, and daily highest tides surpass fixed elevations increasingly often, due in part to sea

level rise. According to NOAA, annual occurrences of high tide flooding have increased 5- to 10-fold since the 1960s. Sea level rise may cause flooding to occur more frequently and last for longer durations of time. As sea level continues to rise, tidal flooding will continue to occur more frequently and over a greater inland area.

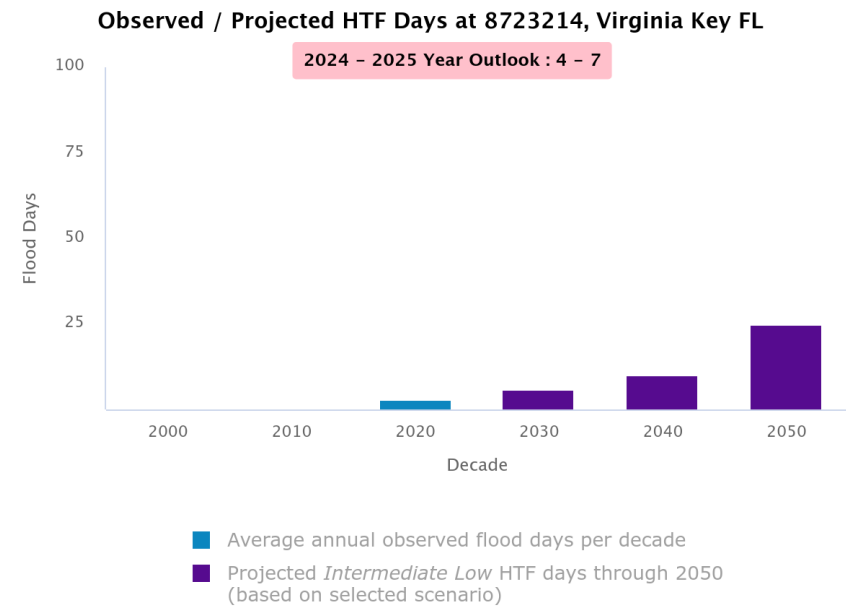
By 2050, Miami-Dade County is projected to experience anywhere from 13 to 84 days with high tide flooding depending on the emissions scenario. **Figure 3-7** shows these projections based on the corresponding sea level rise projection curves for Southeast Florida.

Figure 3-7: Projected Days with High Tide Flooding



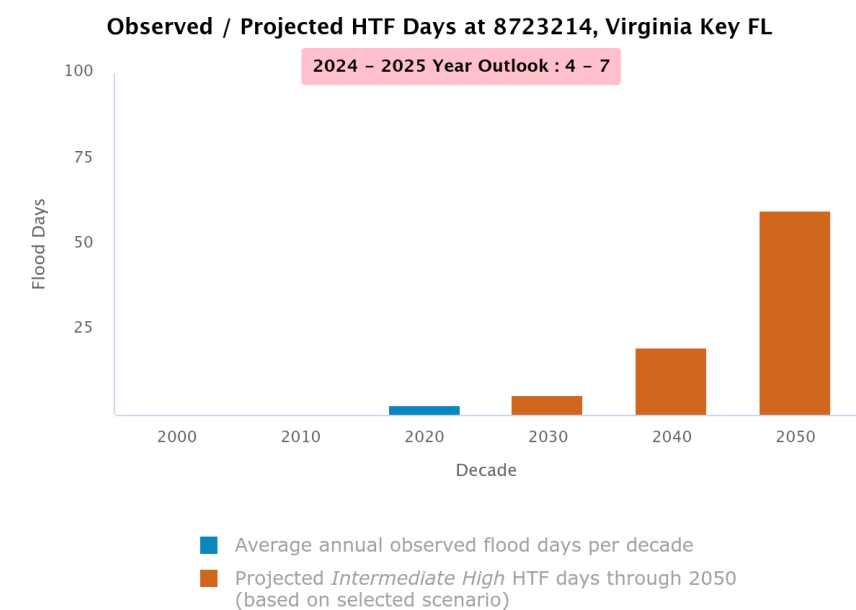
Based on NOAA Annual High Tide Flooding Outlook, results shown in [Figure 3-8](#) and [Figure 3-9](#), it is estimated that under the intermediate low scenario the Palmetto Bay region could experience 25 days of high tide flooding by 2050, and 60 days under the intermediate high scenario.

Figure 3-8: Annual High Tide Flooding Outlook: Intermediate Low



Source: NOAA Tides and Currents

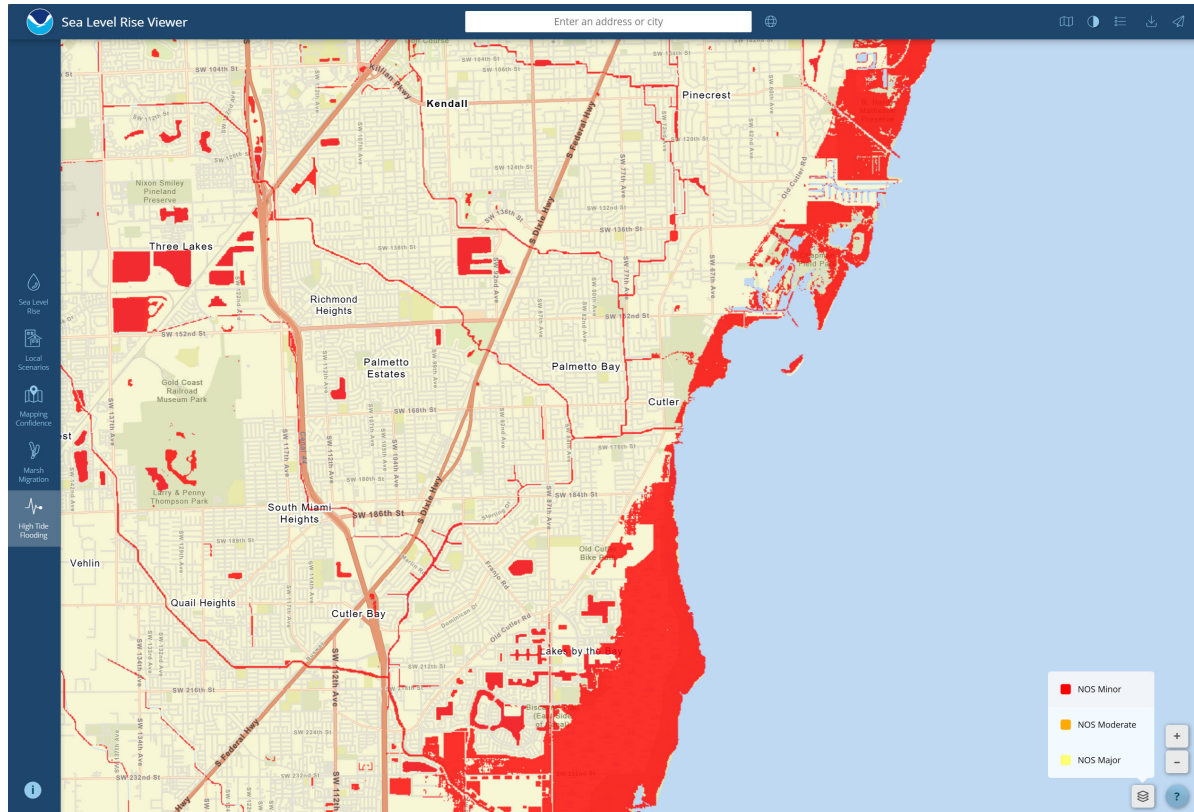
Figure 3-9: Annual High Tide Flooding Outlook: Intermediate High



Source: NOAA Tides and Currents

Figure 3-10 shows areas in Palmetto Bay that are susceptible to high tide flooding as defined by NOAA based on derived national flood thresholds from NOAA Technical Report NOS CO-OPS 086: Patterns and Projections of High Tide Flooding along the U.S. Coastline Using a Common Impact Threshold.

Figure 3-10: Areas Susceptible to High Tide Flooding, Palmetto Bay, FL



Source: NOAA Coastal Flood Exposure Mapper, <https://coast.noaa.gov/digitalcoast/tools/flood-exposure.html>



3.3 RAINFALL INDUCED FLOODING

Flood events result from prolonged or heavy precipitation and typically occur in riverine floodplains, which are the natural channels and adjacent lands where floodwaters collect and drain. Based on historical records from NOAA's Climate at a Glance, Miami-Dade County (used to approximate Palmetto Bay) has received an average annual rainfall of 55.49 inches from 1900 to 2023. A review of precipitation data shown in [Figure 3-11](#), shows there has been a slight increasing trend of 0.14 inches per decade. Throughout the Southeast U.S. there has been a trend toward more days with heavy rainfall, but it remains to be seen whether these changes are occurring in Southeast Florida. NOAA Atlas 14 is a project of the National Weather Service's (NWS) Hydrometeorological Design Studies Center (HDSC) that provides precipitation frequency information for U.S. states and territories. NOAA precipitation frequency estimates serve as the standards for designing, building, and operating infrastructure to withstand the forces of heavy precipitation and floods.

The planning team reviewed Atlas 14 data provided in the Florida Statewide Resilience Dataset to determine precipitation estimates for Palmetto Bay for a 24-hr storm event and various recurrence intervals (25, 50, 100 and 500-year storm events). The findings, summarized in [Table 3-1](#), indicate that a 24-hr 100-yr storm event in Palmetto Bay would produce an average of 14.20 inches of rainfall.

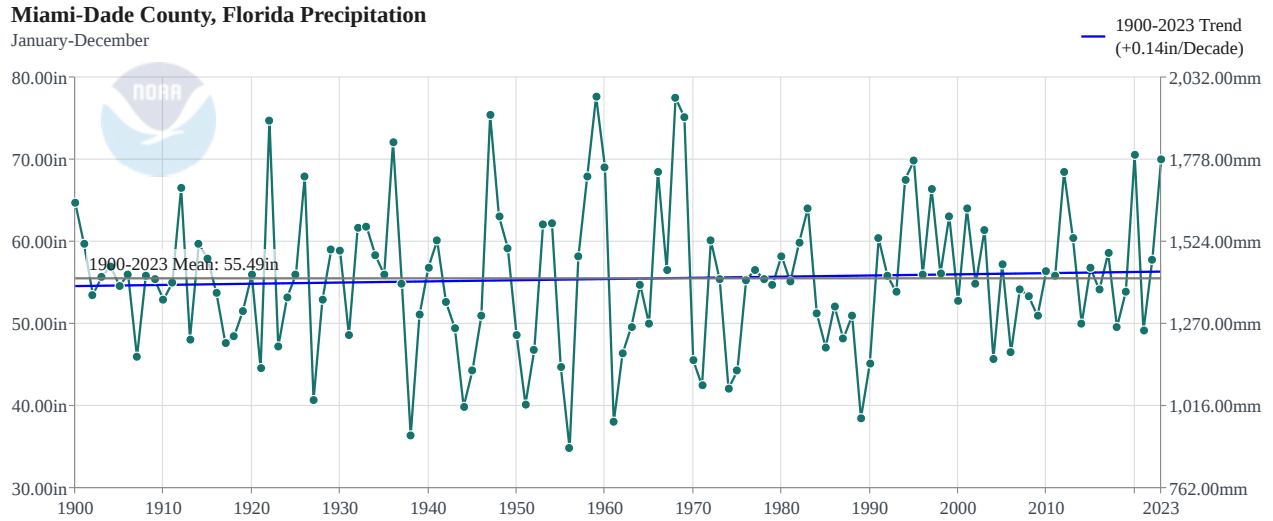
Table 3-1: NOAA Atlas 14 Precipitation Estimates, 24hr Storm Event, Palmetto Bay, FL

Event Frequency	Mean (in)	Max (in)	Min (in)
25 yr	10.20	13.30	8.22
50 yr	12.10	16.00	9.48
100 yr	14.20	19.20	10.80
500 yr	19.70	28.10	13.80

Source: NOAA NWS HDSC Precipitation Frequency Data Server (PFDS), Florida Statewide Resilience Dataset



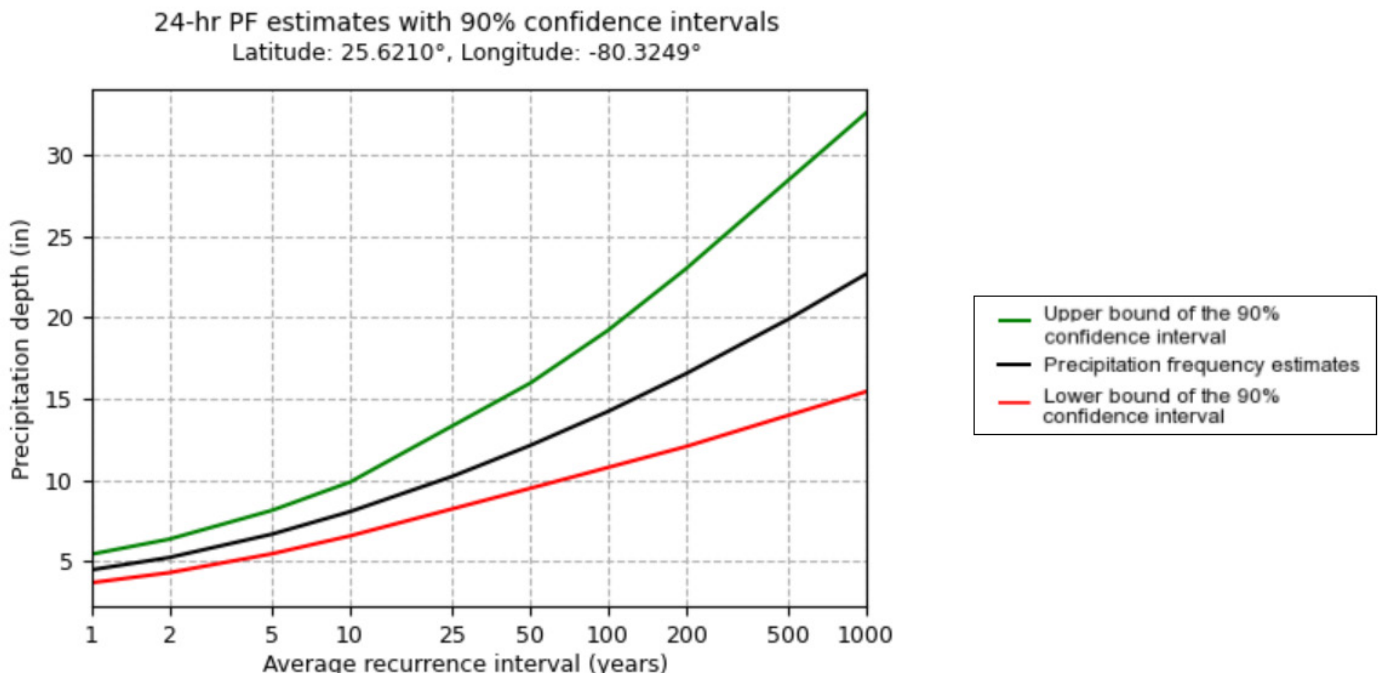
Figure 3-11: Annual Precipitation for Miami-Dade County



Source: NOAA Climate at a Glance County Time Series

A graphical representation of precipitation frequency estimates with 90% confidence intervals for the 24-hour storm is shown in Figure 3-12.

Figure 3-12: Precipitation Frequency Estimates for 24-hr Storm Event, Palmetto Bay, FL



Source: NOAA Atlas 14 Volume 9, Version 2

Greater recurrence intervals are associated with greater precipitation amounts, which generally result in greater amounts of flood damage throughout the village. Based on past rainfall and flood events recorded by NOAA's NCEI Storm Events Database, Palmetto Bay has experienced flooding and costly damage from as little as 4-6 inches of rainfall over a 3-hr period; per Atlas 14 data, 6 inches of rain in a 3-hour period is equivalent to between 10- to 25-year storm. [Table 3-2](#) below summarizes some past rainfall events and their impacts.

Table 3-2: NCEI Past Rainfall & Flood Events

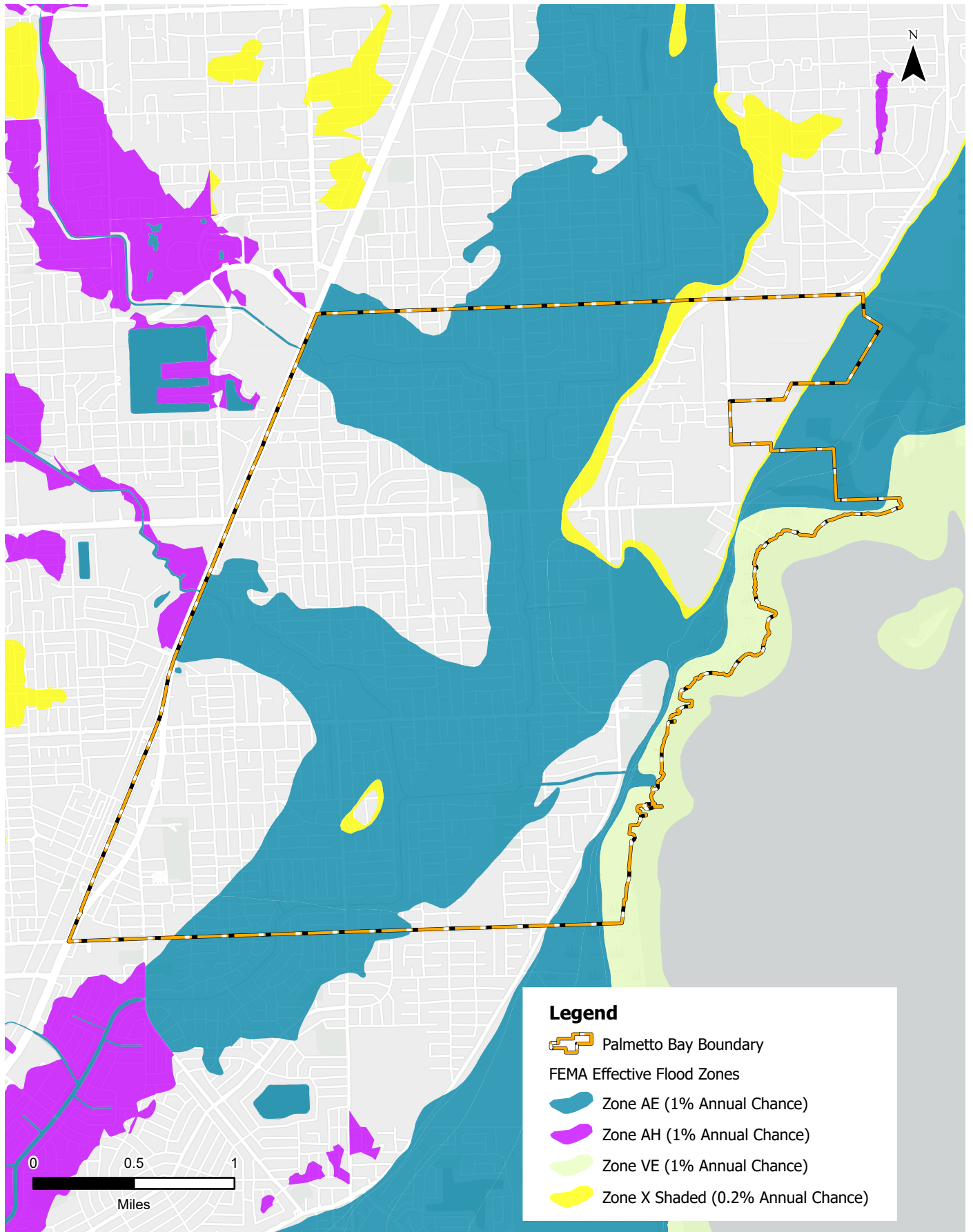
Date	Event Type	Property Damage	Event Narrative
8/1/2004	Heavy Rain	\$10,000	Three to five inches of rain fell in a three-hour period causing a house roof to collapse. Streets were flooded and county-wide power was out to 20,000 customers.
10/4/2008	Flash Flood	\$1,000	An area of heavy rain continued into Miami-Dade County with rainfall estimates from the National Weather Service radar at two to three inches per hour. There were reports of water entering cars. Several roads were closed with 2 to 3 feet of water for several hours.
11/25/2009	Heavy Rain	\$50,000	Strong mid to upper-level disturbances moved across Florida causing periods of heavy rainfall and localized flooding. Four apartments were flooded in an apartment in Palmetto Bay. Heavy early morning rain caused the roof of the building to collapse, sending water into the units. Rainfall amounts in the area were generally in the 3-to-4-inch range through the event.
10/30/2011	Flash Flood	\$100,000	Severe flooding occurred over large parts of eastern metro Miami-Dade County. The area of heavy rain began over southern sections of the flood area, including Cutler Bay, Palmetto Bay and Key Biscayne. Numerous roads were under deep water and reports of dozens of homes with water intrusion were received across this entire area. Rainfall amounts were in the 6-to-10-inch range virtually all of it falling in less than 12 hours.
5/18/2016	Flood	\$5,000	Strong showers and thunderstorms developed along an associated weak boundary, leading to gusty winds, small hail, and flooding across Miami-Dade and Palm Beach counties. Several nearby rain gauges in reported 24 hour rainfall totals between 5 and 8 inches rainfall.
8/2/2017	Flash Flood	\$1,000,000	Several rounds of strong storms and heavy rain fell across Miami-Dade County during the afternoon and early evening hours of August 1st. Rainfall totals of 4-6 inches were widespread in these areas, with isolated amounts of 7-8 inches. Virtually all of this rain fell in a three-hour period. Numerous reports of flood waters entering businesses, homes, apartment lobbies and parking garages.
10/8/2018	Coastal Flooding	--	The high October astronomical tides, King tides, in combination with the strong winds and minor surge from Hurricane Michael in the Gulf of Mexico brought a couple days of minor saltwater flooding along both the Atlantic and Gulf coasts of South Florida.
8/30/2019	Coastal Flooding	--	Established easterly flow, combined with plentiful low-level moisture, allowed for scattered showers and a few thunderstorms to develop over the Atlantic waters during the morning. These showers/storms moved onshore along the east coast metro during the morning hours. Heavy rainfall rates lead to flooding of streets across areas of Miami-Dade Counties, especially with antecedent soil conditions from prior days rainfall. High tides also contributed to minor coastal flooding across the area.
11/15/2023	Flash Flood	--	A strengthening low-pressure system moving across the Florida Keys brought widespread heavy rainfall to much of South Florida. Strong winds led to coastal flooding along portions of the SE Florida coast. There were numerous reports of standing water, stranded vehicles, and road closures. Several roads had 6-12 inches of standing water and stranded vehicles. Up to 8 inches of rain was estimated to have fallen in the area within a 3-hour period, with 12-hour rainfall amounts of 10-12 inches.

Source: NOAA NCEI Storm Events Database

*Not all reports record property damage. Property damage still may have occurred.

Palmetto Bay is a coastal community with several canals that run throughout the center of the village. The portions of the village within the floodplains are at the greatest risk for future flood impacts. [Figure 3-13](#) displays the 1%-annual-chance (100-year) and 0.2%-annual-chance (500-year) floodplains in Palmetto Bay, as determined by the current effective (9/11/2009) Flood Insurance Rate Maps (FIRMs) provided by FEMA.

Figure 3-13: FEMA Flood Hazard Area



Per the Fourth National Climate Assessment, the frequency and intensity of heavy precipitation events is expected to increase across the country. Specifically, it is “very likely” (90-100% probability) that most areas of the United States will exhibit an increase of at least 5% in the maximum 5-day precipitation by late 21st century. Additionally, increases in precipitation totals are expected in the Southeast. The mean change in the annual number of days with rainfall over 1 inch for the Southeastern U.S. is 0.5 to 1.5 days. With more rainfall falling in more intense incidents, the region may experience more frequent flash flooding. However, it should be noted that at a more localized level, regional rainfall trends have not been observed in South Florida, and projections of future precipitation changes are less clear. Still, increased flooding may also result from more intense tropical cyclone; researchers have noted the occurrence of more intense storms bringing greater rainfall totals, a trend that is expected to continue as ocean and air temperatures rise.

SFWMD created a tool to estimate future extreme rainfall changes based on future climate scenarios. SFWMD’s Rainfall Change Factors GIS Dashboard produces rainfall change factors that are applied to NOAA’s Atlas 14 precipitation frequency estimates. Change factors represent the calculated ratio of modeled future rainfall depths to historic rainfall depths. A change factor value is produced for events of a given duration and return period and are applied to multiply the equivalent NOAA Atlas 14 precipitation frequency estimates to determine increasing or decreasing future rainfall. Change factors greater than 1.0 represent future rainfall increase. For example, a change factor equal to 1.3 represents a rainfall increase of 30%.

The SFWMD change factors were computed from 40-year periods representing future projected climate for two periods 2020 – 2059 and 2050-2089 (centered in 2040 and 2070) and historical conditions for 1966-2005. The projections are based on the medium-low (RCP 4.5) and high (RCP 8.5) emissions scenarios; however, due to observed overlap in the results, SFWMD adopted combined change factors.

SFWMD’s Rainfall Change Factors GIS Dashboard was used to generate change factors and produce future extreme rainfall estimates for Palmetto Bay. Change factors for a 24-hour rain event and return periods of 5, 10, 25, 50, 100, and 200 years in Miami-Dade County are listed in [Table 3-3](#) below.

Table 3-3: Future Extreme Rainfall Change Factors: Miami-Dade County 24-hr event

Return Period	Change Factor (2020 – 2059)	Change Factor (2050 – 2089)
5-yr	1.09	1.09
10-yr	1.12	1.12
25-yr	1.14	1.16
50-yr	1.17	1.18
100-yr	1.19	1.21
200-yr	--	1.23

Source: SFWMD, USGS Caribbean-Florida Water Science Center, NOAA

*50th percentile: SFWMD modeling found a noticeable wide spread of derived change factors. As a result, SFWMD has adopted the 50% confidence as the accepted change factor value for each rainfall scenario and delineates a 25th percentile lower range and a 75th percentile upper range. The adoption of future extreme rainfall change factors outside of the 50% confidence interval might result in under and/or over estimation of future extreme rainfall depths as part of flood vulnerability planning processes.

[Table 3-4](#) and [Table 3-5](#) display future extreme rainfall estimates for Palmetto Bay calculated using the Atlas 14 rainfall projections (shown in [Table 3-1](#)) and SFWMD changes factors for Miami-Dade (shown in [Table 3-3](#)). Based on the climate scenarios discussed above, these values approximate rainfall for the 2040 and 2070 planning horizons by projecting future rainfall depth that could occur during a 24-hr event between 2020 – 2059 and 2050-2089. The change factor for the 2040 100-year event projects a 19% increase in rainfall such that a 24-hr 100-yr rainfall event between 2020-2059 would produce an estimated 16.90 inches of rain. The change factor for the 2070 100-year event projects a 21% increase in rainfall such that a 24-hr 100-yr rainfall event between 2020-2059 would produce an estimated 17.18 inches of rain.

Table 3-4: Future Extreme Rainfall Projections: 2040 Palmetto Bay, 24-hr event

Return Period	Mean (in)	Max (in)	Min (in)
25-yr	11.63	15.16	9.37
50-yr	14.16	18.72	11.09
100-yr	16.90	22.85	12.85

Source: SFWMD, USGS Caribbean-Florida Water Science Center, NOAA

Table 3-5: Future Extreme Rainfall Projections: 2070 Palmetto Bay, 24-hr event

Return Period	Mean (in)	Max (in)	Min (in)
25-yr	11.83	15.43	9.54
50-yr	14.28	18.88	11.19
100-yr	17.18	23.23	13.07

Source: SFWMD, USGS Caribbean-Florida Water Science Center, NOAA



3.4 STORM SURGE FLOODING

Storm surge is water that is pushed toward the shore by the force of the winds swirling around the storm as shown in [Figure 3-14](#). This advancing surge combines with the normal tides to create the hurricane storm tide, which can increase the mean water level to heights impacting roads, homes and other critical infrastructure. In addition, wind driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides. Because much of the densely populated Atlantic coastline lies less than 10 feet above mean sea level, the danger from storm tides is tremendous. Given Palmetto Bay's coastal location and low elevation, it is very vulnerable to storm surge flooding.

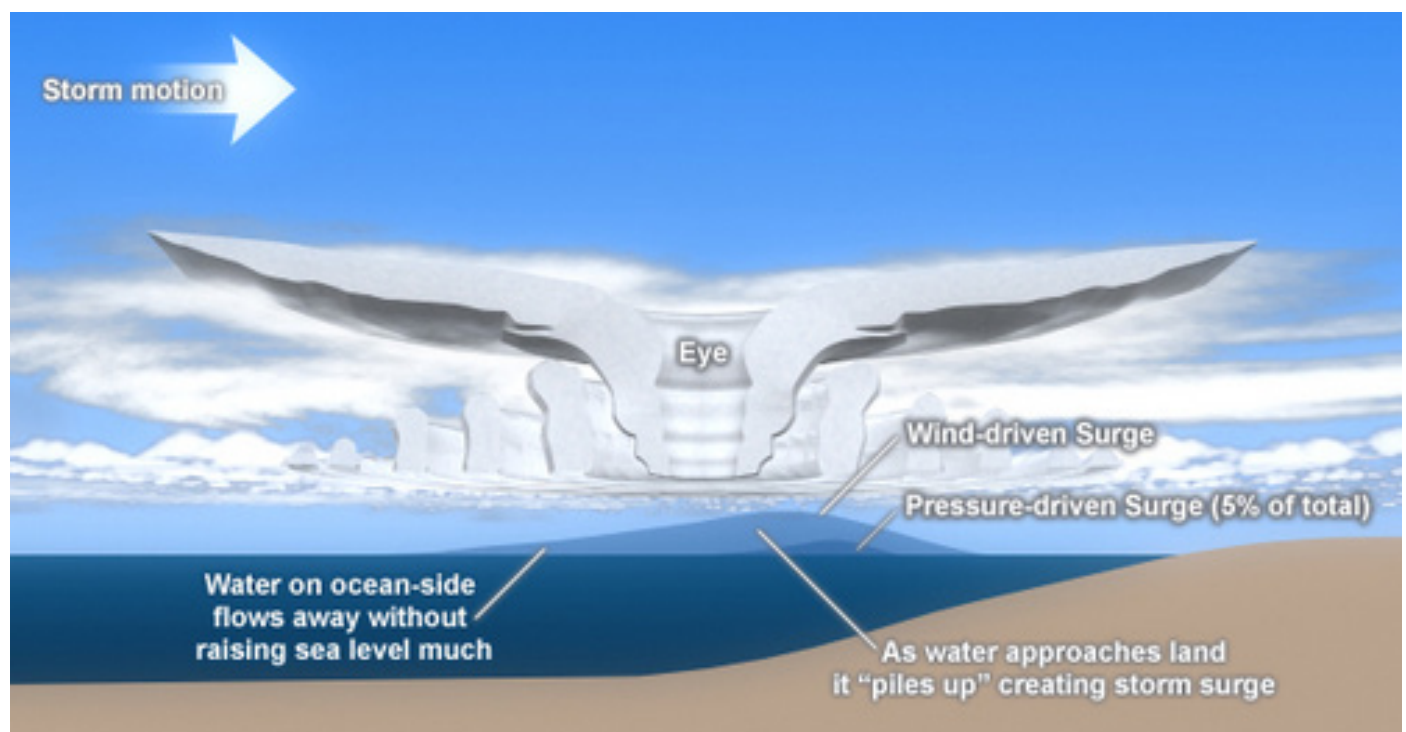
Sea level change will be particularly important in influencing storm surge flooding in the Palmetto Bay area, since the area is already subject to flooding from above normal tides, surge and rainfall events from hurricanes and less powerful tropical storms.

The maximum potential storm surge for a particular location depends on a number of different factors.

Storm surge is a very complex phenomenon because it is sensitive to the slightest changes in storm intensity, forward speed, size (radius of maximum winds-RMW), angle of approach to the coast, central pressure (minimal contribution in comparison to the wind), and the shape and characteristics of coastal features such as bays and estuaries. Other factors which can impact storm surge are the width and slope of the continental shelf. A shallow slope will potentially produce a greater storm surge than a steep shelf. For example, a Category 4 storm hitting the Louisiana coastline, which has a very wide and shallow continental shelf, may produce a 20-foot storm surge, while the same hurricane in Miami Beach, Florida, where the continental shelf drops off very quickly, might see an 8 or 9-foot surge.

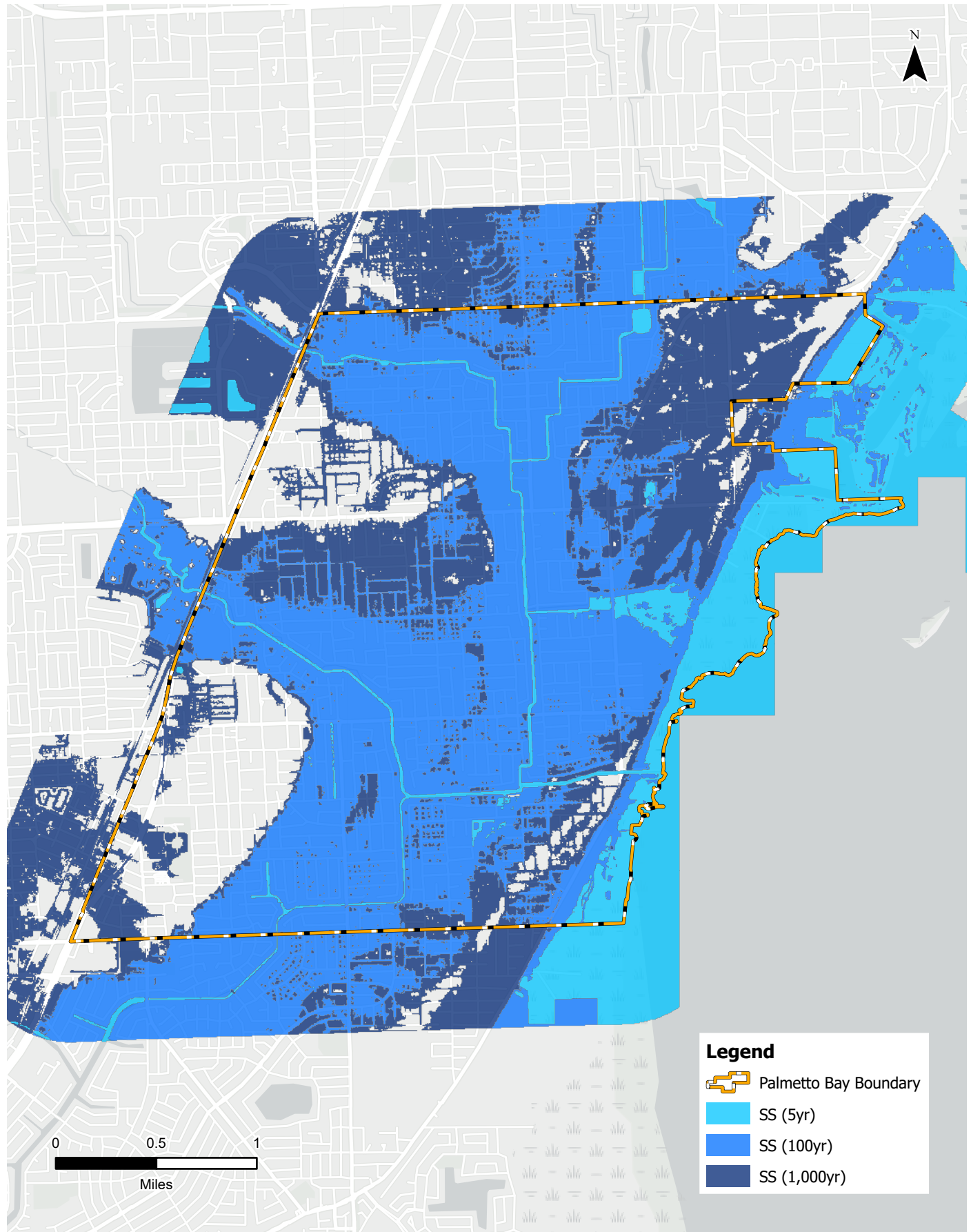
The canal system in Palmetto Bay affects how storm surge impacts the village. The village is controlled by the C-100 Canal system, which has a critical connection to the C-1 Canal system through the C-100B Canal to join the C-1N canal at the S-122 structure on Franjo Road in Cutler Bay. This interconnection and the low elevation at the C-1 Canal mean that storm surge can back-feed into the C-100B and impact the rest of Palmetto Bay. Storm surge extent for Palmetto Bay is displayed in [Figure 3-15](#).

Figure 3-14: Components of Hurricane Storm Surge



Source: NOAA/The COMET Program

Figure 3-15: Storm Surge



3.5 COMPOUND FLOODING

As defined by Florida Administrative Code 62S-8, “compound flooding” is flooding caused by complex interactions between two or more oceanographic, hydrological, or meteorological processes such as the combination of pluvial (rainfall-induced flooding, such as flash, surface water, drain, and sewer floods), fluvial (riverine floods), coastal (sea level rise, tides, waves, storm surge, and nuisance floods), or groundwater flooding. Compound flooding in Palmetto Bay is primarily caused by a mix of pluvial, fluvial, and coastal flooding.

Observations during numerous flood events in the region have demonstrated that the extents and depths of flooding due to compound flooding can be more severe than flooding due to a single flood mechanism. Consequently, it is important to understand the relationship between the various flooding mechanisms in Palmetto Bay and their impact on the natural and built environment. This is vital for resilience planning as the village assesses strategies for coping with and mitigating flood. The flood scenarios examined in the vulnerability assessment include several examples of compound flooding. These can be reviewed in [Section 4: Flood Vulnerability Assessment](#).

Stormwater Flooding

While not a natural hazard, stormwater flooding occurs with the accumulation of water and can contribute to and exacerbate flooding in the village. Localized stormwater flooding occurs when heavy rainfall and an accumulation of runoff overburden the stormwater drainage system. Although the flooding may drain quickly, it can still amount to significant damages. While it may not impact as large an area or produce the damaging wave energy of coastal flooding, it is, nonetheless, a chronic problem.

Localized stormwater flooding in Palmetto Bay can be attributed to its generally flat topography, abundance of water features, and the large amount of developed and impervious land, which limits ground absorption and increases surface water runoff.

Localized flooding may be caused by the following issues:

- **Inadequate Capacity:** An undersized/under capacity pipe system can cause water to back-up behind a structure which can lead to areas of ponded water and/or overtopping of banks.
- **Clogged Inlets:** Debris covering the asphalt apron and the top of grate at catch basin inlets may contribute to an inadequate flow of stormwater into the system. Debris within the basin itself may also reduce the efficiency of the system by reducing the carrying capacity.
- **Blocked Drainage Outfalls:** Debris blockage or structural damage at drainage outfalls may prevent the system from discharging runoff, which may lead to a back-up of stormwater within the system.
- **Improper Grade:** Poorly graded asphalt around catch basin inlets may prevent stormwater from entering the catch basin as designed. Areas of settled asphalt may create low spots within the roadway that allow for areas of ponded water.

It should be noted that drainage is largely controlled by the canal system throughout the watershed, and stormwater flooding can be affected by this system and by the interplay of multiple simultaneous flood sources. For example, the C-100 basin receives runoff from a large, developed area east of SW 157 Avenue and drains to the C-100 Canal which runs through Palmetto Bay to the Biscayne Bay. If the S-123 salinity control structure at the end of the C-100 Canal in Palmetto Bay is closed due to storm surge, then runoff from rainfall could back up and cause flooding in Palmetto Bay.

Climate change and sea level rise have the potential to affect stormwater flooding. According to the Fourth National Climate Assessment, the frequency and intensity of rainfall events is expected to increase across the U.S., and total precipitation amounts are expected to increase in the Southeast. These trends have not been clearly observed in South Florida; however, if they extend to the planning area, these changes may cause increases in localized flooding, as stormwater drainage systems designed for smaller flood volumes may become overwhelmed more frequently.

3.6 EXTREME HEAT

As defined by FEMA, in most of the United States extreme heat is classified by a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees.

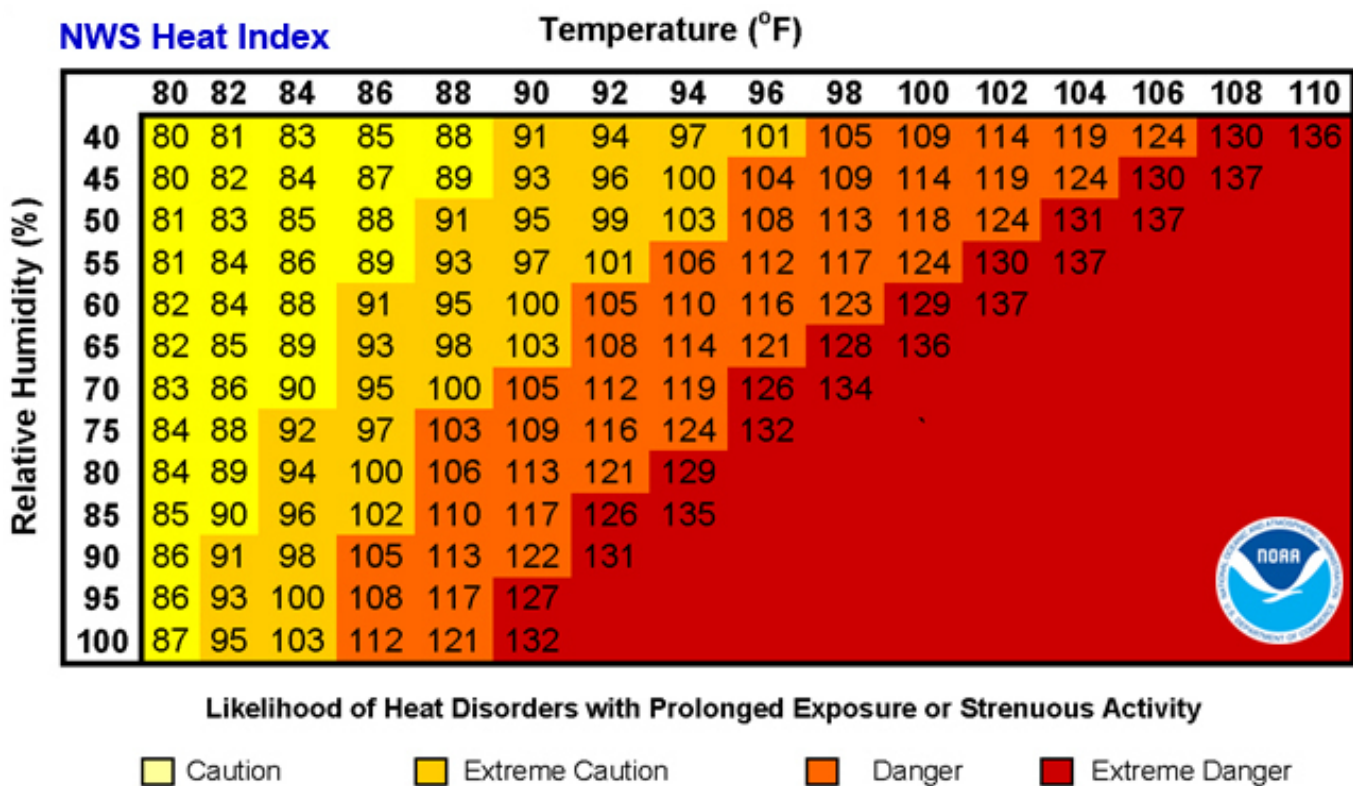
According to the National Oceanic and Atmospheric Administration (NOAA), heat is one of the leading weather-related killers in the United States.

It's also the deadliest weather-related killer in the United States. Under extreme heat conditions, the human body has difficulties cooling through the normal method of the evaporation of perspiration and must work harder to maintain a normal temperature. Health risks rise when a person is overexposed to heat. The most dangerous place to be during an extreme heat incident is in a permanent home, with little or no air conditioning.

Ambient air temperature and relative humidity determine the relative intensity of heat conditions. The relationship of these factors creates what is known as the apparent temperature. The Heat Index Chart, shown in [Figure 3-16](#), uses temperature and humidity to produce a guide for the apparent temperature, to better inform the public of heat dangers.

Heat and excessive heat event types are distinguished by locally or regionally designated thresholds for heat advisory and excessive heat warning. According to the National Weather Service documentation criteria, heat events are reported whenever heat index values meet or exceed heat advisory thresholds, and excessive heat events are reported whenever heat index values meet or exceed excessive heat warning thresholds. While heat conditions may last several days, a warning can be issued even for one day of expected heat conditions.

Figure 3-16: Heat Index Chart



Per the National Weather Service (NWS), certain populations are more vulnerable to heat, including young children and infants, older adults, people with chronic medical conditions, and pregnant women. People who are socially isolated are also at heightened risk, as are individuals who work outside under direct sun exposure. Even young and healthy individuals are susceptible to heat-related disorders if they participate in strenuous physical activities during hot weather or are not acclimated to hot weather.

Sun exposure, wind conditions, age, and physical condition influence susceptibility to heat disorder. In cities, the urban heat island effect can increase temperatures from 1.8 to 5.4°F higher than the less developed areas around them. Hotter than average days in the summer increase illness and death by compromising the body's ability to regulate its temperature. This loss of temperature control can result in a cascade of illnesses, including heat cramps, heat exhaustion, heatstroke, and hyperthermia. Temperature extremes can also worsen chronic conditions, including cardiovascular, respiratory, and cerebrovascular disease and diabetes-related conditions.

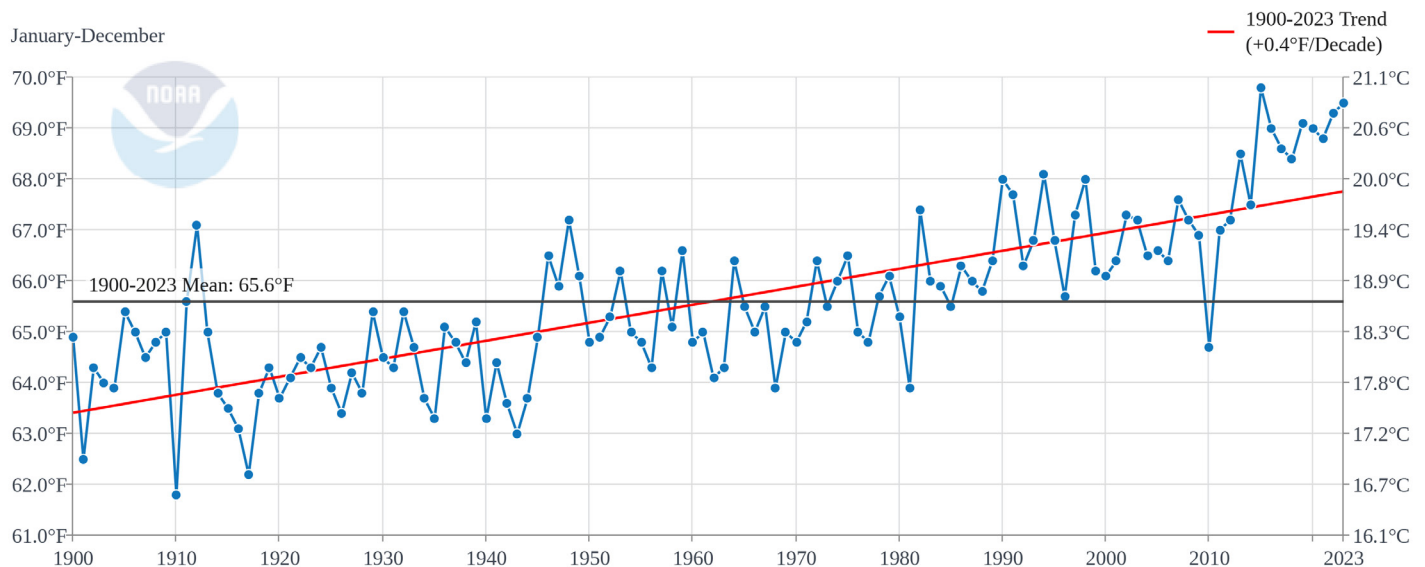
Impacts of extreme heat are not only focused on human health; prolonged heat exposure can have negative impacts on infrastructure as well.

Prolonged high heat exposure increases the risk of pavement deterioration, as well as railroad warping or buckling. High heat also puts a strain on energy systems and consumption, as air conditioners are run at a higher rate and for longer; extreme heat can also reduce transmission capacity over electric systems.

South Florida is no stranger to high levels of temperature and humidity and the region experiences periods where it is hot all the time. In the summer of 2021, the National Weather Service stated that Miami observed 60 days of temperatures at or above 90°F.

Records of minimum annual temperature show an increasing annual trend. In Miami-Dade County, average minimum annual temperature has increased at a rate of 0.4 degrees Fahrenheit per decade, as shown in [Figure 3-17](#).

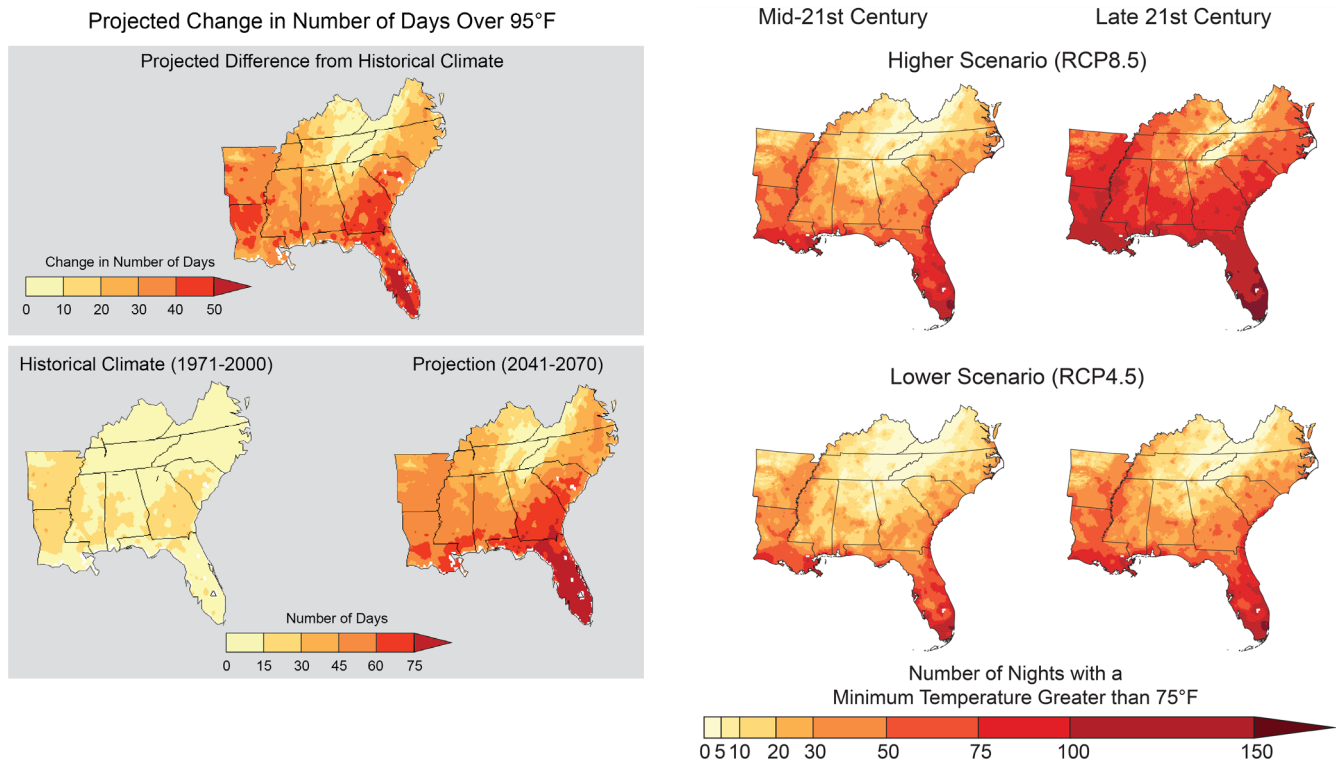
Figure 3-17: Miami-Dade County Minimum Annual Temperature, 1900-2023



Source: NOAA Climate at a Glance

Based on greenhouse gas emission scenarios there are different future warming scenarios for South Florida. Shown in [Figure 3-18](#), higher greenhouse gas emissions will increase the number of warm days and warm nights. The figure shows a comparison of the historic number of hot days in South Florida to the number of hot days projected for mid-century. As shown below, Miami-Dade is projected to have about 40 more days of temperatures over 95°F by mid-century. There will also likely be an increase in the number of nights with a minimum temperature greater than 75°F. Under a higher emission scenario there will be about 50 more hot nights mid-century and late century compared to the lower emission scenario. Hot nights are problematic because they reduce a person's ability to cool down from a hot day. Not having relief from the heat may increase heat related illnesses and death.

Figure 3-18: Emission Scenarios & Number of Warm Day and Nights



Source: National Climate Assessment, U.S. Global Change Research Program



4.1 OVERVIEW

There are three primary components that make up the overall vulnerability assessment: exposure, sensitivity, and risk. Exposure is the depth of water caused by flooding and is assessed by determining the flood depth(ft) at each asset. Sensitivity is the impact of flooding on assets and is determined based on the number of assets impacted for each asset type. Risk summarizes the severity of flood on each asset type and is based on the percentage of impacted assets by asset type.



Flood Scenarios

The State requires the assessment of current flood conditions and projected conditions for two additional time horizons: 2040 and 2070. The village will also assess a 2030 planning horizon.

Based on the identified flood hazards and the planning horizons, each asset was evaluated in the context of 32 different flood scenarios. The identified scenarios are listed in [Table 4-1](#), below. The data sources for each flood type are detailed in [Section 1.5](#).

[Figure B-1](#) – [Figure B-32](#) in [Appendix B](#) displays a series of maps with the various flood scenarios stacked across the time horizons. These maps detail the potential flood extent of each scenario and how flood extent may change over time and under various flood scenarios. Maximum flood depth for each flood scenario is shown in [Table 4-2](#).



Table 4-1: Flood Scenarios

Flood Scenario	Abbreviation
Current Conditions	
1%-annual-chance flood	1% Flood
25yr rainfall event	25yr
High tide (1.74ft above MHHW)	High Tide
Storm surge (5yr storm event)	SS/5yr
Storm surge (100yr storm event)	SS/100yr
Storm surge (1,000yr storm event)	SS/1,000yr
2030 Conditions	
Sea level rise (intermediate low)	SLR – Low
Sea level rise (intermediate high)	SLR – High
Storm surge/5yr storm event/SLR intermediate low	SS/5yr/2030 SLR – Low
Storm surge/5yr storm event/SLR intermediate high	SS/5yr/2030 SLR – High
Storm surge/100yr storm event/SLR intermediate low	SS/100yr/2030 SLR – Low
Storm surge/100yr storm event/SLR intermediate high	SS/100yr/2030 SLR – High
Storm surge/1,000yr storm event/SLR intermediate low	SS/1,000yr/2030 SLR – Low
Storm surge/1,000yr storm event/SLR intermediate high	SS/1,000yr/2030 SLR – High
2040 Conditions	
Sea level rise (intermediate low)	2040 SLR – Low
Sea level rise (intermediate high)	2040 SLR – High
25yr rainfall event/Current SLR 1foot	25yr/SLR (1ft)
Storm surge/5yr storm event/SLR intermediate low	SS/5yr/2040 SLR – Low
Storm surge/5yr storm event/SLR intermediate high	SS/5yr/2040 SLR – High
Storm surge/100yr storm event/SLR intermediate low	SS/100yr/2040 SLR – Low
Storm surge/100yr storm event/SLR intermediate high	SS/100yr/2040 SLR – High
Storm surge/1,000yr storm event/SLR intermediate low	SS/1,000yr/2040 SLR – Low
Storm surge/1,000yr storm event/SLR intermediate high	SS/1,000yr/2040 SLR – High
2070 Conditions	
Sea level rise (intermediate low)	2070 SLR – Low
Sea level rise (intermediate high)	2070 SLR – High
25yr rainfall event/Current SLR 2foot	25yr/SLR (2ft)
Storm surge/5yr storm event/SLR intermediate low	SS/5yr/2070 SLR – Low
Storm surge/5yr storm event/SLR intermediate high	SS/5yr/2070 SLR – High
Storm surge/100yr storm event/SLR intermediate low	SS/100yr/2070 SLR – Low
Storm surge/100yr storm event/SLR intermediate high	SS/100yr/2070 SLR – High
Storm surge/1,000yr storm event/SLR intermediate low	SS/1,000yr/2070 SLR – Low
Storm surge/1,000yr storm event/SLR intermediate high	SS/1,000yr/2070 SLR – High

Table 4-2: Flood Scenarios: Maximum Flood Depth (ft)

Flood Scenario	Current Conditions	2030		2040		2070	
		Sea Level Rise					
		Int-Low	Int-High	Int-Low	Int-High	Int-Low	Int-High
Tidal Flooding (MHHW*)		2.4	2.9	2.6	3.3	3.1	5.2
5yr Storm Surge	9.3	9.8	10.3	10.0	10.7	10.5	12.6
100yr Storm Surge	17.8	18.3	18.8	18.5	19.2	19.0	21.1
1,000 Storm Surge	21.4	21.9	22.4	22.1	22.8	22.6	24.7
High Tide Flooding (starting at 1.74ft amhhw**)	7.6	-	-	-	-	-	-
1%-annual-chance Flood	19.4	-	-	-	-	-	-
25yr Rainfall Event	21.6	-	-	-	-	-	-
25yr Rainfall Event & SLR 1ft	-	21.6	-	-	-	-	-
25yr Rainfall Event & SLR 2ft	-	-	-	21.6	-	-	-

*MHHW = Mean High High Water

**amhhw = above mean high high water



4.2 EXPOSURE ANALYSIS

Overview

To assess vulnerability, the village needs to understand which assets are exposed to flood hazards. In keeping with Resilient Florida Program guidance and state statute requirements, exposure is established based on the depth of water caused by flooding. Each asset was assessed for the potential inundation of water for each of the established flood scenarios.

Methodology

Flood depth inundation values are derived as the difference between ground elevation and flood surface elevation. A Digital Elevation Model (DEM) is used to establish elevation at a given point. The inundation value at the asset's point of intersection with the flood surface is attributed as the asset's approximate inundation for each scenario.

Exposure ratings, outlined in [Table 4-3](#) through [Table 4-5](#), are assigned to each asset based on the depth of water caused by the flood scenarios. All exposure results are measured in feet. The depth of water a single asset is exposed to varies based on the different flood scenarios assessed.

Point assets exposed to less than or equal to half a foot of water have a low exposure rating. Water depths less than or equal to one and a half feet of water but greater than half a foot have a medium rating, and those with a high exposure rating are exposed to greater than one and a half feet of water. These thresholds were established based on the estimated heights various assets may avoid and begin to experience moderate to high levels of water damage.

Table 4-3: Exposure Rating (Point Features)

Low	≤ ½ ft
Medium	½ ft – 1 ½ ft
High	> 1 ½ ft

Critical assets that are represented as line features such as roads, levees, and bridges are exposed to varying depths of flood along the asset. To assess linear features, points were generated along linear assets at

50ft intervals. End points were used to assess bridges. An inundation value for each point along the line was derived using the same method as the point asset data. The exposure rating for each asset generated by tallying the points with flood depths greater than six inches of inundation and dividing it by the total point count for each asset. This yields a percentage of each linear asset that is inundated above six inches. As shown in [Table 4-4](#), if 33% or less of the asset's points have flood depths greater than six inches then the asset was assigned a low exposure rating. If more than 33% but 66% or less of the points have flood depths over six inches the asset was assigned a medium rating. Assets where more than 66% of the points have flood depths greater than six inches were assigned a high exposure rating.

Table 4-4: Exposure Rating (Line Features)

Low	≤33% points with flood depth greater than 6"
Medium	33% – 66% points with flood depth greater than 6"
High	> 66% points with flood depth greater than 6"

Critical assets that are represented as polygon features such as conservation areas, parks, historic districts, stormwater ponds, surface water, and wetlands are exposed to varying depths of flood across the asset area. Inundation values for polygon features were determined using mathematical models that derive Max and Mean inundation values for each polyline or Polygon. Like point and linear features, inundation values are derived by determining the difference between ground elevation and flood surface elevation. To estimate overall exposure, these assets were evaluated by determining the extent of the area exposed to a given flood hazard.

Polygon features with 33% or less of the area exposed has low exposure, areas with 33% - 66% of the area exposed has medium exposure, and areas with greater than 66% of the area exposed has high exposure.

Table 4-5: Exposure Rating (Polygon Features)

Low	≤33% area exposed to flood scenario
Medium	33% – 66% area exposed to flood scenario
High	> 66% area exposed to flood scenario

Results

Exposure maps for each flood hazard are in [Appendix B](#). [Figure B-1](#) through [Figure B-32](#) displays the flood hazard extent, asset location, and the exposure rating (by color). Tables with the exposure results for each asset are provided in Annex A which can be requested from the village.

To provide a summary of over all exposure, aggregate exposure maps were developed to visualize where highly exposed assets are located. This analysis helps evaluate exposure across multiple hazards for each planning horizon. Using the rating criteria in [Table 4-3](#) through [Table 4-5](#), the assets were assigned points based on the exposure rating:

- 0 points if the asset is not exposed
- 1 point for low exposure rating
- 2 points for medium exposure rating
- 3 points for high exposure rating
- The points were totaled to determine aggregate exposure. The rating criteria is displayed in [Table 4-6](#), below. [Figure 4-1](#) through [Figure 4-4](#) displays a map for each planning horizon, and the assets categorized by their aggregate exposure rating. Assets with high aggregate exposure experience high exposure (flood depth over 6") across multiple hazards for a given planning horizon.

Table 4-6: Aggregate Exposure Rating

None	0 points
Low	9 points or less
Medium	9 – 15 points
High	15 or more points

Note: The maximum number of points an asset can receive is 27. Maximum aggregate exposure points are based on the number of hazards within each planning horizon: current planning horizon has 18-points max, 24 points for 2030, and 27 points for the 2040 and 2070 planning horizons.

Figure 4-1: Aggregate Exposure: Current Planning Horizon

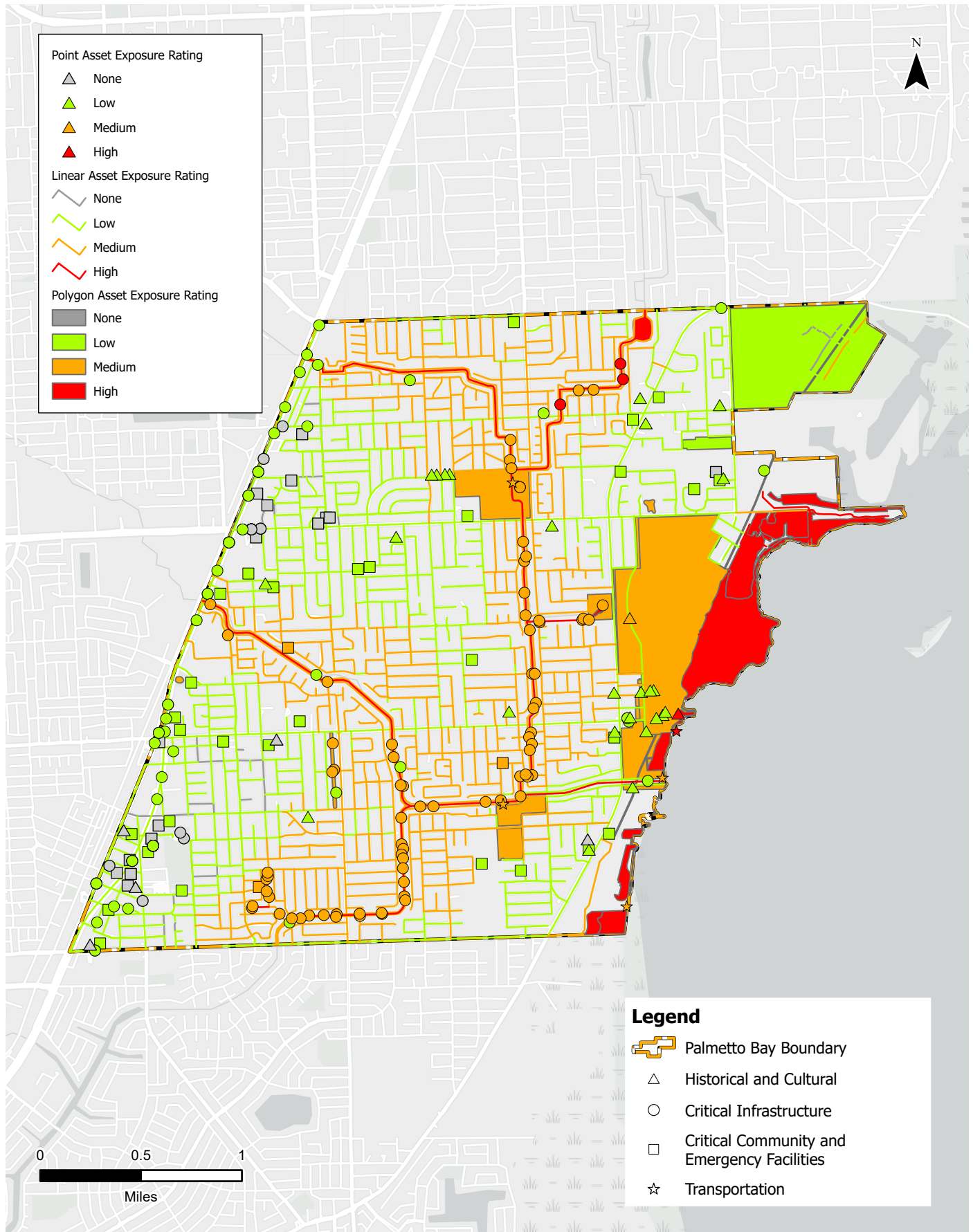


Figure 4-2: Aggregate Exposure: 2030 Planning Horizon

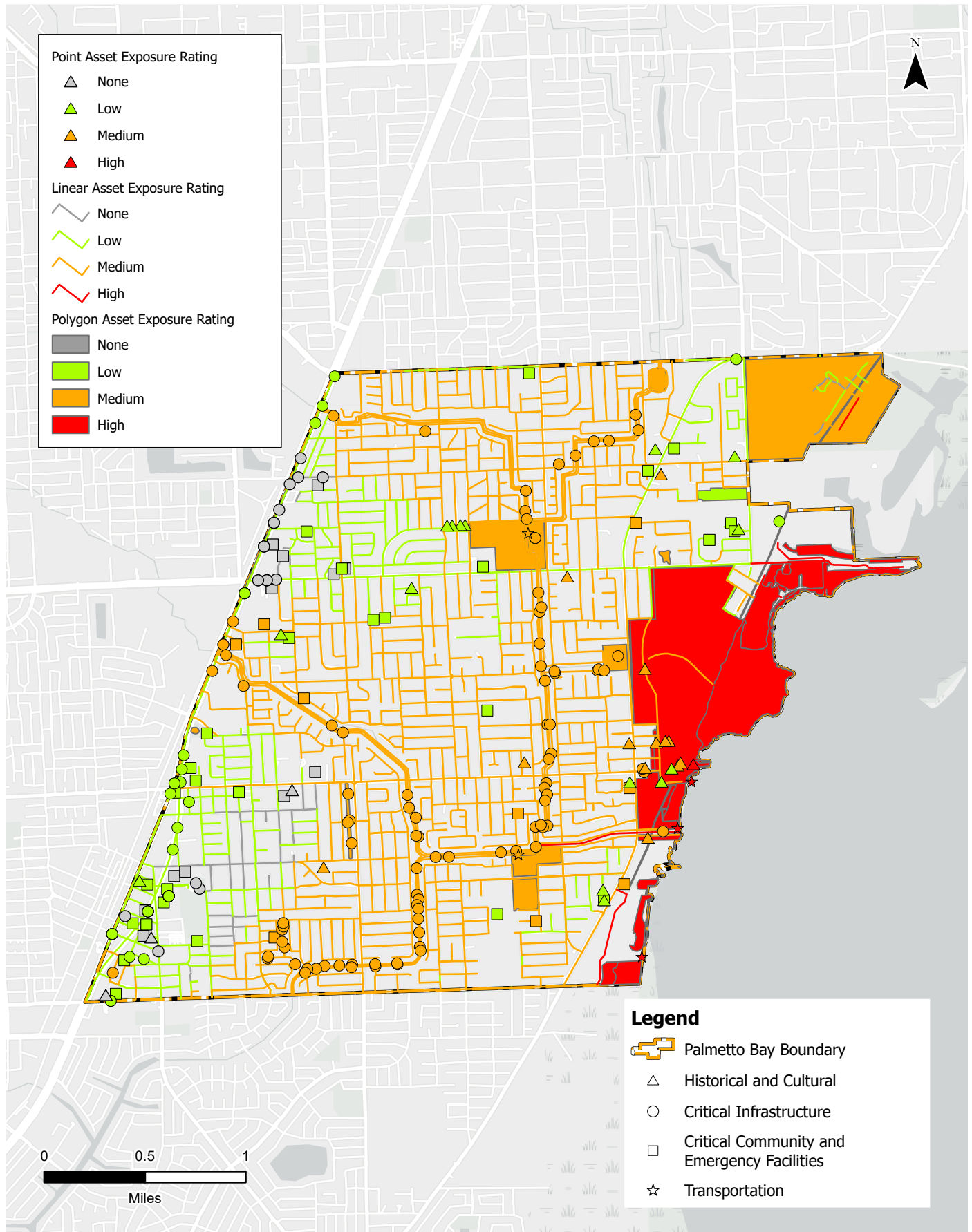


Figure 4-3: Aggregate Exposure: 2040 Planning Horizon

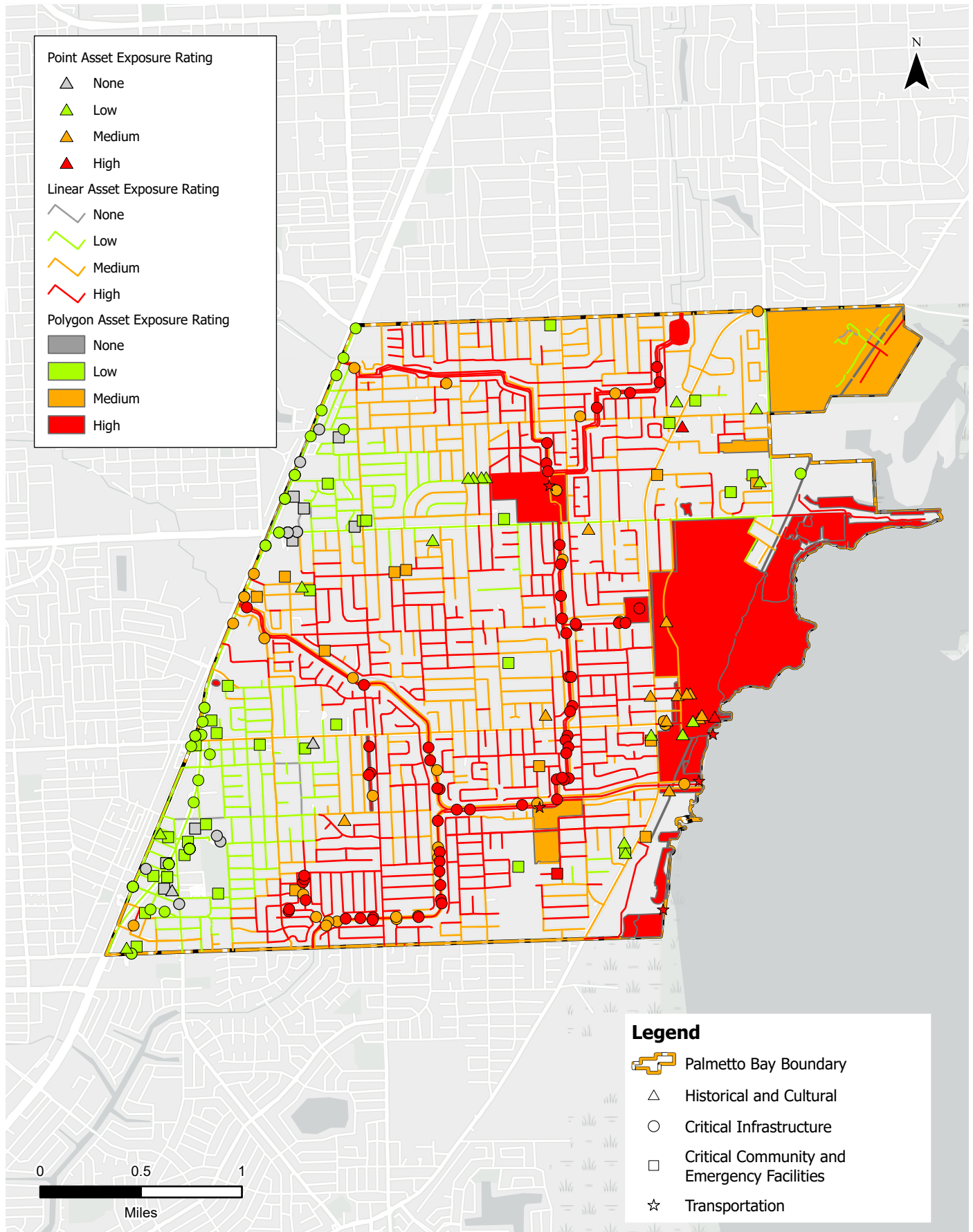
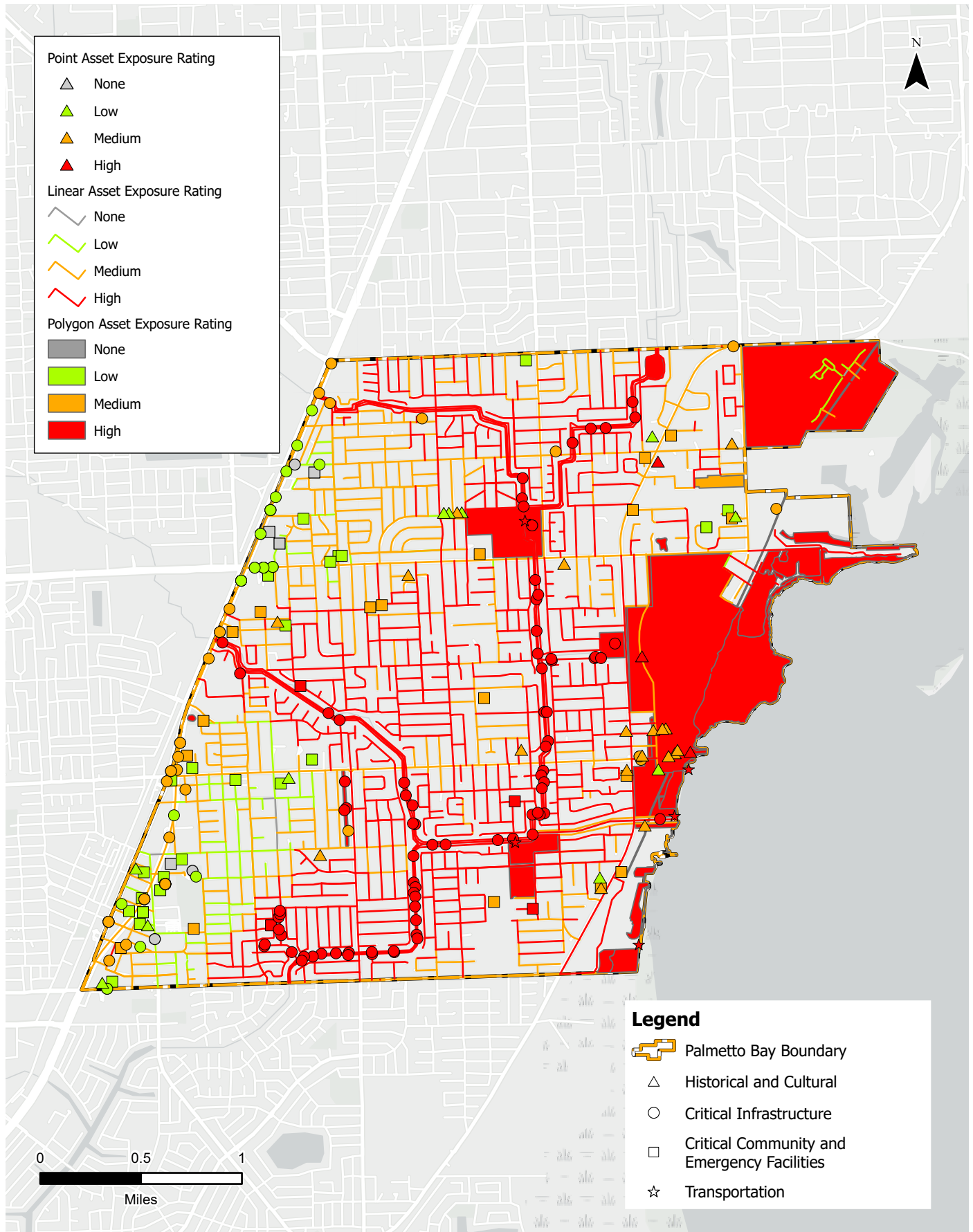


Figure 4-4: Aggregate Exposure: 2070 Planning Horizon



4.3 SENSITIVITY ANALYSIS

Overview

The purpose of the sensitivity analysis is to measure the cumulative effect of flooding on assets by applying the data from the exposure analysis to the inventory of critical assets. The analysis evaluates the severity of flood impacts on each asset type for each flood scenario. This assessment identifies if similar assets are exposed to the same flood scenarios.

Methodology

In accordance with the Resilient Florida Program guidance and state statute requirements, the sensitivity analysis is derived using the results from the exposure analysis. Sensitivity is presented by asset type and is the sum of individual assets exposed to a given flood scenario. The total number of assets exposed varies across flood scenarios and planning horizons. Sensitivity results are summarized in [Table 4-7](#) through [Table 4-10](#), below.



Results

Table 4-7: Sensitivity Analysis – Current Conditions

Asset Type	Total Asset Count	Current Conditions					
		1% Flood	25yr Precipitation	High Tide	SS/5yr	SS/100yr	SS/1,000yr
Critical Community and Emergency Facilities							
Affordable Housing	1	1	1	0	0	1	1
Schools	21	3	7	0	0	1	14
Law Enforcement Facilities	2	0	0	0	0	0	0
Healthcare Facilities	22	3	10	0	0	6	11
Fire Stations	2	0	0	0	0	0	1
Community Centers	1	1	0	0	0	1	1
Churches	10	3	2	0	0	3	6
Local Government Facilities	1	0	0	0	0	0	0
Critical Infrastructure							
Communications Facilities FDEM	1	0	1	0	0	1	1
Post offices	1	0	0	0	0	0	0
Substation	1	0	1	0	0	0	1
Wastewater Treatment/Lift Stations	1	1	0	0	0	1	1
Solid and Hazardous Waste Facilities – FDEP	6	2	2	0	0	4	4
Solid and Hazardous Waste Facilities – SQG	136	8	119	0	0	5	105
SFWMD Infrastructure (culverts w/ risers)	3	3	2	2	0	3	3
Outfalls	77	77	72	46	0	77	77
Stormwater Ponds	6	6	6	6	2	5	6
Levees	35	35	34	21	3	35	35

Asset Type	Total Asset Count	Current Conditions					
		1% Flood	25yr Precipitation	High Tide	SS/5yr	SS/100yr	SS/1,000yr
Natural, Cultural, and Historic							
Historic and Cultural Structures	22	9	9	1	1	10	20
Historic Resources	4	2	4	2	2	3	3
National Parks	1	1	1	1	1	1	1
Conservation Areas	12	11	12	10	7	11	12
Wetlands	7	7	7	7	7	7	7
Surface Water Flowlines	19	19	19	19	5	19	19
Surface Waters	2	1	2	2	1	2	2
Transportation and Evacuation Routes							
Airports	1	1	1	0	1	1	1
Marinas and Boat Ramps	4	4	4	3	2	4	4
Bridges	12	10	12	10		10	12
Major Roadways (NTD)	1,232	767	1,197	3	9	896	1,130
Major Roadways (FDOT)	20	14	20	9	1	16	20



Table 4-8: Sensitivity Analysis – 2030 Conditions

Asset Type	Total Asset Count	2030 Conditions							
		2030 SLR - Low	2030 SLR - High	SS/5yr/2030 SLR - Low	SS/5yr/2030 SLR - High	SS/100yr/2030 SLR - Low	SS/100yr/2030 SLR - High	SS/1,000yr/2030 SLR - Low	SS/1,000yr/2030 SLR - High
Critical Community and Emergency Facilities									
Affordable Housing	1	0	0	0	0	1	1	1	1
Schools	21	0	0	0	0	2	5	14	17
Law Enforcement Facilities	2	0	0	0	0	0	0	1	2
Healthcare Facilities	22	0	0	0	0	7	8	14	15
Fire Stations	2	0	0	0	0	0	1	1	1
Community Centers	1	0	0	0	0	1	1	1	1
Churches	10	0	0	0	0	4	4	7	8
Local Government Facilities	1	0	0	0	0	0	0	0	1
Critical Infrastructure									
Communications Facilities FDEM	1	0	0	0	0	1	1	1	1
Post offices	1	0	0	0	0	0	0	0	0
Substation	1	0	0	0	0	0	0	1	1
Wastewater Treatment/Lift Stations	1	0	0	0	0	1	1	1	1
Solid and Hazardous Waste Facilities – FDEP	6	0	0	0	0	4	4	4	4
Solid and Hazardous Waste Facilities – SQG	136	0	0	0	0	6	7	112	114
SFWMD Infrastructure (culverts w/ risers)	3	0	0	0	0	3	3	3	3
Outfalls	77	0	0	0	0	77	77	77	77
Stormwater Ponds	6	1	1	2	2	6	6	6	6
Levees	35	1	1	3	3	35	35	35	35
Natural, Cultural, and Historic									
Historic and Cultural Structures	22	1	1	1	1	11	14	21	21
Historic Resources	4	2	2	2	2	3	3	4	4
National Parks	1	1	1	1	1	1	1	1	1
Conservation Areas	12	6	6	8	8	12	12	12	12
Wetlands	7	6	6	7	7	7	7	7	7
Surface Water Flowlines	19	4	5	5	5	19	19	19	19
Surface Waters	2	1	1	1	1	2	2	2	2
Transportation and Evacuation Routes									
Airports	1	0	0	1	1	1	1	1	1
Marinas and Boat ramps	4	0	0	2	2	4	4	4	4
Bridges	12	0	0	0	0	10	10	12	12
Major Roadways (NTD)	1,232	1	1	14	16	958	994	1,158	1,196
Major Roadways (FDOT)	20	0	0	1	1	17	17	20	20

Table 4-9: Sensitivity Analysis – 2040 Conditions

Asset Type	Total Asset Count	2040 Conditions								
		2040 SLR - Low	2040 SLR – High	25yr/ SLR (1ft)	SS/5yr/2040 SLR – Low	SS/5yr/2040 SLR – High	SS/100yr/2040 SLR – Low	SS/100yr/2040 SLR – High	SS/1,000yr/2040 SLR – Low	SS/1,000yr/2040 SLR – High
Critical Community and Emergency Facilities										
Affordable Housing	1	0	0	1	0	0	1	1	1	1
Schools	21	0	0	7	0	0	3	10	15	17
Law Enforcement Facilities	2	0	0	0	0	0	0	0	1	2
Healthcare Facilities	22	0	0	10	0	0	8	9	15	16
Fire Stations	2	0	0	0	0	0	0	1	1	1
Community Centers	1	0	0	0	0	0	1	1	1	1
Churches	10	0	0	2	0	0	4	4	7	8
Local Government Facilities	1	0	0	0	0	0	0	0	0	1
Critical Infrastructure										
Communications Facilities FDEM	1	0	0	1	0	0	1	1	1	1
Post offices	1	0	0	0	0	0	0	0	0	0
Substation	1	0	0	1	0	0	0	0	1	1
Wastewater Treatment/Lift Stations	1	0	0	0	0	0	1	1	1	1
Solid and Hazardous Waste Facilities – FDEP	6	0	0	2	0	0	4	4	4	4
Solid and Hazardous Waste Facilities – SQG	136	0	0	119	0	0	6	10	114	115
SFWMD Infrastructure (culverts w/ risers)	3	0	0	2	0	0	3	3	3	3
Outfalls	77	0	0	74	0	0	77	77	77	77
Stormwater Ponds	6	1	1	6	2	2	6	6	6	6
Levees	35	1	1	34	3	3	35	35	35	35
Natural, Cultural, and Historic										
Historic and Cultural Structures	22	1	1	9	1	1	12	17	21	22
Historic Resources	4	2	2	4	2	2	3	3	4	4
National Parks	1	1	1	1	1	1	1	1	1	1
Conservation Areas	12	6	7	12	8	8	12	12	12	12
Wetlands	7	6	7	7	7	7	7	7	7	7
Surface Water Flowlines	19	4	5	19	5	5	19	19	19	19
Surface Waters	2	1	1	2	1	1	2	2	2	2
Transportation and Evacuation Routes										
Airports	1	0	0	1	1	1	1	1	1	1
Marinas and Boat ramps	4	0	1	4	2	2	4	4	4	4
Bridges	12	0	0	12	0	0	10	12	12	12
Major Roadways (NTD)	1,232	1	2	1,198	16	18	973	1,037	1,163	1,211
Major Roadways (FDOT)	20	0	0	20	1	1	17	18	20	20

Table 4-10: Sensitivity Analysis – 2070 Conditions

Asset Type	Total Asset Count	2070 Conditions									
		2070 SLR - Low	2070 SLR – High	25yr/ SLR (2ft)	SS/5yr/2070 SLR – Low	SS/5yr/2070 SLR – High	SS/100yr/2070 SLR – Low	SS/100yr/2070 SLR – High	SS/1,000yr/2070 SLR – Low	SS/1,000yr/2070 SLR – High	
Critical Community and Emergency Facilities											
Affordable Housing	1	0	0	1	0	0	1	1	1	1	
Schools	21	0	0	7	0	0	10	16	20	20	
Law Enforcement Facilities	2	0	0	0	0	0	0	2	2	2	
Healthcare Facilities	22	0	0	10	0	3	8	15	19	19	
Fire Stations	2	0	0	0	0	0	1	1	2	2	
Community Centers	1	0	0	0	0	0	1	1	1	1	
Churches	10	0	0	2	0	0	4	8	10	10	
Local Government Facilities	1	0	0	0	0	0	0	1	1	1	
Critical Infrastructure											
Communications Facilities FDEM	1	0	0	1	0	0	1	1	1	1	
Post offices	1	0	0	0	0	0	0	0	1	1	
Substation	1	0	0	1	0	0	0	1	1	1	
Wastewater Treatment/Lift Stations	1	0	0	1	0	1	1	1	1	1	
Solid and Hazardous Waste Facilities – FDEP	6	0	0	2	0	2	4	4	5	5	
Solid and Hazardous Waste Facilities – SQG	136	0	0	120	0	0	9	115	133	133	
SFWMD Infrastructure (culverts w/ risers)	3	0	0	2	0	3	3	3	3	3	
Outfalls	77	0	0	75	0	76	77	77	77	77	
Stormwater Ponds	6	1	2	6	2	5	6	6	6	6	
Levees	35	1	1	34	3	34	35	35	35	35	
Natural, Cultural, and Historic											
Historic and Cultural Structures	22	1	1	9	1	2	17	21	22	22	
Historic Resources	4	2	2	4	2	2	3	4	4	4	
National Parks	1	1	1	1	1	1	1	1	1	1	
Conservation Areas	12	7	7	12	8	11	12	12	12	12	
Wetlands	7	7	7	7	7	7	7	7	7	7	
Surface Water Flowlines	19	5	5	19	5	19	19	19	19	19	
Surface Waters	2	1	1	2	1	1	2	2	2	2	
Transportation and Evacuation Routes											
Airports	1	0	0	1	1	1	1	1	1	1	
Marinas and Boat ramps	4	0	2	4	2	4	4	4	4	4	
Bridges	12	0	0	12	0	10	10	12	12	12	
Major Roadways (NTD)	1,232	2	6	1,200	18	520	1,028	1,201	1,231	1,231	
Major Roadways (FDOT)	20	0	0	20	1	12	18	20	20	20	

4.4 RISK ANALYSIS

Overview

Risk levels for each asset type are determined based on the sensitivity and exposure analysis. The risk analysis builds off of the sensitivity analysis by assigning a level of risk to each asset type based on the percentage of assets affected by each of the flood scenarios. This analysis indicates which asset types (e.g. schools, roads, culverts, etc.) tend to be the least or most exposed to flood within a given planning horizon.

Methodology

In accordance with the Resilient Florida Program guidance and state statute requirements, the risk analysis is derived using the results from the sensitivity analysis. Risk is presented by asset type and is the percentage of individual assets exposed to a given flood scenario. For example, there are 21 schools and three are exposed to the 1%-annual-chance flood in 2030, so 14% of the evaluated schools are at risk of this flood type and have a low-risk rating for 1%-annual-chance flood in 2030. The level of risk for each asset type varies across flood scenarios and planning horizons. The thresholds for the risk ratings are provided in [Table 4-11](#). Risk results are summarized in [Table 4-12](#) – [Table 4-15](#), below.

Table 4-11: Risk Rating

None	0%
Low	≤25%
Medium	25 – 50%
High	>50% – 75%
Extreme	>75%



Results

Table 4-12: Risk Assessment – Current Conditions

Asset Type	Total Asset Count	Current Conditions					
		1% Flood	25yr Precipitation	High Tide	SS/5yr	SS/100yr	SS/1,000yr
Critical Community and Emergency Facilities							
Affordable Housing	1	100%	100%	0%	0%	100%	100%
Schools	21	14%	33%	0%	0%	5%	67%
Law Enforcement Facilities	2	0%	0%	0%	0%	0%	0%
Healthcare Facilities	22	14%	45%	0%	0%	27%	50%
Fire Stations	2	0%	0%	0%	0%	0%	50%
Community Centers	1	100%	0%	0%	0%	100%	100%
Churches	10	30%	20%	0%	w0%	30%	60%
Local Government Facilities	1	0%	0%	0%	0%	0%	0%
Critical Infrastructure							
Communications Facilities FDEM	1	0%	100%	0%	0%	100%	100%
Post offices	1	0%	0%	0%	0%	0%	0%
Substation	1	0%	100%	0%	0%	0%	100%
Wastewater Treatment/Lift Stations	1	100%	0%	0%	0%	100%	100%
Solid and Hazardous Waste Facilities – FDEP	6	33%	33%	0%	0%	67%	67%
Solid and Hazardous Waste Facilities – SQG	136	6%	88%	0%	0%	4%	77%
SFWMID Infrastructure (culverts w/ risers)	3	100%	67%	67%	0%	100%	100%
Outfalls	77	100%	94%	60%	0%	100%	100%
Stormwater Ponds	6	100%	100%	100%	33%	83%	100%
Levees	35	100%	97%	60%	9%	100%	100%

Asset Type	Total Asset Count	Current Conditions					
		1% Flood	25yr Precipitation	High Tide	SS/5yr	SS/100yr	SS/1,000yr
Natural, Cultural, and Historic							
Historic and Cultural Structures	22	41%	41%	5%	5%	45%	91%
Historic Resources	4	50%	100%	50%	50%	75%	75%
National Parks	1	100%	100%	100%	100%	100%	100%
Conservation Areas	12	92%	100%	83%	58%	92%	100%
Wetlands	7	100%	100%	100%	100%	100%	100%
Surface Water Flowlines	19	100%	100%	100%	26%	100%	100%
Surface Waters	2	50%	100%	100%	50%	100%	100%
Transportation and Evacuation Routes							
Airports	1	100%	100%	0%	100%	100%	100%
Marinas and Boat ramps	4	100%	100%	75%	50%	100%	100%
Bridges	12	83%	100%	83%	0%	83%	100%
Major Roadways (NTD)	1,232	62%	97%	0%	1%	73%	92%
Major Roadways (FDOT)	20	70%	100%	45%	5%	80%	100%

Table 4-13: Risk Assessment – 2030 Conditions

Asset Type	Total Asset Count	2030 Conditions							
		2030 SLR - Low	2030 SLR – High	SS/5yr/2030 SLR – Low	SS/5yr/2030 SLR – High	SS/100yr/2030 SLR – Low	SS/100yr/2030 SLR – High	SS/1,000yr/2030 SLR – Low	SS/1,000yr/2030 SLR – High
Critical Community and Emergency Facilities									
Affordable Housing	1	0%	0%	0%	0%	100%	100%	100%	100%
Schools	21	0%	0%	0%	0%	10%	24%	67%	81%
Law Enforcement Facilities	2	0%	0%	0%	0%	0%	0%	50%	100%
Healthcare Facilities	22	0%	0%	0%	0%	32%	36%	64%	68%
Fire Stations	2	0%	0%	0%	0%	0%	50%	50%	50%
Community Centers	1	0%	0%	0%	0%	100%	100%	100%	100%
Churches	10	0%	0%	0%	0%	40%	40%	70%	80%
Local Government Facilities		0%	0%	0%	0%	0%	0%	0%	100%
Critical Infrastructure									
Communications Facilities FDEM	1	0%	0%	0%	0%	100%	100%	100%	100%
Post offices	1	0%	0%	0%	0%	0%	0%	0%	0%
Substation	1	0%	0%	0%	0%	0%	0%	100%	100%
Wastewater Treatment/Lift Stations	1	0%	0%	0%	0%	100%	100%	100%	100%
Solid and Hazardous Waste Facilities – FDEP	6	0%	0%	0%	0%	67%	67%	67%	67%
Solid and Hazardous Waste Facilities – SQG	136	0%	0%	0%	0%	4%	5%	82%	84%
SFWMD Infrastructure (culverts w/ risers)	3	0%	0%	0%	0%	100%	100%	100%	100%
Outfalls	77	0%	0%	0%	0%	100%	100%	100%	100%
Stormwater Ponds	6	17%	17%	33%	33%	100%	100%	100%	100%
Levees	35	3%	3%	9%	9%	100%	100%	100%	100%
Natural, Cultural, and Historic									
Historic and Cultural Structures	22	5%	5%	5%	5%	50%	64%	95%	95%
Historic Resources	4	50%	50%	50%	50%	75%	75%	100%	100%
National Parks	1	100%	100%	100%	100%	100%	100%	100%	100%
Conservation Areas	12	50%	50%	67%	67%	100%	100%	100%	100%
Wetlands	7	86%	86%	100%	100%	100%	100%	100%	100%
Surface Water Flowlines	19	21%	26%	26%	26%	100%	100%	100%	100%
Surface Waters	2	50%	50%	50%	50%	100%	100%	100%	100%
Transportation and Evacuation Routes									
Airports	1	0%	0%	100%	100%	100%	100%	100%	100%
Marinas and Boat ramps	4	0%	0%	50%	50%	100%	100%	100%	100%
Bridges	12	0%	0%	0%	0%	83%	83%	100%	100%
Major Roadways (NTD)	1,232	0%	0%	1%	1%	78%	81%	94%	97%
Major Roadways (FDOT)	20	0%	0%	5%	5%	85%	85%	100%	100%

Table 4-14: Risk Assessment – 2040 Conditions

Asset Type	Total Asset Count	2040 Conditions								
		2040 SLR - Low	2040 SLR – High	25yr/ SLR (1ft)	SS/5yr/2040 SLR – Low	SS/5yr/2040 SLR – High	SS/100yr/2040 SLR – Low	SS/100yr/2040 SLR – High	SS/1,000yr/2040 SLR – Low	SS/1,000yr/2040 SLR – High
Critical Community and Emergency Facilities										
Affordable Housing	1	0%	0%	100%	0%	0%	100%	100%	100%	100%
Schools	21	0%	0%	33%	0%	0%	14%	48%	71%	81%
Law Enforcement Facilities	2	0%	0%	0%	0%	0%	0%	0%	50%	100%
Healthcare Facilities	22	0%	0%	45%	0%	0%	36%	41%	68%	73%
Fire Stations	2	0%	0%	0%	0%	0%	0%	50%	50%	50%
Community Centers	1	0%	0%	0%	0%	0%	100%	100%	100%	100%
Churches	10	0%	0%	20%	0%	0%	40%	40%	70%	80%
Local Government Facilities	1	0%	0%	0%	0%	0%	0%	0%	0%	100%
Critical Infrastructure										
Communications Facilities FDEM	1	0%	0%	100%	0%	0%	100%	100%	100%	100%
Post offices	1	0%	0%	0%	0%	0%	0%	0%	0%	0%
Substation	1	0%	0%	100%	0%	0%	0%	0%	100%	100%
Wastewater Treatment/Lift Stations	1	0%	0%	0%	0%	0%	100%	100%	100%	100%
Solid and Hazardous Waste Facilities – FDEP	6	0%	0%	33%	0%	0%	67%	67%	67%	67%
Solid and Hazardous Waste Facilities – SQG	136	0%	0%	88%	0%	0%	4%	7%	84%	85%
SFWMID Infrastructure (culverts w/ risers)	3	0%	0%	67%	0%	0%	100%	100%	100%	100%
Outfalls	77	0%	0%	96%	0%	0%	100%	100%	100%	100%
Stormwater Ponds	6	17%	17%	100%	33%	33%	100%	100%	100%	100%
Levees	35	3%	3%	97%	9%	9%	100%	100%	100%	100%
Natural, Cultural, and Historic										
Historic and Cultural Structures	22	5%	5%	41%	5%	5%	55%	77%	95%	100%
Historic Resources	4	50%	50%	100%	50%	50%	75%	75%	100%	100%
National Parks	1	100%	100%	100%	100%	100%	100%	100%	100%	100%
Conservation Areas	12	50%	58%	100%	67%	67%	100%	100%	100%	100%
Wetlands	7	86%	100%	100%	100%	100%	100%	100%	100%	100%
Surface Water Flowlines	19	21%	26%	100%	26%	26%	100%	100%	100%	100%
Surface Waters	2	50%	50%	100%	50%	50%	100%	100%	100%	100%
Transportation and Evacuation Routes										
Airports	1	0%	0%	100%	100%	100%	100%	100%	100%	100%
Marinas and Boat ramps	4	0%	25%	100%	50%	50%	100%	100%	100%	100%
Bridges	12	0%	0%	100%	0%	0%	83%	100%	100%	100%
Major Roadways (NTD)	1,232	0%	0%	97%	1%	1%	79%	84%	94%	98%
Major Roadways (FDOT)	20	0%	0%	100%	5%	5%	85%	90%	100%	100%

Table 4-15: Risk Assessment – 2070 Conditions

Asset Type	Total Asset Count	2070 Conditions								
		2070 SLR - Low	2070 SLR – High	25yr/ SLR (2ft)	SS/5yr/2070 SLR – Low	SS/5yr/2070 SLR – High	SS/100yr/2070 SLR – Low	SS/100yr/2070 SLR – High	SS/1,000yr/2070 SLR – Low	SS/1,000yr/2070 SLR – High
Critical Community and Emergency Facilities										
Affordable Housing	1	0%	0%	100%	0%	0%	100%	100%	100%	100%
Schools	21	0%	0%	33%	0%	0%	48%	76%	95%	95%
Law Enforcement Facilities	2	0%	0%	0%	0%	0%	0%	100%	100%	100%
Healthcare Facilities	22	0%	0%	45%	0%	14%	36%	68%	86%	86%
Fire Stations	2	0%	0%	0%	0%	0%	50%	50%	100%	100%
Community Centers	1	0%	0%	0%	0%	0%	100%	100%	100%	100%
Churches	10	0%	0%	20%	0%	0%	40%	80%	100%	100%
Local Government Facilities	1	0%	0%	0%	0%	0%	0%	100%	100%	100%
Critical Infrastructure										
Communications Facilities FDEM	1	0%	0%	100%	0%	0%	100%	100%	100%	100%
Post offices	1	0%	0%	0%	0%	0%	0%	0%	100%	100%
Substation	1	0%	0%	100%	0%	0%	0%	100%	100%	100%
Wastewater Treatment/Lift Stations	1	0%	0%	100%	0%	100%	100%	100%	100%	100%
Solid and Hazardous Waste Facilities – FDEP	6	0%	0%	33%	0%	33%	67%	67%	83%	83%
Solid and Hazardous Waste Facilities – SQG	136	0%	0%	88%	0%	0%	7%	85%	98%	98%
SFWMD Infrastructure (culverts w/ risers)	3	0%	0%	67%	0%	100%	100%	100%	100%	100%
Outfalls	77	0%	0%	97%	0%	99%	100%	100%	100%	100%
Stormwater Ponds	6	17%	33%	100%	33%	83%	100%	100%	100%	100%
Levees	35	3%	3%	97%	9%	97%	100%	100%	100%	100%
Natural, Cultural, and Historic										
Historic and Cultural Structures	22	5%	5%	41%	5%	9%	77%	95%	100%	100%
Historic Resources	4	50%	50%	100%	50%	50%	75%	100%	100%	100%
National Parks	1	100%	100%	100%	100%	100%	100%	100%	100%	100%
Conservation Areas	12	58%	58%	100%	67%	92%	100%	100%	100%	100%
Wetlands	7	100%	100%	100%	100%	100%	100%	100%	100%	100%
Surface Water Flowlines	19	26%	26%	100%	26%	100%	100%	100%	100%	100%
Surface Waters	2	50%	50%	100%	50%	50%	100%	100%	100%	100%
Transportation and Evacuation Routes										
Airports	1	0%	0%	100%	100%	100%	100%	100%	100%	100%
Marinas and Boat ramps	4	0%	50%	100%	50%	100%	100%	100%	100%	100%
Bridges	12	0%	0%	100%	0%	83%	83%	100%	100%	100%
Major Roadways (NTD)	1,232	0%	0%	97%	1%	42%	83%	97%	99%	99%
Major Roadways (FDOT)	20	0%	0%	100%	5%	60%	90%	100%	100%	100%



5.1 OVERVIEW

Miami-Dade County developed a [Heat Vulnerability Assessment](#) to help prevent heat related illnesses and deaths in communities throughout the county and to understand how health risk varies across the county. The analysis examined each zip code for the severity of heat exposure and the prevalence of sensitive groups. There are three zip codes within Palmetto Bay: 33157, 33158, 33176. Zip code 33158 falls completely within Palmetto Bay, however the other two zip codes cross village boundaries and capture data from other jurisdictions. It's important to keep this in mind when reviewing the results below.



To create a heat vulnerability assessment, the county used regression statistics to show which exposure and sensitivity variables had the strongest relationship with average annual heat related illness hospitalization and emergency department rates from 2015 to 2019.

The study also evaluated a range of factors that contribute to heat exposure, and heat sensitivity. The factors are detailed in the sections below. The methodology and results of the study are explained in detail in the [Miami-Dade Extreme Heat Vulnerability Mapping Report](#) (Uejio and Ahn, 2022).



5.2 HEAT VULNERABILITY INDEX

Due to various exposure and sensitivity factors, some neighborhoods experience increased risk to heat related illness hospitalizations or emergency room department visits. The assessment examines heat vulnerability in the context of heat health risk. Using emergency department visits and hospitalizations due to heat related illness as the primary metrics, the heat vulnerability index examines the many factors that contribute to heat vulnerability.

This study analyzed publicly available emergency room and hospitalization rates for 2015-2019 from the Florida Department of Health. It should be noted that studies suggest that classified heat related deaths and illnesses are undercounted – which is likely the case in the Miami-Dade study area.

There are three resulting outputs for the heat vulnerability index: Average Heat Vulnerability, Hospitalization Vulnerability, and Emergency Department Vulnerability. Descriptions of each output are detailed below.

Hospitalization Vulnerability: Shows the level of risk for heat related hospitalization for each zip code. Hospitalizations are more likely to reflect heat illnesses in older adults, people with pre-existing, and/or unmanaged health conditions. This assessment determined that the percentage of people living in poverty and the percentage of mobile homes are key indicators that contribute to potential hospitalization due to heat related illness. Mobile homes residents face multiple environmental health threats, tend to live on a fixed income, and/or have unstable income or housing tenure. Often, low-income households have to make “no-win” economic choices between food, housing, transportation, and energy which puts them at higher risk for dealing with periods of extreme heat. These factors were evaluated to determine emergency department vulnerability.

Emergency Department Vulnerability: Shows which areas are more at risk to have people admitted to the emergency department for heat related illness. Based on the study’s statistical analysis, visits to the emergency room are influenced by a person’s: occupational heat exposure (% outdoor workers); age, particularly young children and those recreating outside (age less than 18); heat exposure measured by the magnitude of the urban heat island (daytime surface temperature); percent indigenous population; percentage of people living alone; and percentage of mobile homes. These factors were evaluated to determine emergency department vulnerability.

Average Heat Vulnerability: Provides an average of the Emergency Department Vulnerability and the Hospitalization Vulnerability results. It provides an overall heat vulnerability rating to establish which zip codes may be most prone to heat health risks.

The vulnerability results for all three assessments were aggregated into overall ratings from 1 to 5. A score of 1 indicates less vulnerability and a rating of 5 indicates higher vulnerability. Mapped results of vulnerability to heat health risks are shown in [Figure 5-1](#) – [Figure 5-3](#). The vulnerability ratings for each assessment are shown in [Table 5-1](#).

Table 5-1: Heat Vulnerability Ratings

Zip Code	Average Vulnerability	Hospitalization Vulnerability	Emergency Department Vulnerability
33157	3	2	3
33158	2	1	3
33176	2	1	2

Based on these results, the zip codes that intersect the Palmetto Bay boundary have low to moderate vulnerability. The results capture data that apply both to Palmetto Bay but also include data from the other jurisdictions that the zip codes overlap. Additionally, the vulnerability results capture only some of the demographic and geographic features that contribute to vulnerability of heat health. The heat exposure and sensitivity assessment in the following sections takes a closer look at the individual variables that can contribute to heat vulnerability.



Figure 5-1: Heat Vulnerability Index: Average Heat Vulnerability

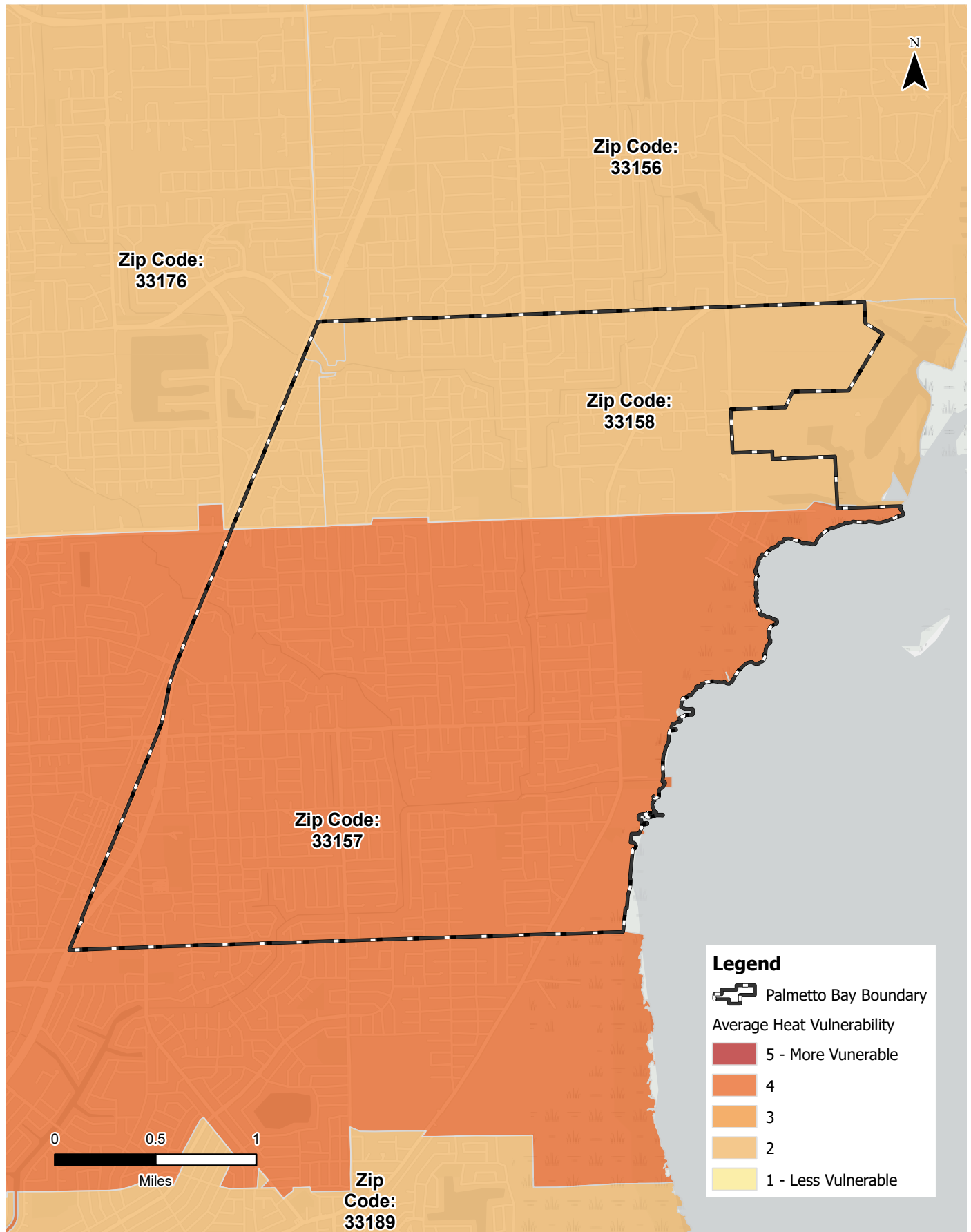


Figure 5-2: Heat Vulnerability Index: Hospitalization Vulnerability

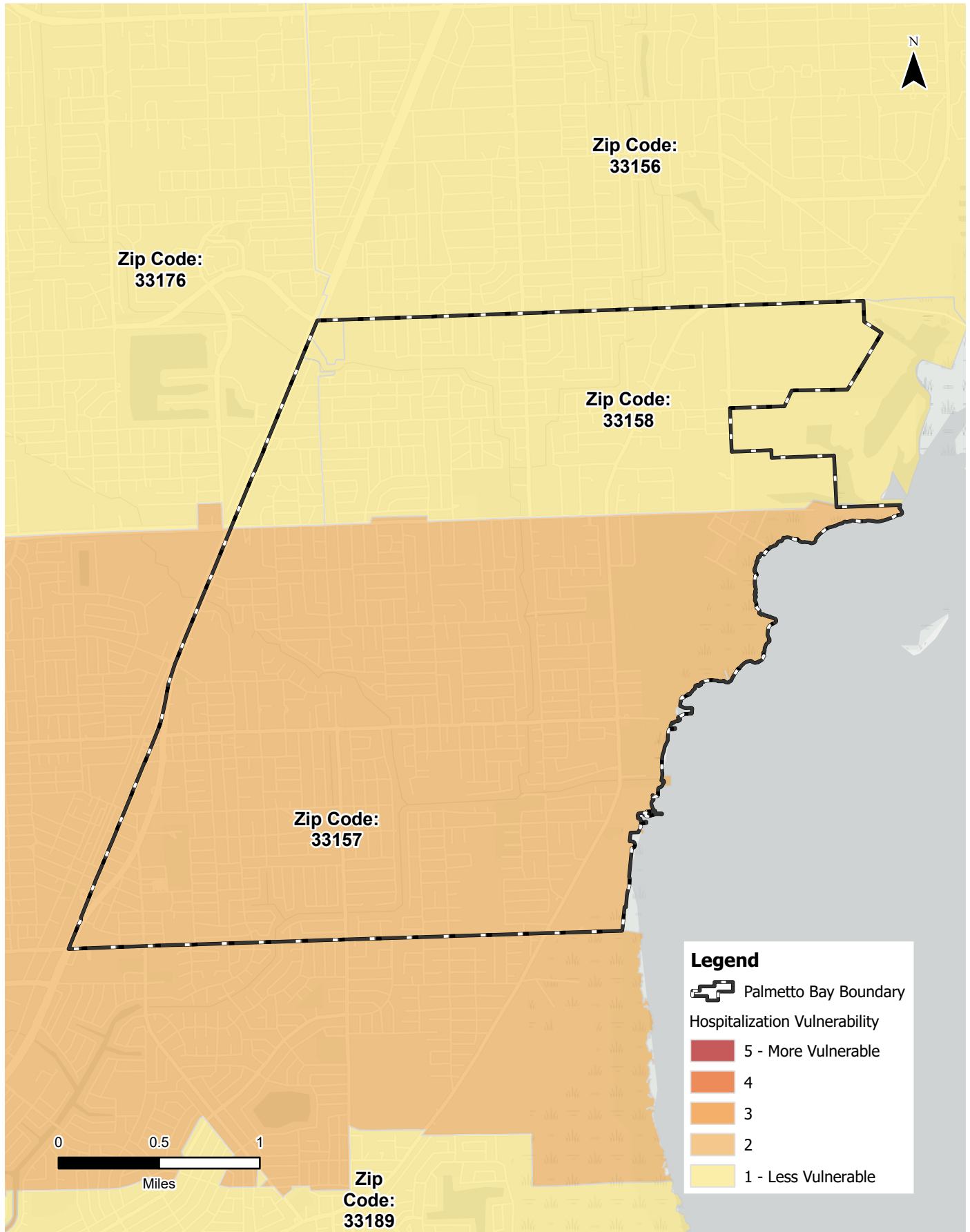
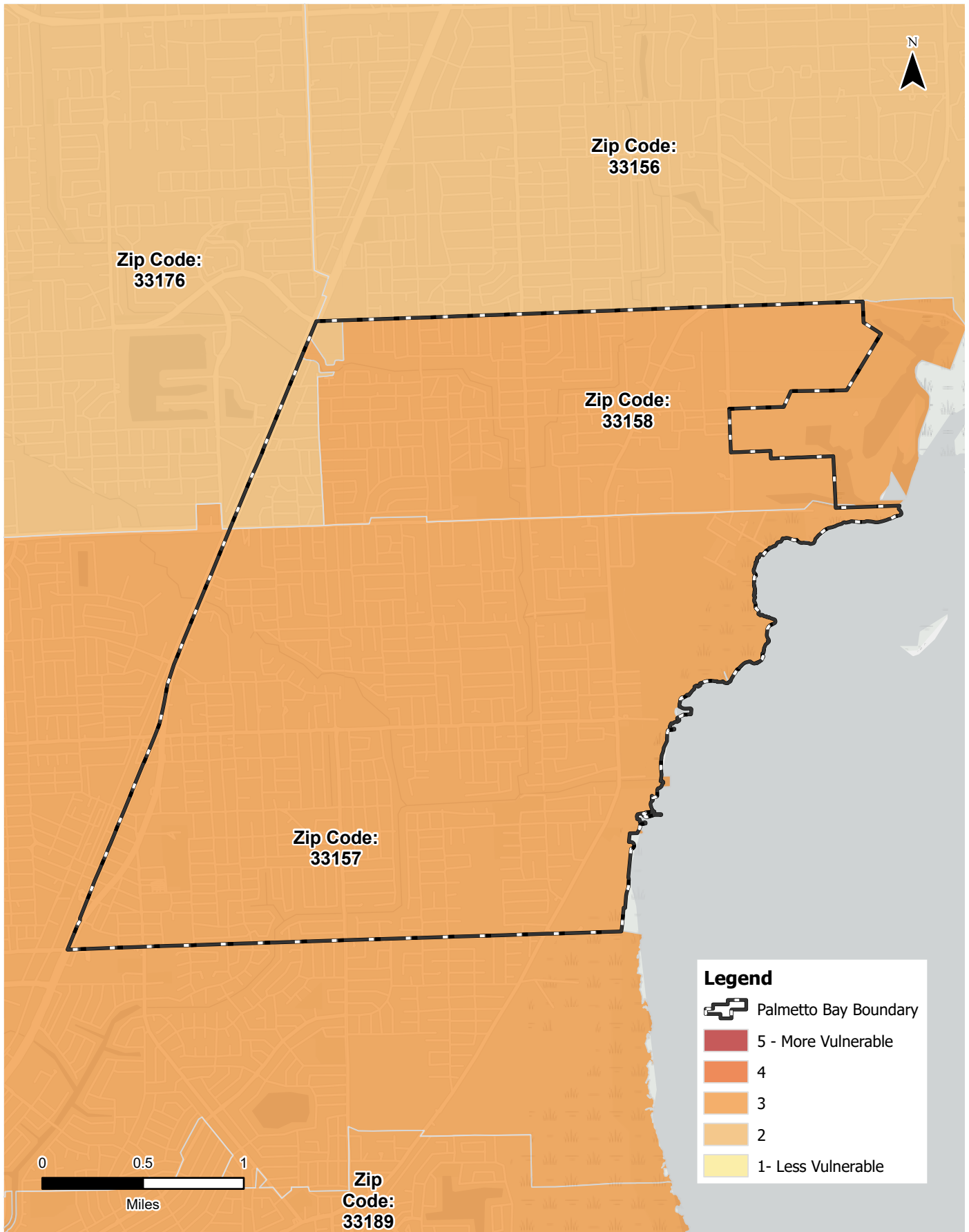


Figure 5-3: Heat Vulnerability Index: Emergency Department Visit Vulnerability



5.3 HEAT EXPOSURE

The heat exposure assessment examined several factors that can increase a person's exposure to heat and ultimately increase their heat health risk. The evaluated variables include urban tree canopy, impervious surfaces, nighttime land surface temperature, daytime land surface temperature, and outdoor workers.

Urban Tree Canopy: Percentage of each zip code covered in shrubs or trees. Trees help cool surface temperature through evapotranspiration.

Impervious Surfaces: Percentage of impervious surface coverage. Impervious surfaces are surfaces that allow little or no storm water infiltration into the ground such as concrete or pavement. High amounts of these materials warm the surface.

Nighttime Land Surface Temperature: Average daytime urban heat island temperature from 2003 - 2021. The results come from hundreds of satellite (MODIS) land surface temperature images recorded at 1:30 a.m.

Daytime Land Surface Temperature: Average daytime urban heat island temperature from 2003 - 2021. The results come from hundreds of satellite (MODIS) land surface temperature images recorded at 1:30 p.m.

Outdoor Workers: Percentage of outdoor workers by zip code. Hot and humid heat exposures challenge the health of outdoor workers engaged in construction, agriculture, first response, manufacturing, military,

or resource extraction and indoor workers without adequate ventilation or access to air conditioning. Elevated heat exposures increase the risk of outdoor worker deaths, illness, injuries, and reduce productivity and cognitive functioning.

Results for each of the exposure variables are shown in [Table 5-2](#). Results of the heat exposure variables in Palmetto Bay are displayed by zip code in [Figure 5-4](#) – [Figure 5-7](#).

Table 5-2: Heat Exposure Results

Exposure Variable	Zip Code		
	33157	33158	33176
Urban Tree Canopy (%)	24.4%	42.3%	22.3%
Impervious Surfaces (%)	34.6%	23.2%	31.7%
Nighttime Land Surface Temperature (°F)	78.6°	78.8°	78.4°
Daytime Land Surface Temperature	108.5°F	103.5°F	109.5°F

There are two cooling centers that are easily accessible to Palmetto Bay residents, the Palmetto Bay Branch Library, and Coral Reef Branch Library. The Palmetto Bay Branch Library is one of the assets analyzed in this plan and has high exposure ratings for 100yr and 1,000yr storm surge and sea level rise compound flooding scenarios. The library also has a medium exposure rating for 1%-annual-chance flood.

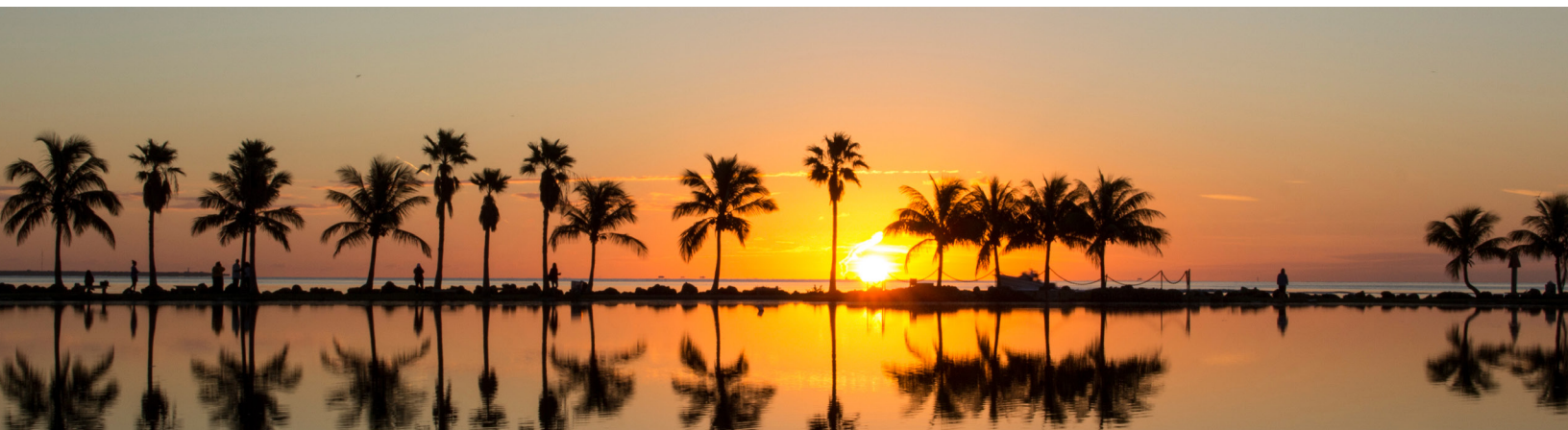


Figure 5-4: Heat Exposure: Urban Tree Coverage

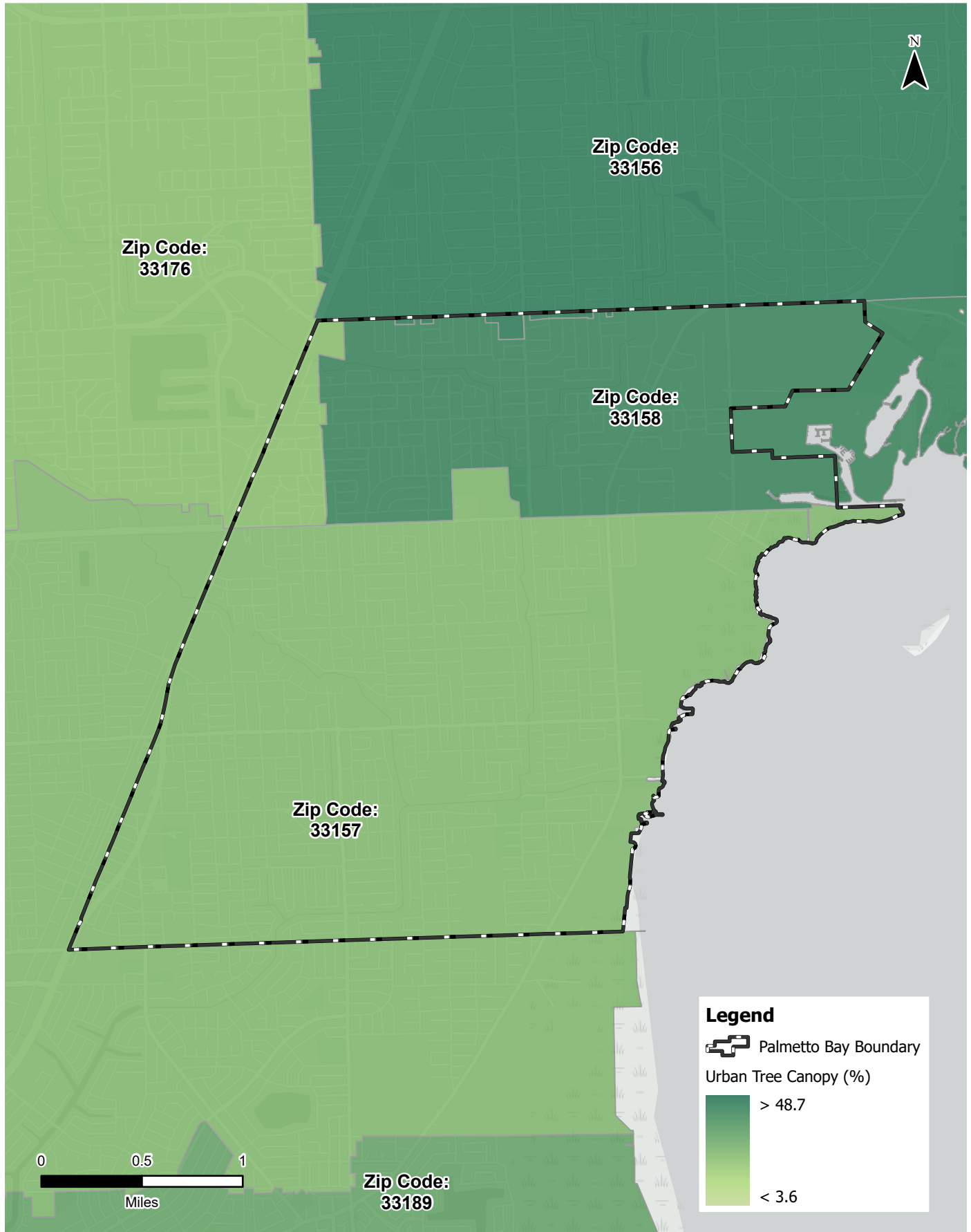


Figure 5-5: Heat Exposure: Impervious Surface Coverage

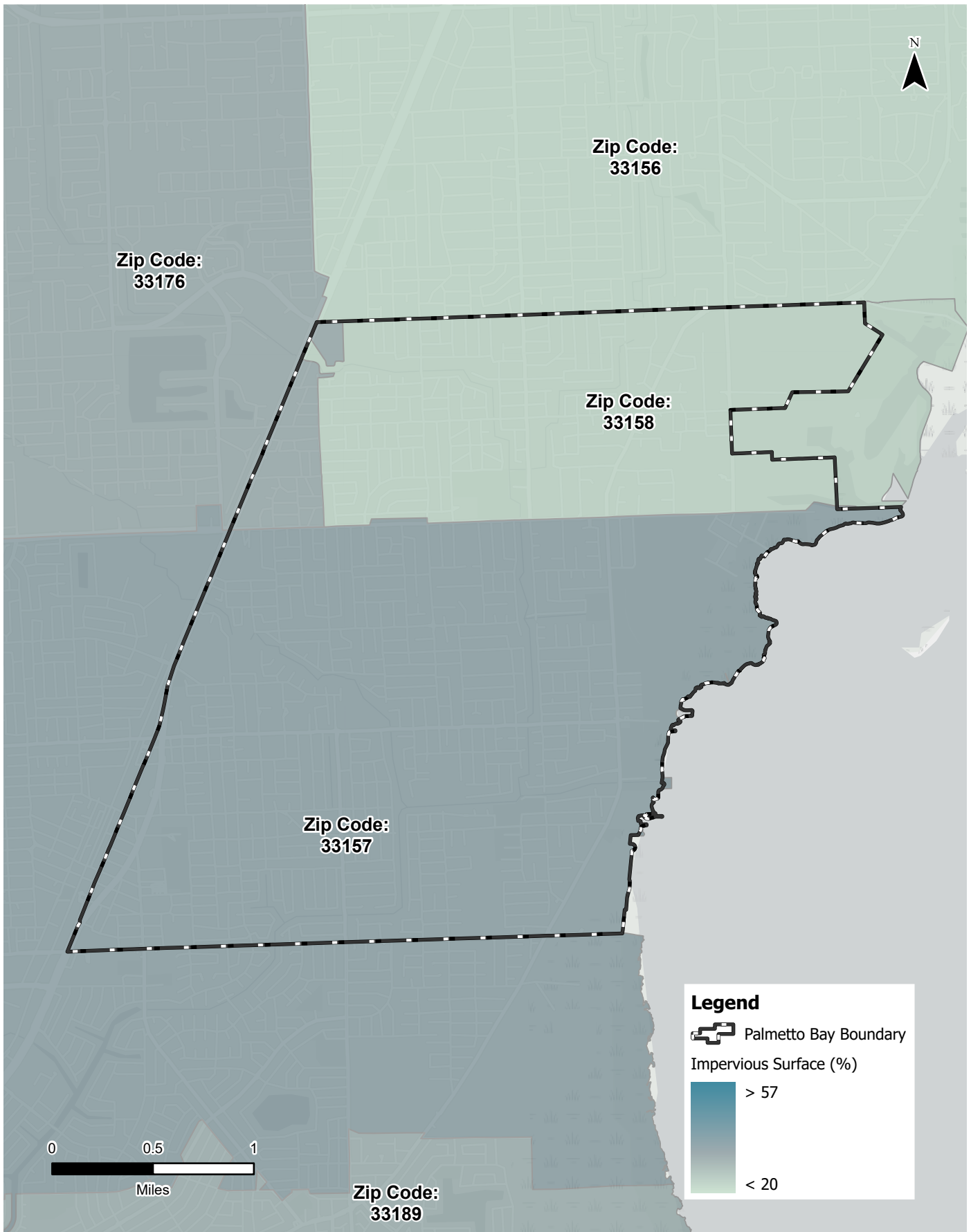


Figure 5-6: Heat Exposure: Nighttime Land Surface Temperature

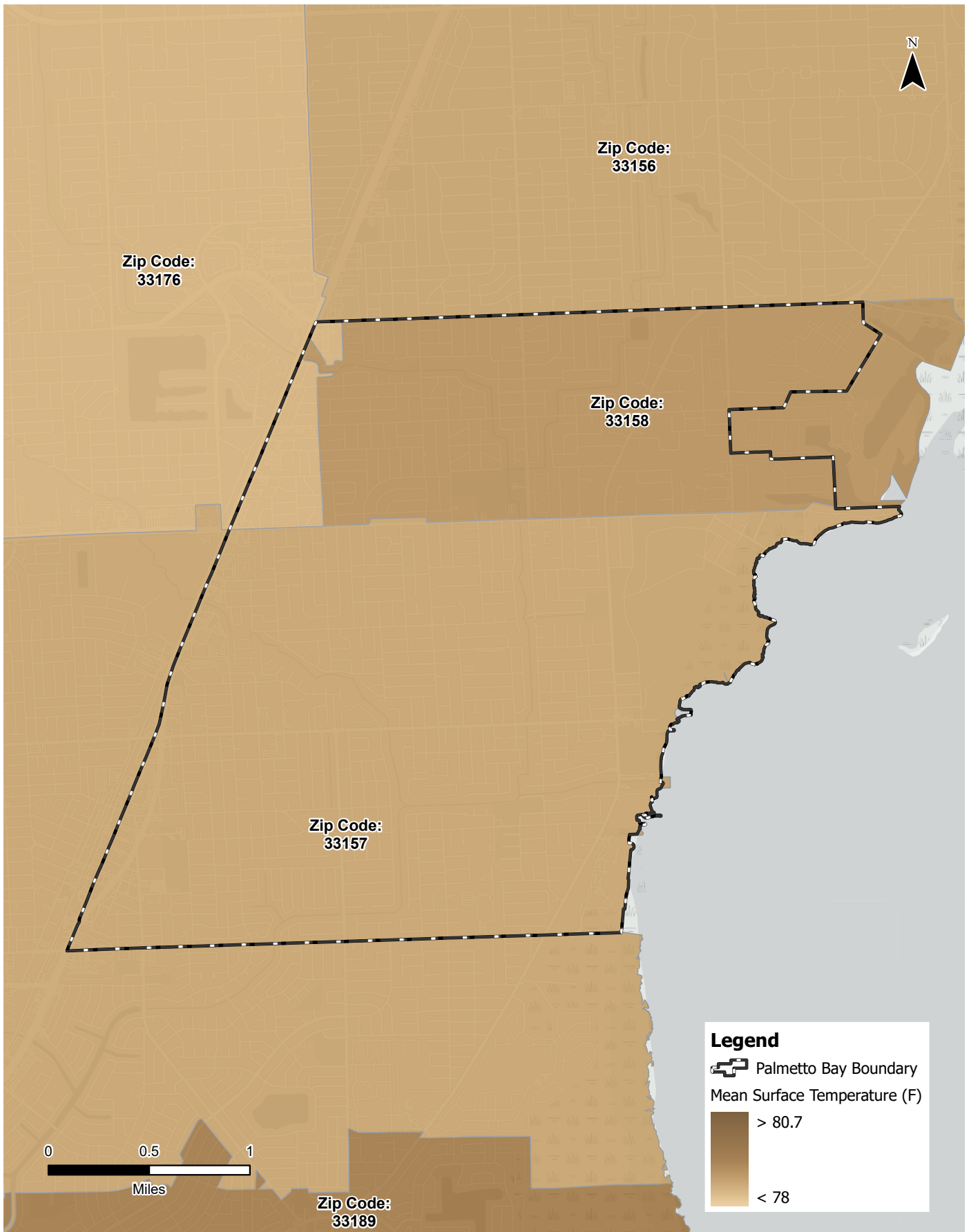
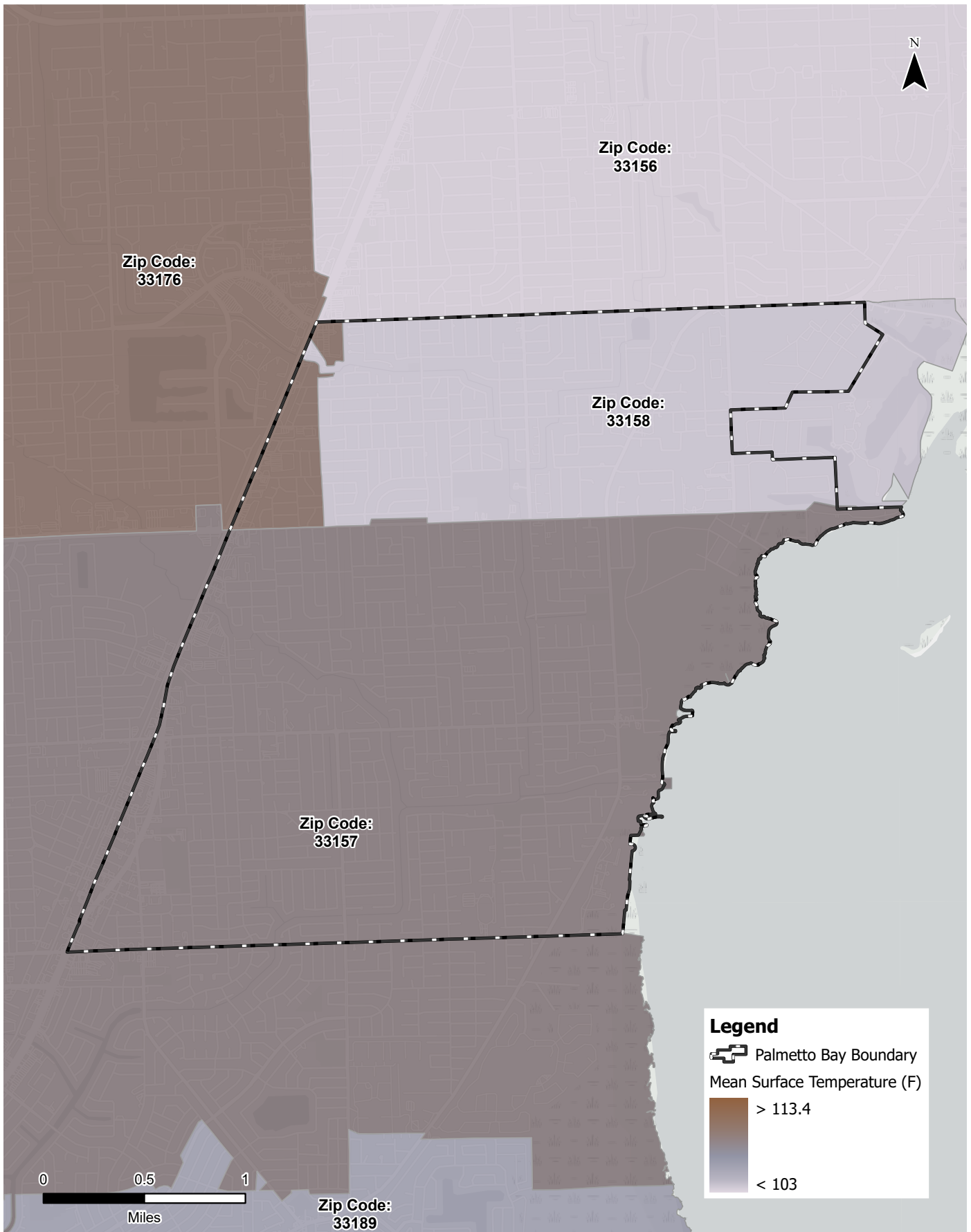


Figure 5-7: Heat Exposure: Daytime Land Surface Temperature



5.4 HEAT SENSITIVITY

People can be more sensitive to negative impacts of heat based on certain socio-economic and demographic factors. This is often due to factors such as age that influence how the body handles high temperatures but is also a result of historically underserved populations that have fewer resources available to cope with extreme heat. The Miami-Dade heat sensitivity analysis examined the following characteristics:

High School Education or Less: percentage of the population (25yrs or older) that has a high school education or less. Education level can be correlated to income, access to health insurance and other socio-economic factors. Lower income households may have limited access to healthcare, work outdoors, or difficulty accessing air conditioning.

Native American/Indigenous: percentage of Native American/Indigenous population by zip code. Indigenous people and communities are vulnerable to climate change, including extreme heat events due to multiple social, environmental, economic, and political stressors. Indigenous people tend to be in marginalized and underserved communities that have less access to air conditioning, hospitals, and social services.

Mobile Homes: percentage of mobile homes by zip code. Mobile/manufactured homes tend to have low air condition prevalence, insulation, and energy efficiency. Mobile homes also tend to be located in areas with fewer trees and more asphalt/impervious surface coverage which increase heat exposure. It should be noted that there are no mobile homes in Palmetto Bay.

African American/Black: percentage of African American/Black population by zip code. Due to historical discrimination and institutional biases, African Americans have limited access to healthcare. Nationwide, African Americans have lower rates of health insurance coverage. Additionally, institutional and healthcare provider biases coupled with discrimination, reduces chronic disease testing and care which may promote heat complications and mortality risks. Increased barriers to healthcare increase risk of heat-related illness.



Aged 65 and Older: Percentage of adults aged 65 or older. Older adults are physiologically sensitive to heat, more likely to suffer from chronic diseases, and take medications that increase heat sensitivity and/or dehydration. Compared to middle aged adults, older adults are more likely to have impaired body temperature regulation and blood pressure. Pre-existing conditions can also impair the body's responses and functioning to heat stress.

English as Second Language: Percentage of population that learned English as their second language. Those who speak English as second language may not have the same access to weather warnings as someone whose first language is English. Language barriers can limit the ability to understand and respond to extreme heat warning messages.

Poverty Rate: Percentage of population living in poverty. Studies have found evidence of the relationship between poverty and heat-associated mortality. Those who live in poverty are less likely to have air conditioning or may not be able to afford it. Additionally, limited access to health insurance makes it harder to detect disease, maintain healthier behaviors, and manage chronic illness – all of which increase risks of heat-related illness.

Population Living Alone: Percentage of population living alone. Those socially isolated or living alone have increased risk of heat related death, especially if they are older adults. Isolated individuals may lack mobility or have difficulty seeking other resources to reduce heat exposure.

Results for each of the sensitivity variables are shown in [Table 5-3](#). Mapped heat sensitivity results for Palmetto Bay are displayed by zip code in [Figure 5-8](#) – [Figure 5-15](#).

Table 5-3: Heat Sensitivity Results

Sensitivity Variable	Zip Code		
	33157	33158	33176
High School Education or Less (%)	40.6%	9.6%	28.2%
Native American/Indigenous (%)	0.0%	0.0%	0.0%
Mobile Homes (%)	0.1%	0.4%	0.2%
African American/Black (%)	19.2%	2.7%	15.0%
Aged 65 and Older (%)	14%	17.3%	17.0%
English as Second Language (%)	15.9%	2.0%	15.2%
Poverty Rate (%)	13.7%	2.0%	15.2%
Living Alone (%)	4.9%	3.5%	7.6%

Figure 5-8: Heat Sensitivity: High School Education or Less

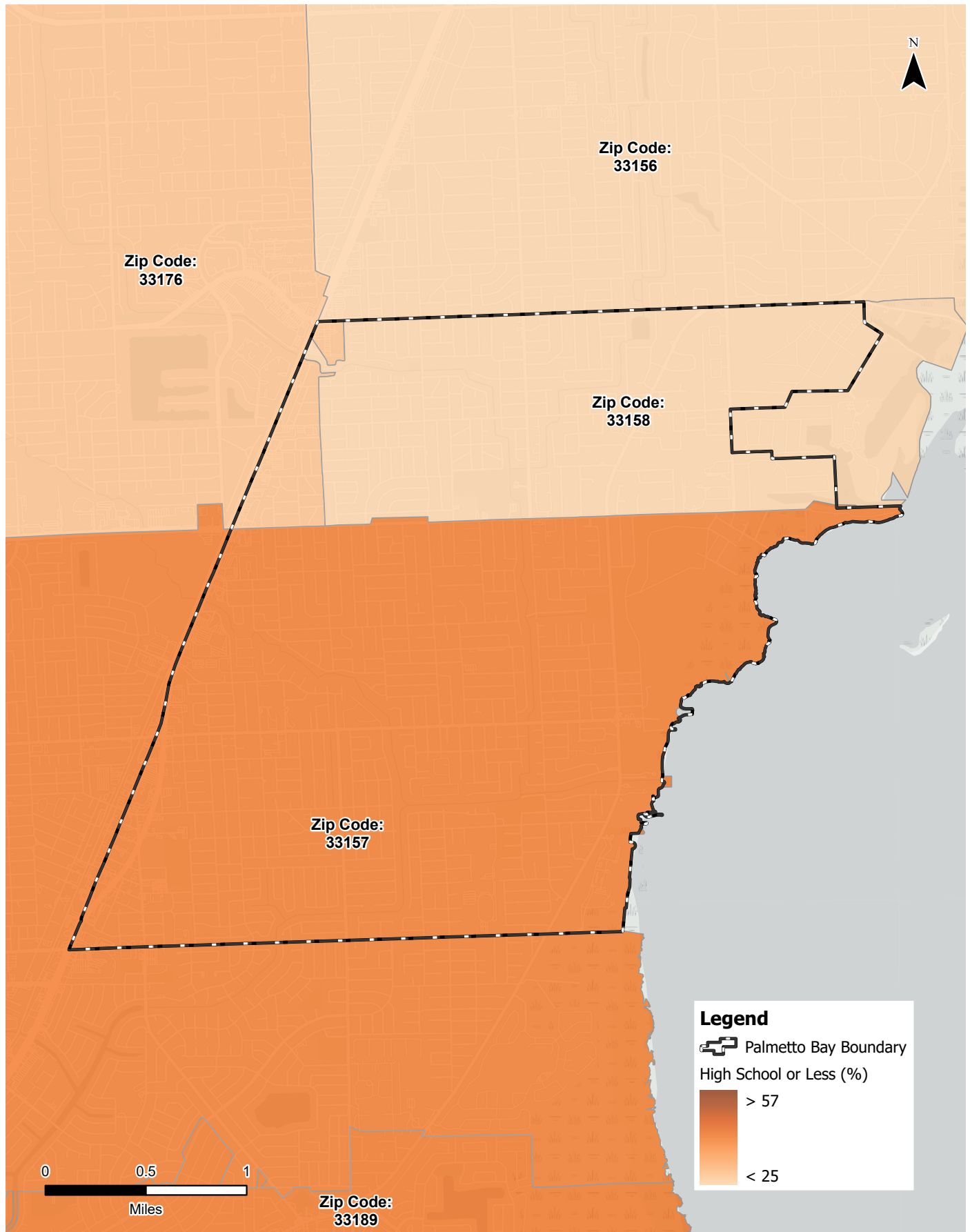


Figure 5-9: Heat Sensitivity: Native American/Indigenous Population

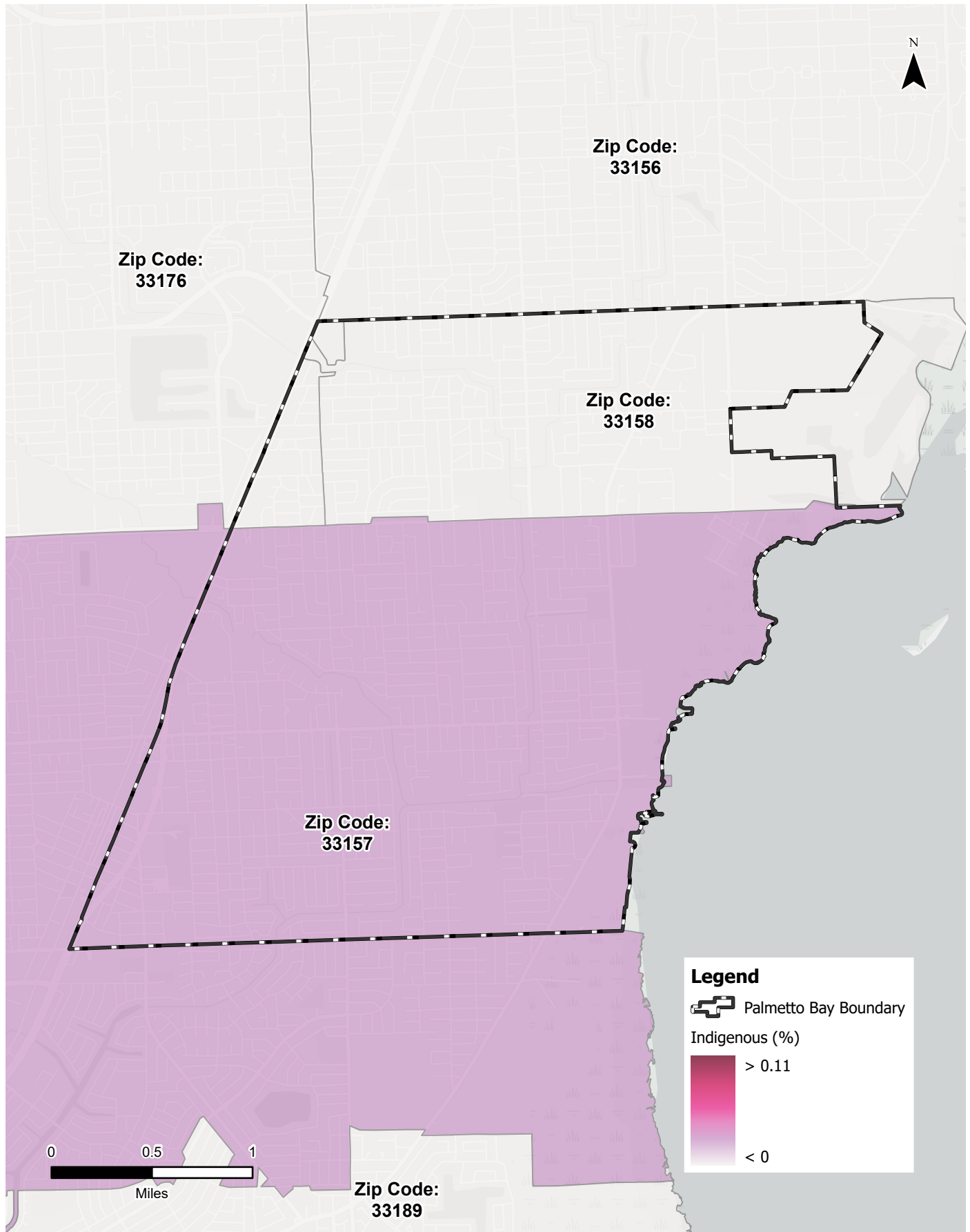


Figure 5-10: Heat Sensitivity: Percentage of Mobile Homes

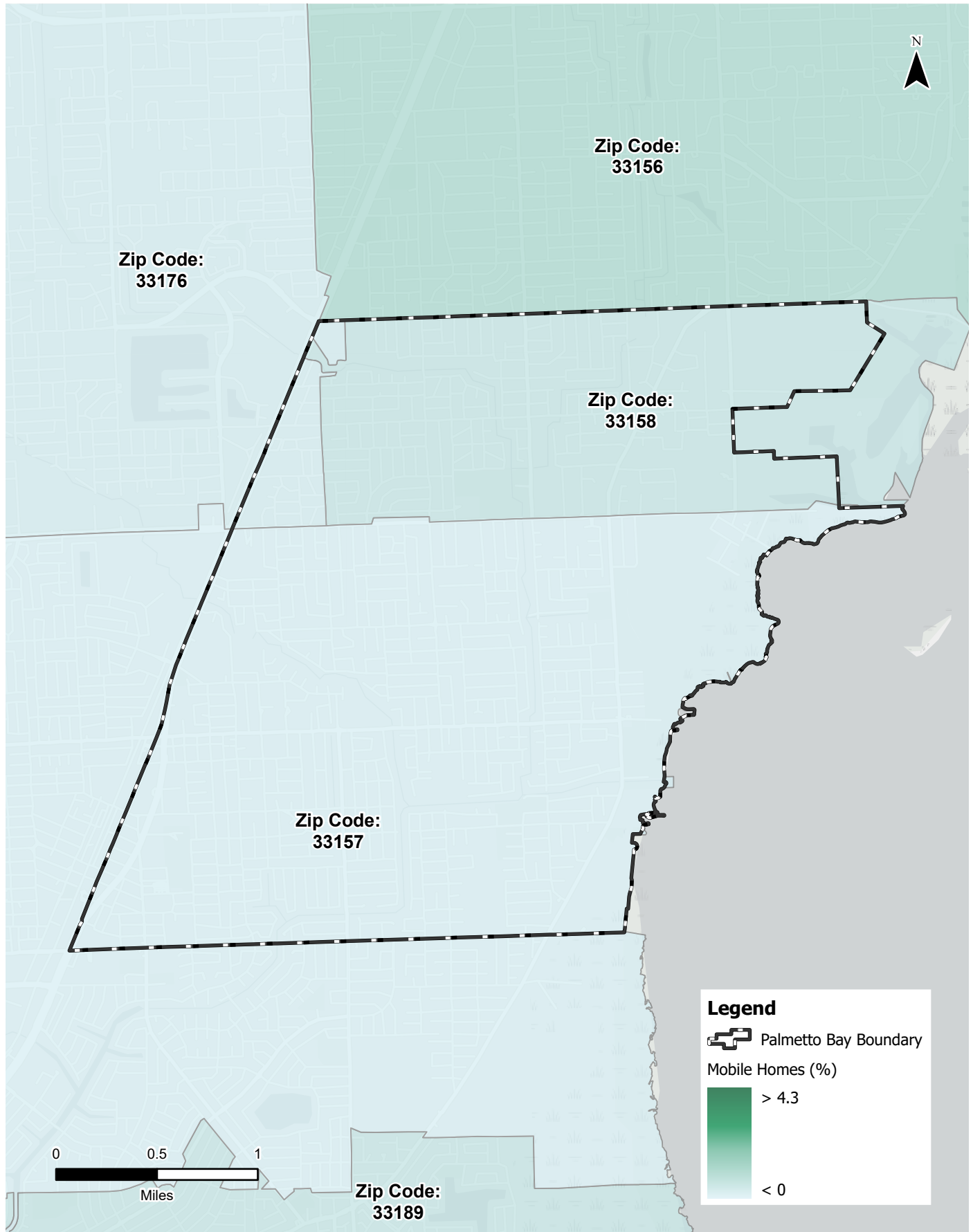


Figure 5-11: Heat Sensitivity: African American/Black Population

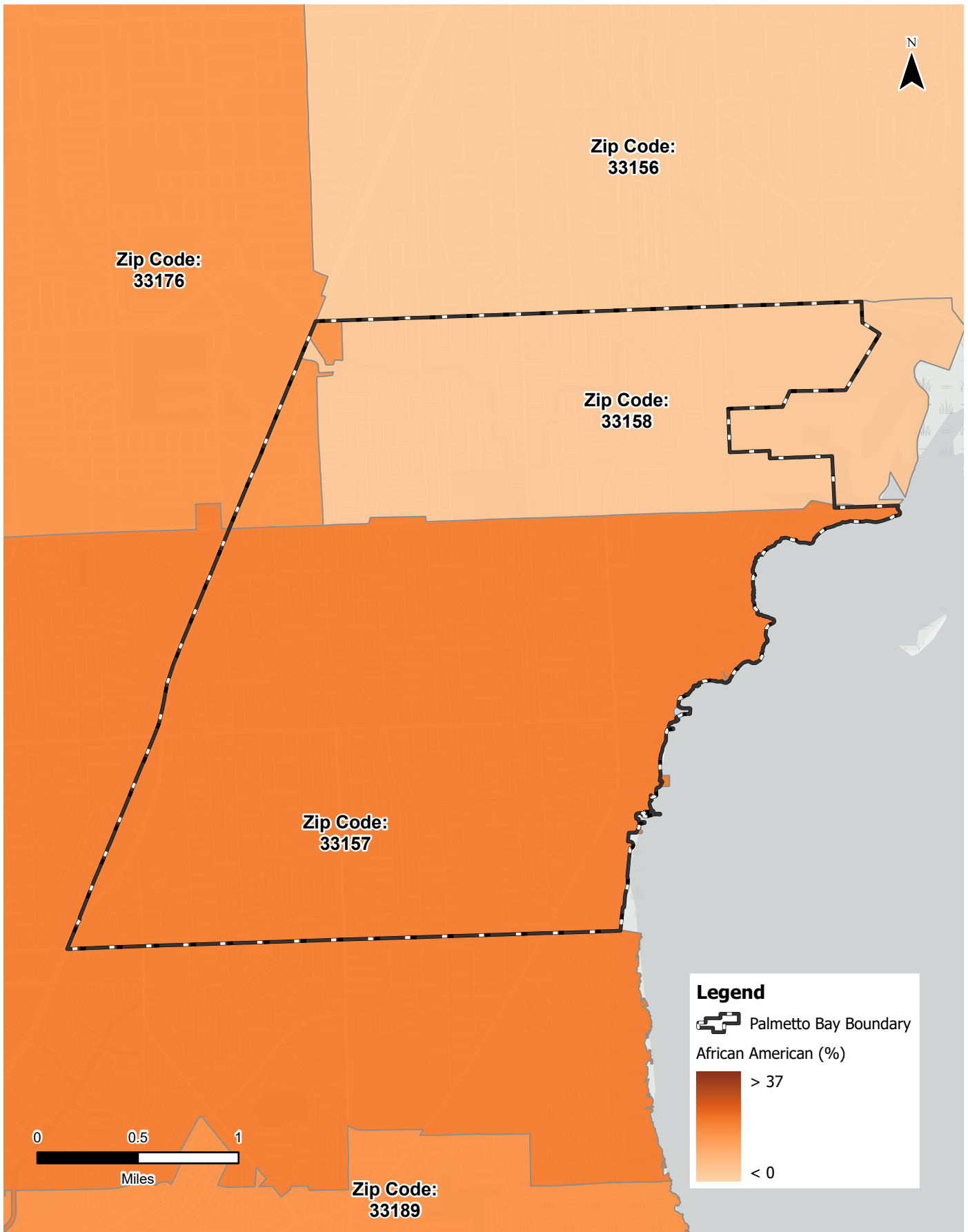


Figure 5-12: Heat Sensitivity: Population Aged 65 or Older

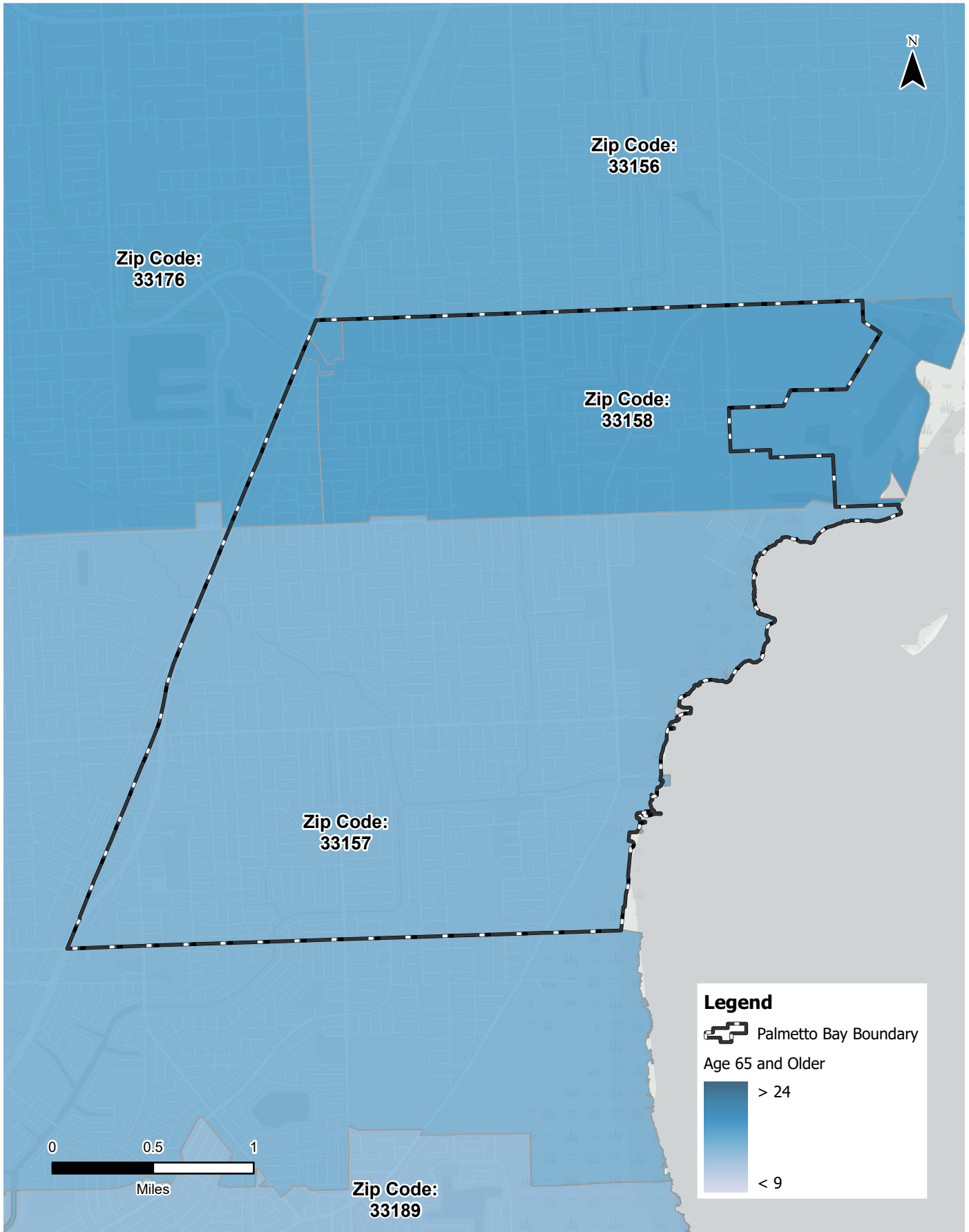


Figure 5-13: Heat Sensitivity: English as Second Language

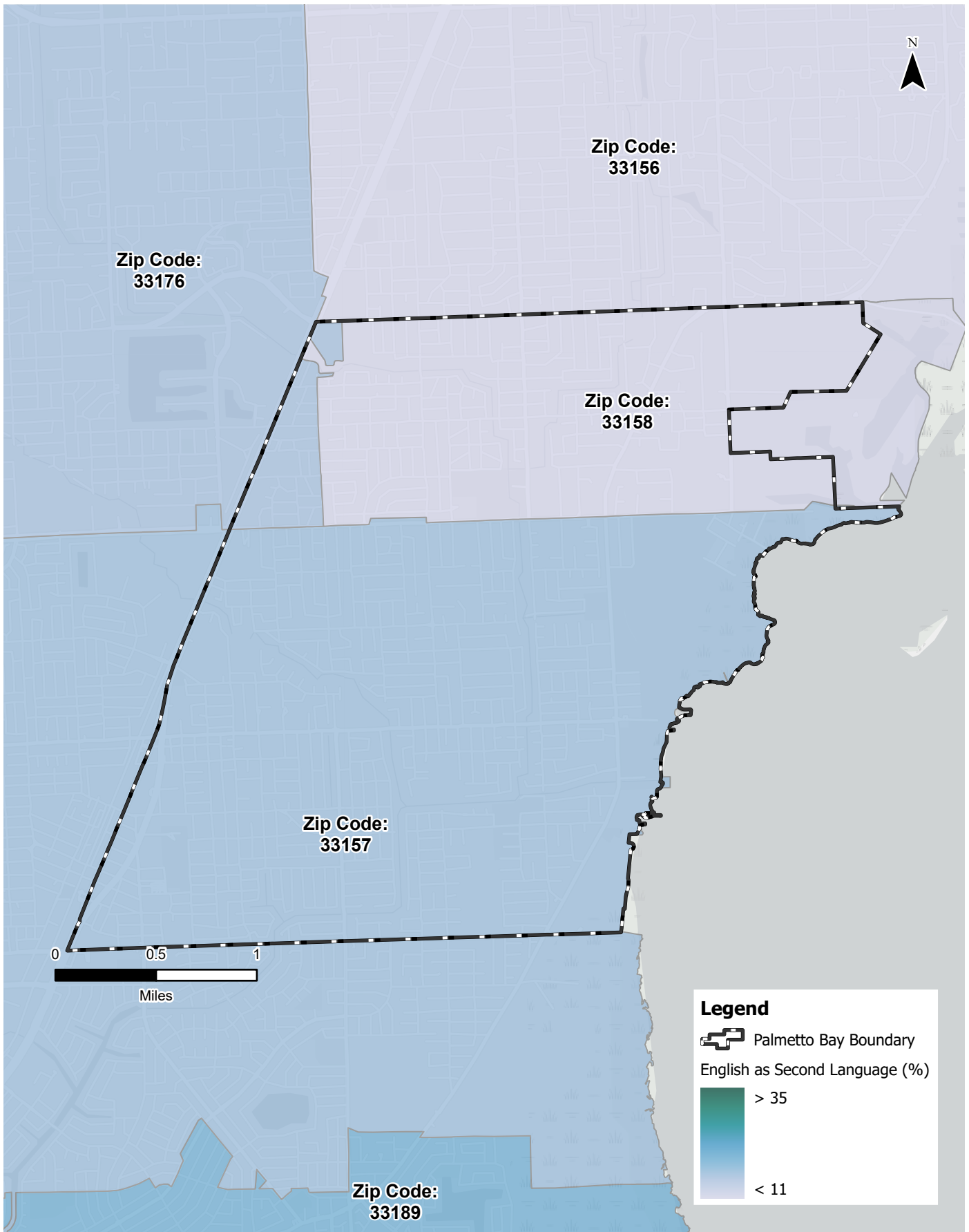


Figure 5-14: Heat Sensitivity: Population Living in Poverty

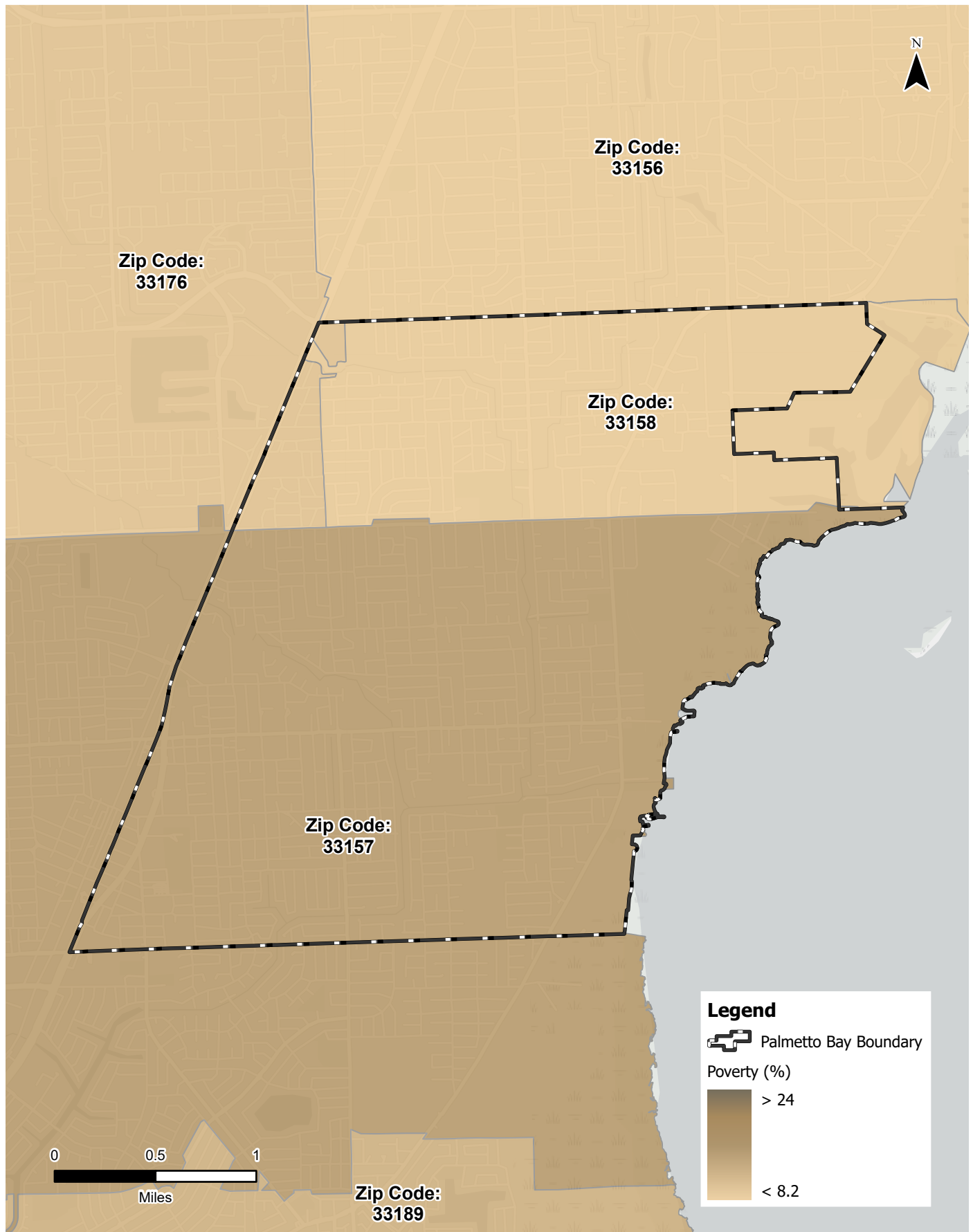
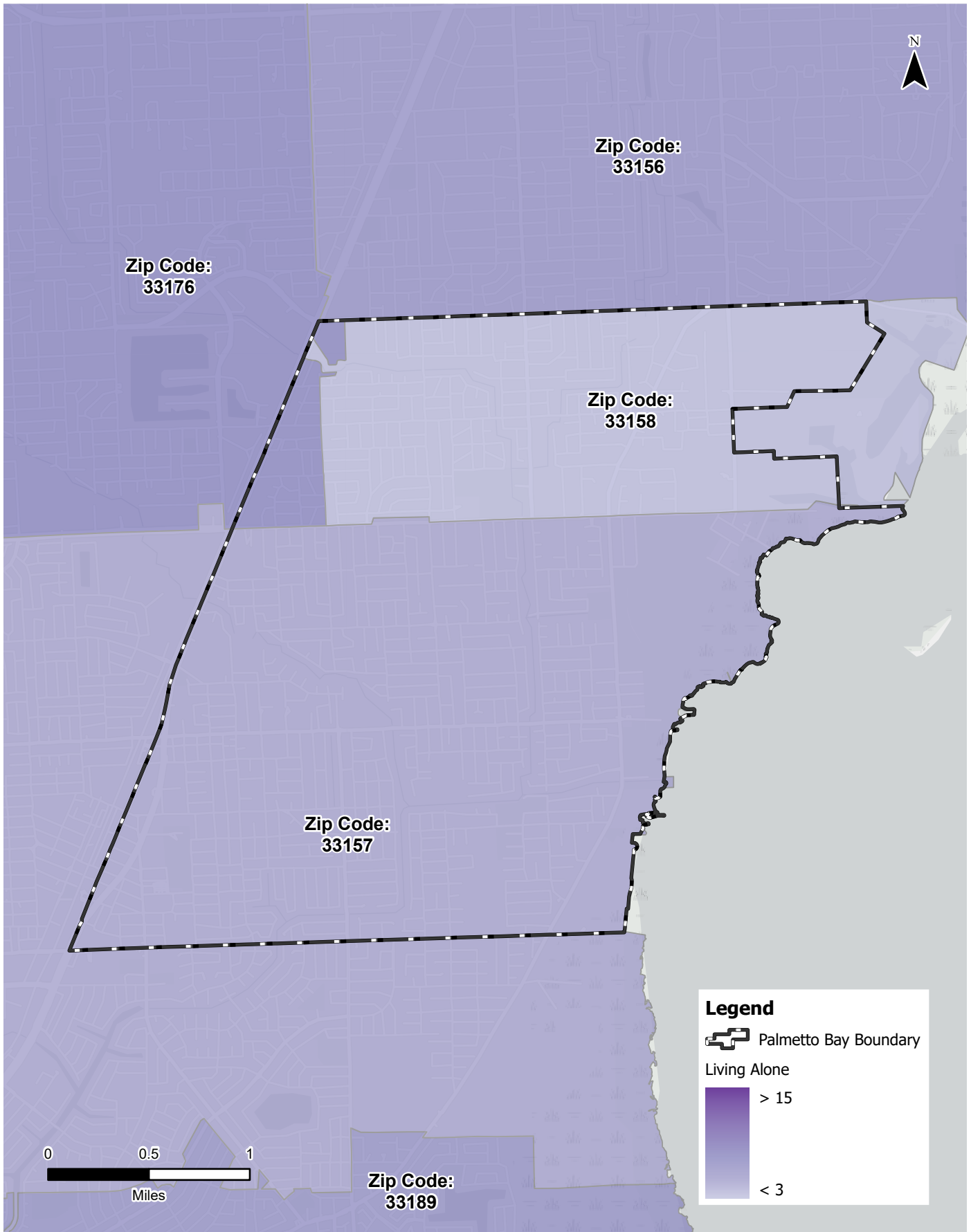


Figure 5-15: Heat Sensitivity: Population Living Alone





6.1 OVERVIEW

The adaptation actions outlined in this document will help Palmetto Bay to identify and implement tangible actions that will improve local resilience.

The Steering Committee underwent several brainstorming sessions and explored adaptation projects and approaches to create strategies that support the plan objectives and reflect the village's resilience needs. At the third Resilience Steering Committee meeting, committee members reviewed and discussed results and key findings from the vulnerability assessment. The findings were used to identify vulnerable assets and areas that should be addressed by the adaptation plan.



To facilitate the brainstorming process, the village's planning consultant reviewed examples of resilience and adaptation strategies and used a range of adaptation strategy categories to help committee members consider a variety of approaches.

The committee reviewed the resilience approaches outlined in the Florida Adaptation Planning Guidebook. The following adaptation categories were used to demonstrate how to develop a comprehensive approach to resilience:

- **Protection:** Structurally defensive strategies
- **Accommodation:** Alter physical design
- **Retreat:** Move away when protection and accommodation are not effective
- **Avoidance:** Guide new development away from at risk areas



01 Protection

Protection strategies are structurally defensive measures that directly protect vulnerable structures, allowing them to be left largely unaltered.



02 Accommodation

Accommodation strategies alter physical design of vulnerable structures to allow the structure or land use to stay in place with modification.



03 Retreat

Retreat from areas or infrastructure where protection or accommodation will not be efficient or effective can be voluntary, incentivized, or done gradually.



04 Avoidance

Avoidance involves guiding new development away from areas that are subject to coastal hazards and can be done by implementing policy and/or offering of incentives.

The committee also discussed key considerations, or various factors, to consider throughout the strategy development process. Such considerations included:

- **Plan Objectives:** ways to achieve plan goals and consider solutions to risk and vulnerability;
- **Barriers:** potential challenges that may limit strategy implementation;
- **Capability:** reasonable and feasible options given current and potential future resources;
- **Timeline for Implementation:** determine when project implementation can begin and how long it would take to complete; and
- **Plan Integration:** opportunities for adaptation strategies to complement actions and projects throughout the village and county
- **Potential Funding:** consider what types of projects have been funded through local, county, state, and federal programs



6.2 CAPABILITY ASSESSMENT

This section provides a summary of the Village of Palmetto Bay's capability to implement adaptation projects and reduce risk. The purpose of conducting a capability assessment is to determine the ability to implement a comprehensive adaptation strategy and to identify potential opportunities for establishing or enhancing specific adaptation policies, programs, or projects.

The assessment reviews existing mitigation activities, policies, regulations, and plans that pertain to adaptation and can affect vulnerability as well as administrative, technical, and fiscal resources that may support project implementation.

The capability assessment completed for Palmetto Bay serves as a critical planning step toward developing an effective resilience strategy. Coupled with the vulnerability assessment, the capability assessment helps identify and target effective goals, objectives, and potential adaptation actions that are realistically achievable.

Regulatory Capability

Regulatory capabilities, include planning and land management tools used to implement hazard resilience and adaptation activities evaluating regulatory capability also helps ensure an integrated approach to resilience, which is a crucial step in this planning process. To build upon past local, regional, and state efforts, the section below evaluates existing plans to identify what the community has already done that can be incorporated into this planning process. Below is a summary of local and regional plans and ordinances that are relevant to the Village of Palmetto Bay's resilience planning efforts.

Palmetto Bay Village-Wide Parks Master Plan, 2023



The parks master plan seeks to improve the parks system throughout Palmetto Bay. The plan provides an evaluation of existing parks, the potential for new park locations, and a needs

assessment to identify necessary improvements and priorities for future investment. Parks and open space play an important role in building resilience as they help manage flood water when covered in vegetation that can help increase infiltration and limit runoff. Similarly parks play a key role in mitigating extreme heat by reducing the urban heat index and providing shaded areas for residents to get out of the sun.

Maintaining and expanding park space in the floodplain or in flood-prone areas is a great way to add value to the community and protect against future flood. Parks increase social cohesion, provide a space for recreation and, reduce impacts of extreme heat and reduce the quantity of water requiring management. This plan supports the village's resilience efforts by exploring opportunities for park improvements and expansion. Future park locations were considered in the development of the adaptation action plan.

Village of Palmetto Bay 2035/2045 Comprehensive Plan

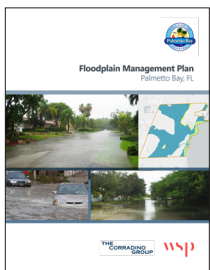
A comprehensive plan, also called a land use plan or general plan, establishes the overall vision for what a community wants to be and serves as a guide for future governmental decision making. Typically, a comprehensive plan contains sections on demographic conditions, land use, transportation elements, and community facilities. Given the broad nature of the plan and its regulatory standing in many communities, the integration of resiliency measures into the comprehensive plan can enhance the likelihood of achieving risk reduction goals, objectives, and actions.

The Village of Palmetto Bay's Comprehensive Plan is currently being updated and will be completed in 2025. The plan contains 12 elements, with goals, objectives,

and policies identified within each element. While all elements of the plan can be relevant to adaptation and resilience planning, several key elements include conservation and sustainability, coastal management, recreation and open space, and future land use.

The State of Florida requires that the comprehensive plan coastal management element language complies with the Peril of Flood requirements in paragraph 163.3178(2)(f) of the Florida Statutes. This language outlines the village's intent to restrict development activities from areas that would damage or destroy coastal resources and limit public expenditures in areas subject to natural disasters. The village's comprehensive plan fulfills these requirements.

Village of Palmetto Bay Floodplain Management Plan, 2023



A floodplain management plan (FMP) provides a framework for action regarding corrective and preventative measures to reduce flood-related impacts. The FMP is a key activity that receives credit under the Community Rating System (CRS) program. The CRS is an incentive-

based program that encourages communities to undertake defined flood mitigation activities that go beyond the minimum requirements of the National Flood Insurance Program. Each of the CRS mitigation activities is assigned a point value. As a community earns points and reaches identified thresholds, they can apply for an improved CRS class. The Village of Palmetto Bay is a Class 5 community and receives a discount of 25%.

Like this plan, the FMP identifies and evaluates flood hazards, assess critical assets, and conducts a vulnerability assessment to understand flood risk in Palmetto Bay. The village's plan covered the following hazards: coastal/canal bank erosion, dam/levee failure, flood (coastal and inland), hurricane and tropical storm, sea level rise, and stormwater/localized flooding. As many of the same hazards are covered in this plan, data and findings from the FMP will be included and expanded upon in this planning effort. The FMP also includes a mitigation strategy with 14 actions developed to reduce risk and vulnerability. Adaptation actions selected for this plan complement and build off of the projects included in the FMP.

Village of Palmetto Bay 2020 Stormwater Master Plan

A stormwater master plan is designed to address flooding associated with stormwater runoff. The stormwater master plan is typically focused on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding. The Palmetto Bay 2020 Stormwater Master Plan is an update of the 2014 plan and assess areas throughout the village for stormwater programming and priorities. This plan identifies priority sub basins and localized drainage improvement locations to implement capital improvement projects.

This plan helps the village identify areas with ongoing flood challenges and understand where future flooding may worsen. Several of the projects within the stormwater plan consider future impacts of sea level rise. These projects were considered and incorporated in the development of the adaptation action plan.

Palmetto Bay Multi-Modal Transportation Master Plan, 2025

Transportation networks are directly impacted by flood events. Floods can make roads and other transportation systems impassable when roads are inundated or damaged by water. Damaged and inundated roads can make properties inaccessible from fire, EMS services, and other emergency response vehicles.

The Village of Palmetto Bay is developing the 2025 Multi-Modal Transportation Master Plan to address the rapid growth in South Miami-Dade County and the increasing need for safer, more efficient infrastructure and services across all transportation modes. A primary goal for this plan is to create a connected, safe, and resilient community. Multi-modal transportation that is not solely centered around cars builds resilience within a community. Access to sidewalks, bike paths, and public transportation provides diverse options and alternative routes for travel, ensuring a more reliable and robust transportation system during disruptions or emergencies.

As the village develops the master plan, it will be important to consider the findings from this vulnerability assessment and understand how future flood hazards may impact the existing transportation infrastructure.

Miami-Dade County Local Mitigation Strategy, 2025

A local mitigation strategy is a community's blueprint for how it intends to reduce the impact of natural, and in some cases human-caused, hazards on people and the built environment. The essential elements of a hazard mitigation plan include a risk assessment, capability assessment, and mitigation projects.

The Village of Palmetto Bay has adopted the 2020 Miami-Dade County Local Mitigation Strategy (LMS). The previous LMS is being updated and will be finalized in 2025. The LMS includes flood mitigation related projects specific to the village, including drainage improvements, stormwater pumps, erosion control, emergency response support, and building retrofits. Detailed descriptions of these projects are included in Part 2 of the LMS.

Resilient 305 Strategy



The Resilient305 Strategy is a living strategy addressing resilience challenges prioritized through intergovernmental and community collaboration. It is designed to address key shocks (like storm events) and chronic stresses (like infrastructure failure). Early

implementation of the strategy has garnered nearly \$1 billion in direct and indirect funding to support resilience-related community improvement initiatives. The program uses a website (<https://resilient305.com/>) to track its progress. The Miami Resilience and Public Works Department is moving from planning to implementation stage with the associated Miami Forever strategic plan. In this process, they are integrating community engagement and building improved infrastructure for flood protection and stormwater management. This plan provides a model for integrating resilience across community efforts and setting up a framework for successful plan implementation.

Miami-Dade County Sea Level Rise Strategy



The development of the Miami-Dade Sea Level Rise Strategy was an action included in the Resilient305 Strategy. The plan has three primary components:

- Tells the story of the county's history of living with water and illustrates a vision to adapt communities to rising sea levels
- Details key actions and capital projects that will advance our adaptation goals, help the county recover, and create local jobs
- Provides information on the key challenges, along with the many opportunities to gracefully and equitably accommodate more water.

The plan includes adaptation approaches that consist of individual tools for the county and municipalities to implement for a comprehensive approach to sea level rise resilience. These tools will be implemented by the county but can also be tailored for local-level implementation based on the geography and physical characteristics of each community. The plan provides case studies, implementation guides, and location specific strategies that best fit a community's unique challenges. The plan can be explored and downloaded at the [Sea Level Rise Strategy ArcGIS Hub](#).

Adaptation strategies and approaches detailed in the county's strategy were consulted and incorporated into the development of this adaptation strategy. Integration between the two plans will ensure a coordinated approach to resilience.

Miami-Dade County Extreme Heat Toolkit



Miami-Dade County's Extreme Heat Toolkit was developed to provide a high-level briefing of various policy and project options identified by

the community to adapt to and mitigate extreme heat. The toolkit offers a glimpse into benefits and tradeoffs associated with adapting and mitigating extreme heat through strategies related to 1) Blue & Green Spaces; 2) Buildings and Transit; and 3) Communications and Community Engagement. The

toolkit provides several strategies for communities to address extreme heat. These strategies were reviewed, and relevant tools were incorporated into the adaption action plan.

Miami-Dade County Heat Vulnerability Assessment

The Miami-Dade Heat Vulnerability Assessment can be found on the county's website [Understanding Heat Exposure in Miami-Dade County](#). The assessment was development to understand how heat health risk varies across the county. The assessment analyzes each zip code for the severity of heat exposure, the prevalence of sensitive groups, and the area's ability to adapt to heat.

The heat vulnerability assessment was used to understand heat vulnerability in Palmetto Bay. Details of the findings are discussed in [Section 5](#) of this plan.

[Table 6-1](#) below summarizes regulatory capabilities and land management tools that can help support flood and heat adaptation.

Table 6-1: Regulatory Resilience Capabilities

Regulatory Tool (ordinances, codes, plans)	Comments
Zoning ordinance	Chapter 30 of the Code of Ordinances; contains the Village's Land Development Code
Subdivision ordinance	Part of Land Development Code; Sec. 30-80
Floodplain ordinance	Part of Land Development Code; Sec. 30-80
Sustainable building standards	Chapter 5 o the Code of Ordinance: Article II
Building code	Florida Building Code 8th Edition (2023)
Site Plan Review Requirements	Part of Land Development Code; Sec. 30-30.5
Capital Improvements Plan	Completed 2020
Flood Insurance Study or Other Engineering Study for Streams	FEMA 2009 FIS Report and 2021 Preliminary FIS Report; no local studies
Repetitive Loss Plan	Completed in 2024

Administrative and Technical Capability

The ability of a local government to develop and implement resilience projects, policies, and programs is directly tied to its ability to direct staff time and resources for that purpose. Administrative capability can be evaluated by determining how resilience-related activities are assigned to local departments and if there are adequate personnel resources to complete these activities. The degree of intragovernmental coordination among departments will also affect administrative capability for the implementation and success of proposed resilience activities.

Technical capability can generally be evaluated by assessing the level of knowledge and technical expertise of local government employees, such as personnel skilled in using geographic information systems (GIS) to analyze and assess community hazard vulnerability.

[Table 6-2](#) provides a summary of the village's relevant staff and technical resources.

Table 6-2: Administrative and Technical Capabilities

Personnel and Resources
Planner/Engineer with knowledge of land development/land management practices
Engineer/Professional trained in construction practices related to buildings and/or infrastructure
Planner/Engineer/Scientist with an understanding of natural and/or human caused hazards
Resilience Coordinator
Tree Advisory Board
Resiliency Committee
Personnel skilled in GIS
Full time Building Official
Floodplain Manager
Emergency Manager
Grant Writer
Public Information Officer
GIS data: flood zones/hazard areas
GIS data: critical facilities
GIS data: current and/or future land use
GIS data: building footprints
GIS data: links to Assessor's data

Based on village staff input on administrative resources and departments with responsibilities related to resilience, the village is well-equipped to implement the adaptation action plan. The village has staff availability and expertise to implement resilience initiatives, including integrating resilience into normal village functions. Coordination between personnel across various departments is essential to implementation of many resilience initiatives. To make the most of the administrative capability already in place, the village must continue to coordinate planning efforts across multiple departments. There are staff across multiple departments that can support a variety of projects through planning, development regulations and code enforcement, engineering, public education and outreach, and grant writing.

In addition to in-house capabilities, village staff has relationships and memberships with area organizations and stakeholders that can support local resilience efforts. The village should work closely with Miami-Dade County and South Florida Water Management District as both entities pursue regional resilience.

Fiscal Capability

The ability of a local government to implement resilience actions is often dependent on the amount of funding available to do so. This may take the form of outside grant funding awards or locally based revenue and financing. The costs associated with resilience policy and project associated with the creation and monitoring of a given program. In other cases, direct expenses are linked to a physical project such as the acquisition of flood-prone houses, which can require a substantial commitment from local, state, and federal funding sources.

Table 6-3 provides a list of available local fiscal resources that can be used to support resilience.

Table 6-3: Local Fiscal Resources

Fiscal Resources Resource
Capital improvements project funding
Authority to levy taxes for specific purposes
Impact fees for new development
Incur debt through special tax bonds

Based on village staff input on fiscal resources, the village has a few opportunities to generate and manage local funds to implement flood mitigation. Outside funding will likely be needed to supplement these resources. Potential sources for outside grant funding include Florida Department of Environmental Protection, South Florida Water Management District, Florida Department of Transportation, Miami-Dade County, and FEMA Hazard Mitigation Assistance grants.

6.3 PLAN GOALS

Goals are general guidelines that explain what is to be achieved. They are usually broad-based policy type statements and represent long term comprehensive visions. Goals help define the benefits that the plan is trying to achieve. Goals are also necessary to guide the review of possible adaptation measures and to ensure that recommended actions are consistent with what is appropriate for the village. Resilience goals need to reflect community priorities and should be aligned with other village plans.

The Resilience Steering Committee further refined the planning intentions into three plan goals. These goals offer broad approaches to building resilience and will serve as a guide for identifying adaptation strategies:

Table 6-4: Plan Goals

GOAL 1: Plan & Prepare	GOAL 2: Natural Resource Protection	GOAL 3: Holistic Approach
Protect people and property by preparing for future flood conditions and planning for quick and effective recovery.	Protect natural and environmentally sensitive areas and invest in strategies that enhance key ecosystem services that benefit the community and provide natural safeguards.	Prioritize strategies that provide protection, enhance people's everyday wellbeing, and maintain the character and vibrancy of Palmetto Bay.
		

6.4 PRIORITIZATION

To begin project prioritization, Palmetto Bay used a resilience scorecard developed by WSP that evaluates projects based on resilience criteria that a project should address, co-benefit impacts that a project can potentially provide, and considerations for ease of project implementation. The Resilience Scorecard was used to evaluate all strategies identified through this planning process and will also serve as a tool for integrating resilience considerations into other village actions. For example, the Resilience Scorecard can be used to evaluate capital improvement projects, comprehensive plan policies, and other village planning efforts.

Evaluation Criteria

The scorecard evaluates projects across three categories—Effectiveness, Implementation, and Benefits—to determine if one resilience project might be more important, more effective, or more likely to be implemented than another.

- **Effectiveness:** this category considers a project’s ability to withstand shocks and stressors, whether it will provide long-term benefits, and its ability to be replicated or expanded.
- **Implementation:** this category considers the feasibility of project implementation, alignment with other village planning initiatives, and potential obstacles.
- **Benefits:** this category assesses the project’s ability to provide overall benefits to the village, including quality of life for residents, environmental quality and protection, and economic growth.

Several “resilience performance criteria” have been identified for each of these three main categories. To generate scores for each of the overarching categories, the projects are evaluated based on each of these criteria within the three categories. By scoring projects on these criteria, the village also documents the reasons and rationale for selection of projects to be implemented. The resilience scorecard, the performance criteria within each category, and the considerations for scoring are detailed in [Table 6-5](#).

Table 6-5: Resilience Scorecard

	Criteria	Description / Guiding Questions
Effectiveness	Resilient	Is the project itself able to withstand identified hazards and stressors?
	Redundant	Does the project reduce/avoid service interruptions?
	Sustainable	Does the project provide long-term benefits and minimize future mitigation needs?
	Scalable	Can the project be expanded or duplicated if successful? Does this project enable future project implementation?
	Targeted	Does the project benefit high or moderate vulnerability assets?
Implementation	Feasible	Can the strategy be implemented with existing administrative and technical capabilities?
	Supported	Does the strategy have political and public support?
	Integrated	Does the strategy align with other village planning goals and projects?
Benefits	Cost-Beneficial	Do the benefits of the projects outweigh the costs?
	Social Benefits	Does the strategy increase equity within the Town?
	Economic Benefits	Does the strategy support the local economy?
	Environmental Benefits	Does the strategy protect existing natural systems and resources?

Scoring Process

Each resilience project is rated as negative, neutral, or positive for each of the criteria listed in [Table 6-5](#).

- **Negative** (-1 point) = the project opposes the criteria (i.e. costs outweigh benefits, the project contradicts existing plans or policies, there is public or political opposition, etc.)
- **Neutral** (0 points) = the criteria are not relevant to the project, or the pros and cons are balanced
- **Positive** (1 point) = the project meets or provides benefits within the criteria

Points for each of the criteria are grouped and totaled for each of the three categories (effectiveness, implementation, and benefits) to provide a summary rating for each category and an overall prioritization score. For example, a project could receive an effectiveness score between 5 and -5 and an overall resilience score between 12 and -12. Strategies with resilience scores between 9 and 12 are considered high priority strategies, those with scores between 6 and 8 are medium priority, and those with scores of 5 or lower are low priority.

Project scores from the resilience scorecard were determined based on public and stakeholder input and feedback from the steering committee. Preliminary prioritization results were presented to the steering committee for final consensus.

Results of the resilience scorecard prioritization are presented in [Table 6-6](#).

Table 6-6: Resilience Scorecard Results

Action	Priority	Total	Effectiveness	Implementation	Benefits	Resilient	Redundant	Sustainable	Scalable	Targeted	Feasible	Supported	Integrated	Cost-Beneficial	Social Benefits	Economic Benefits	Environmental Benefits
Stormwater Pocket Parks	High	9	3	3	3	1	0	1	1	0	1	1	1	1	1	0	1
Green Infrastructure Requirement	Medium	7	2	3	2	0	1	1	0	0	1	1	1	1	0	0	1
Green Streets & Urban Heat Reduction	High	9	4	3	2	1	0	1	1	1	1	1	1	1	0	0	1
Stormwater System Modifications and Sea Level Rise Protection	Medium	8	4	3	1	1	1	1	0	1	1	1	1	1	0	0	0
Royal Coast Apartments Heat and Flood Protection	Low	5	3	1	1	1	0	1	0	1	0	0	1	0	1	0	0
Palmetto Bay Branch Library Resilience Upgrades	Medium	8	4	3	1	1	1	1	0	1	1	1	1	0	1	0	0

6.5 ADAPTATION ACTION PLAN

Table 6-7: Adaptation Action Plan

Strategy Title	Description	Hazard(s) Addressed	Asset(s) Addressed	Goal(s) Addressed	Priority	Lead Agency/ Department	Implementation Timeline
Stormwater Pocket Parks	Create small neighborhood parks or "Pocket Parks" intended to provide green space and incorporate blue and green infrastructure to manage water. This project aims to find space for water on a smaller scale throughout the village. These should be passive parks that utilize existing open space or locations where pavement can be removed for green and blue infrastructure including rain gardens or "swales," trees, and permeable materials like gravel and shells. These parks should also provide signage and opportunities to describe and showcase innovative stormwater management and discuss resilience in the community.	Rainfall Induced Flooding, Stormwater Flooding	Natural, Cultural, & Historical Resources	2 and 3	High	Palmetto Bay Parks and Recreation, Palmetto Bay Public Services, Palmetto Bay Planning and Zoning	1-3 Years
Green Infrastructure Requirement	Update stormwater regulations to require all development to include green infrastructure options. Approaches include retrofits to parking lots and large site redevelopments that can be designed to reduce stormwater runoff.	Rainfall Induced Flooding, Stormwater Flooding	Critical Infrastructure, Natural, Cultural, & Historical	1	Medium	Palmetto Bay Planning and Zoning, Palmetto Bay Public Services	1-3 Years
Green Streets & Urban Heat Reduction	As the village updates the transportation master plan, explore opportunities to implement green street principles and strategies into future projects. Prioritize the placement of tree in the right of way to help reduce urban heat island effect. Consider opportunities for permeable pavement, utilize the existing right of way to plant trees and install bioswales, rain gardens, and other stormwater features that help reduce runoff, filter water. Such techniques should be considered as the village takes the lead on multi-modal connectivity along the SMART corridor.	Rainfall Induced Flooding, Stormwater Flooding, Storm Surge, Extreme Heat	Transportation and Evacuation Routes	3	High	Palmetto Bay Public Services, Miami-Dade Transportation and Public Works	3-5 Years
Stormwater System Modifications and Sea Level Rise Protection	Implement stormwater system modifications outlined in the 2020 Village of Palmetto Bay Stormwater Master Plan to mitigate flood risks and increase the infrastructures resilience to sea level rise. Secure funding for the projects designed for the following sub-basins: #11, #12, #39, #41, #42, and #43. Note all projects have completed design and permitting.	Stormwater, Rainfall Induced Flooding, Sea Level Rise	Critical Infrastructure	1	Medium	Palmetto Bay Public Services	1-3 Years

Strategy Title	Description	Hazard(s) Addressed	Asset(s) Addressed	Goal(s) Addressed	Priority	Lead Agency/ Department	Implementation Timeline
Royal Coast Apartments Heat and Flood Protection	The ongoing affordable housing crisis in Miami-Dade County is expected to be exacerbated by increasing flood risks associated with sea level rise. Many areas vulnerable to the impacts of sea level rise include areas with affordable housing. Similarly, heat vulnerability disproportionately impacts lower-income households. Explore options for flood risk reduction and heat protection at the Royal Coast Apartments. Potential projects include HVAC elevation, onsite stormwater management, and reflective roof upgrades.	Extreme Heat, Sea Level Rise, Rainfall Induced Flooding, Storm Surge	Critical Community & Emergency Facilities	1 and 2	Low	Palmetto Bay Public Services, TRG Management Company	5+ Years
Palmetto Bay Branch Library Resilience Upgrades	The Palmetto Bay Branch Library is an important place for community gathering and serves as the village's cooling center. The library should ensure that its infrastructure is protected from future flood risks and can continue to operate during periods of high demand. Verify/provide backup power sources for critical facilities with no/unknown generator access to ensure occupants and residents have access to safe spaces during extreme weather events and ensure continuity of critical services. Consider projects such as elevation of electrical equipment, purchase of back-up generator and other forms of energy, redundancy, increase shade on park/property grounds (solar shading, awnings).	Extreme Heat, Sea Level Rise	Critical Community & Emergency Facilities	1 and 2	Medium	Palmetto Bay Parks and Recreation	3-5 Years

Project Focus Areas

The map in [Figure 6-1](#) displays the adaptation action plan project focus areas. These areas correspond to the locations of the selected adaptation projects. Some project focus areas are asset specific while other encompass a larger area within the village. It is important to understand where other relevant assets are located in relation to the adaptation projects. [Figure 6-2](#) displays each focus area and assets within each area as well as neighboring assets. [Table 6-8](#) provides a list of the assets within or in close proximity to each project focus area.

Table 6-8: Assets Near Project Focus Areas

Asset Name	Asset Type	Asset Group	Project Focus Area
Palmetto Bay Collegiate Senior High School	School	Community and Emergency Facilities	Stormwater project sub-basin 11
Lorenzo's Enterprise Group	Healthcare Facility	Community and Emergency Facilities	Stormwater project sub-basin 11
Royal Coast Apartments	Affordable Public Housing	Community and Emergency Facilities	Royal Coast Apartments
ID: 5035D0060001	Outfalls	Critical Infrastructure	Stormwater project sub-basin 42
ID: 5034D0060002	Outfalls	Critical Infrastructure	Stormwater project sub-basin 42
Golden Palms Assisted Living Facility INC	Healthcare Facility	Community and Emergency Facilities	Stormwater project sub-basin 12
(DA02759 : 16870 OLD CUTLER RD)	Historic Structure	Natural and Cultural Historical	Stormwater project sub-basin 12
(DA02816 : 7253 SW 168TH ST)	Historic Structure	Natural and Cultural Historical	Stormwater project sub-basin 43
Palmetto Bay Branch Library	Community Center	Community and Emergency Facilities	Palmetto Bay Branch Library
Mangrove Swamp	Wetland	Natural and Cultural Historical	Palmetto Bay Branch Library
Charles Deering Estate	Historic District	Natural and Cultural Historical	Stormwater project sub-basin 43
Biscayne National Park	Conservation Land	Natural and Cultural Historical	Palmetto Bay Branch Library
Deering Estate at Cutler	Conservation Land	Natural and Cultural Historical	Stormwater project sub-basin 43
NTD Road Segments: 39	Major Roadways – NTD	Transportation and Evacuation Routes	Stormwater project sub-basin 11, 12, 39, 41, 42, and 43
FDOT Road Segments: 3	Major Roadways - FDOT	Transportation and Evacuation Routes	Stormwater project sub-basin 11, 12, 42, and 43
Structure: 870232	Bridges	Transportation and Evacuation Routes	Stormwater project sub-basin 12
Structure: 870015	Bridges	Transportation and Evacuation Routes	Stormwater project sub-basin 12
Structure: 874293	Bridges	Transportation and Evacuation Routes	Stormwater project sub-basin 42
Structure: 874424	Bridges	Transportation and Evacuation Routes	Stormwater project sub-basin 41

Figure 6-1: Project Focus Areas

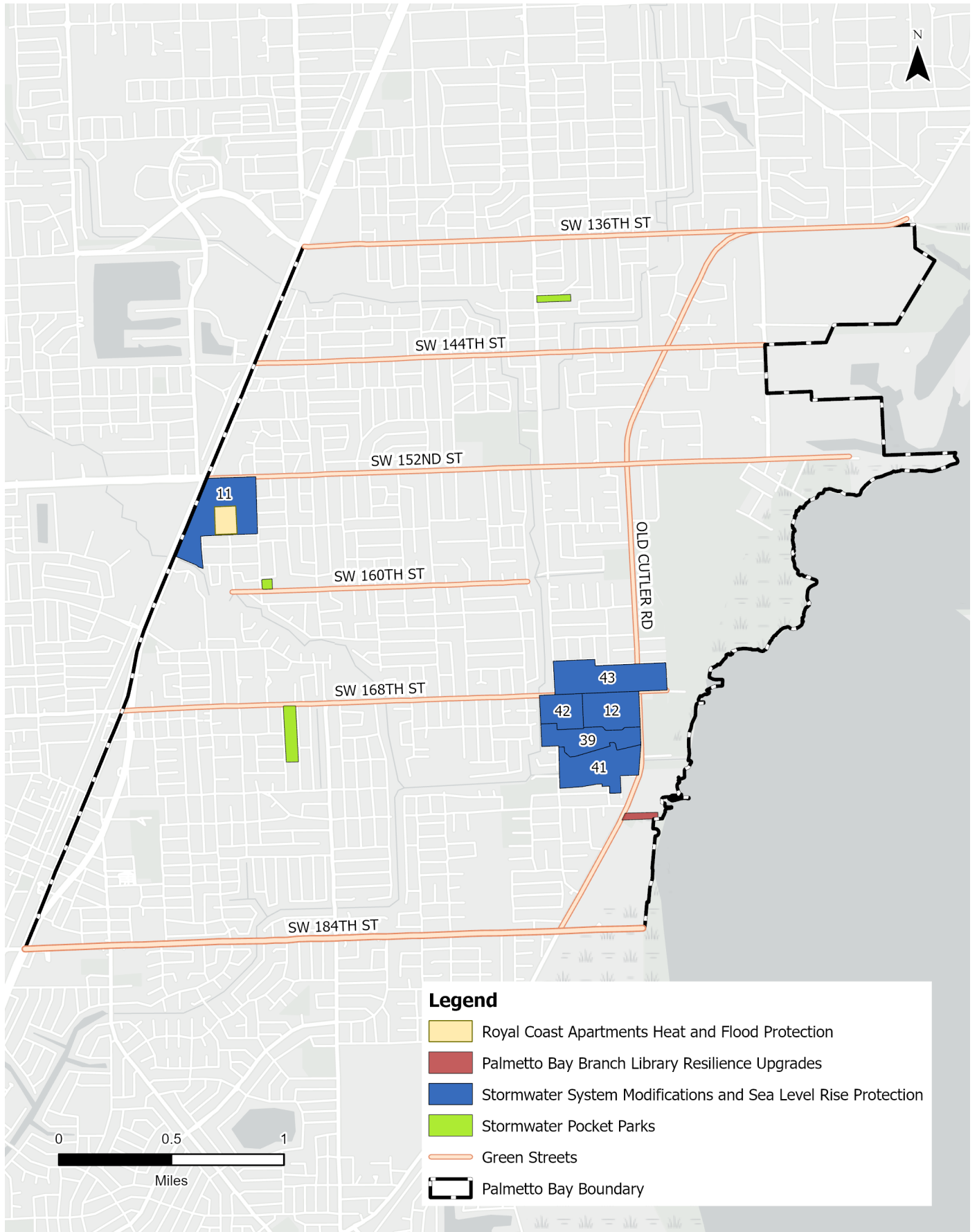
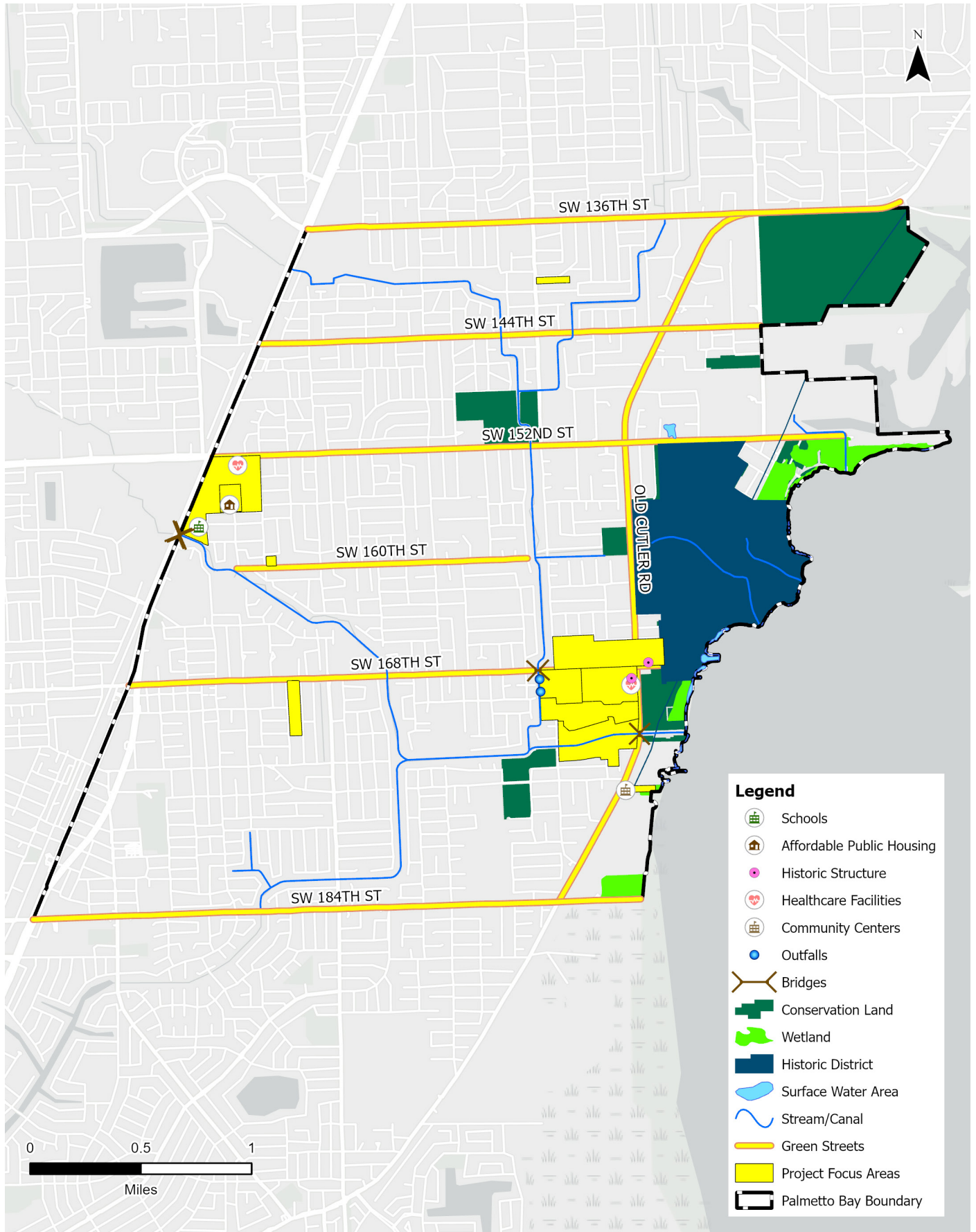


Figure 6-2: Assets Near Project Focus Areas



Project Details

The tables in this section outline details for each of the selected projects, and if applicable, are followed by a respective project map(s).

Stormwater Pocket Parks

Table 6-9: Project Details: Stormwater Pocket Parks

Project Name	Stormwater Pocket Parks
Project Description	Create small neighborhood parks or "Pocket Parks" intended to provide green space and incorporate blue and green infrastructure to manage water. This project aims to find space for water on a smaller scale throughout the village. These should be passive parks that utilize existing open space or locations where pavement can be removed for green and blue infrastructure including rain gardens or "swales," trees, and permeable materials like gravel and shells. These parks should also provide signage and opportunities to describe and showcase innovative stormwater management and discuss resilience in the community. The village will need to complete additional scoping and elevation analyses to determine the most suitable locations.
Location	Three initial locations have been suggested based on potential pocket park locations identified in the Palmetto Bay Parks Master Plan: SW 160th St/ SW 89th Ave; Palmetto Rd/SW 140th St; The Woods (S.W. 186th Street)
Source	Steering Committee input, public survey, Palmetto Bay Parks Master Plan, Miami-Dade County Sea Level Rise Strategy
Scoping Questions	What type of plantings and design features are most suitable to these locations? How will the village coordinate project implementation and coordination with landowners? Which areas provide the most suitable spaces for green infrastructure and stormwater management?
Hazard(s) Addressed	Rainfall induced flooding, stormwater flooding
Asset Group	Natural, Cultural, & Historical Resources
Estimated Timeline	1-3 years
Responsible Entity	Palmetto Bay Parks and Recreation, Palmetto Bay Public Services, Palmetto Bay Planning and Zoning
Potential Partners	Miami-Dade County Water and Sewer Department, Florida Power and Light, Miami-Dade County Parks, Recreation, and Open Spaces
Potential Funding Sources	General Obligation Bonds, Florida DEP (Parks and Open Spaces Florida Grant Program, Florida Recreation Development Assistance Program, Resilient Florida Program)
Estimated Cost	Rain gardens: \$10/square ft, Trees: \$500/ tree, additional cost of purchasing land.
Anticipated Benefit	Reduces flooding and the flow of water from heavy rainfall by slowing down, storing, and treating more runoff on-site. Increases shade and reduces urban heat, beautifies neighborhoods, sequesters carbon, and increases habitat for wildlife and plants. Increases park access and provides physical and mental health benefits for neighborhoods in need of green space, parks, recreation, and open space.
Examples/Case studies	City of North Miami Good Neighbor Stormwater Park; City of Bonifay Resilient Stormwater Park, Town of Lake Park Stormwater 2nd St Project; Hillsborough County Shimberg Park Parcel Flood Mitigation; Naturally Resilient Communities
Priority Rating	High

Figure 6-3 – Figure 6-5 displays three potential locations for pocket parks that were identified in the Palmetto Bay Parks Master Plan. Figure 6-6 displays a map of these suggested locations in relation to exiting open space, agricultural parcels, and existing parks within the village. This overview map can help the village begin to consider potential locations and strategically plan for the most viable sites. See Appendix C for details on occupancy and ownership of the identified parks and open space locations.

Figure 6-3: Stormwater Pocket Park Location 1



Figure 6-4: Stormwater Pocket Park Location 2



Figure 6-5: Stormwater Pocket Park Location 3

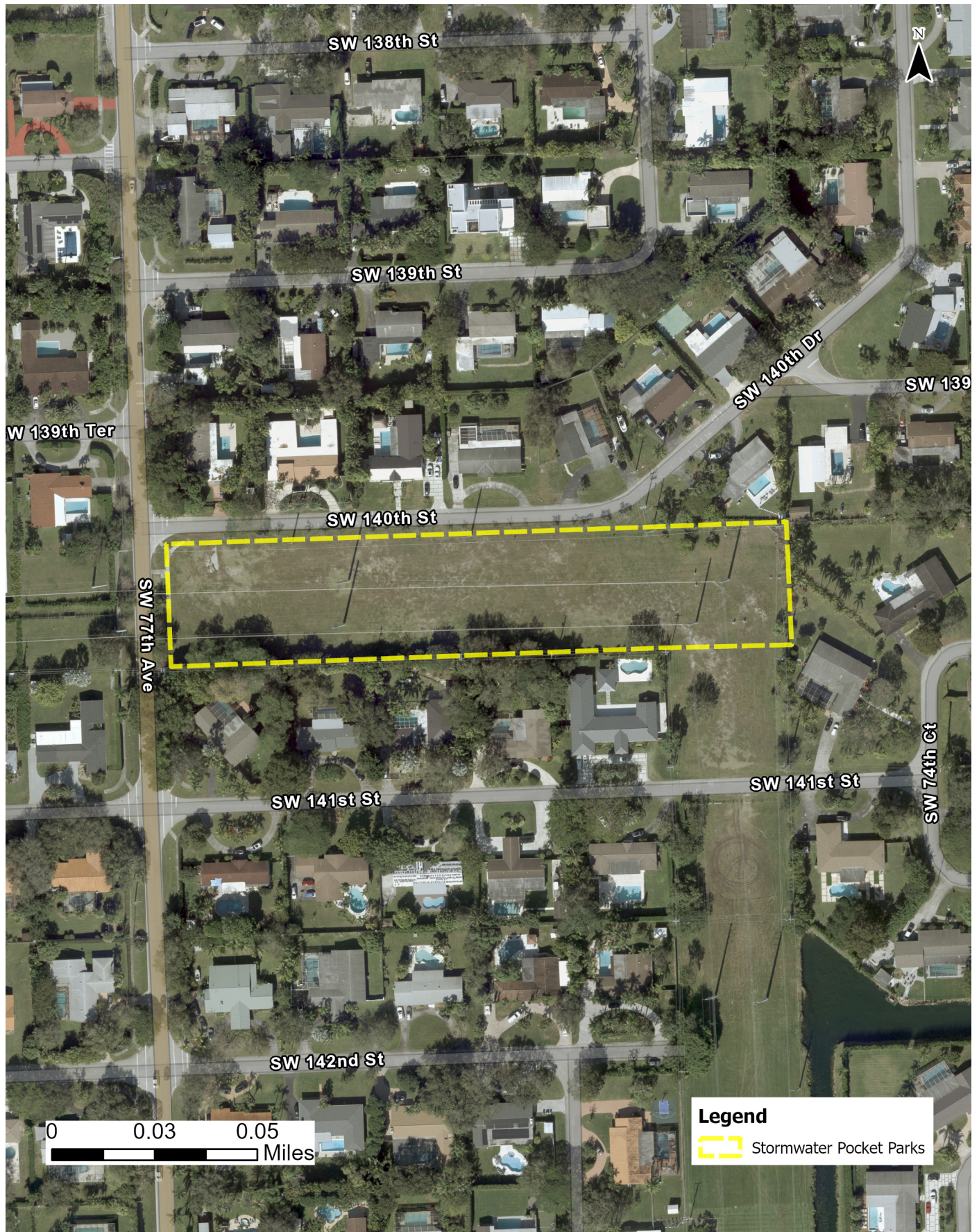
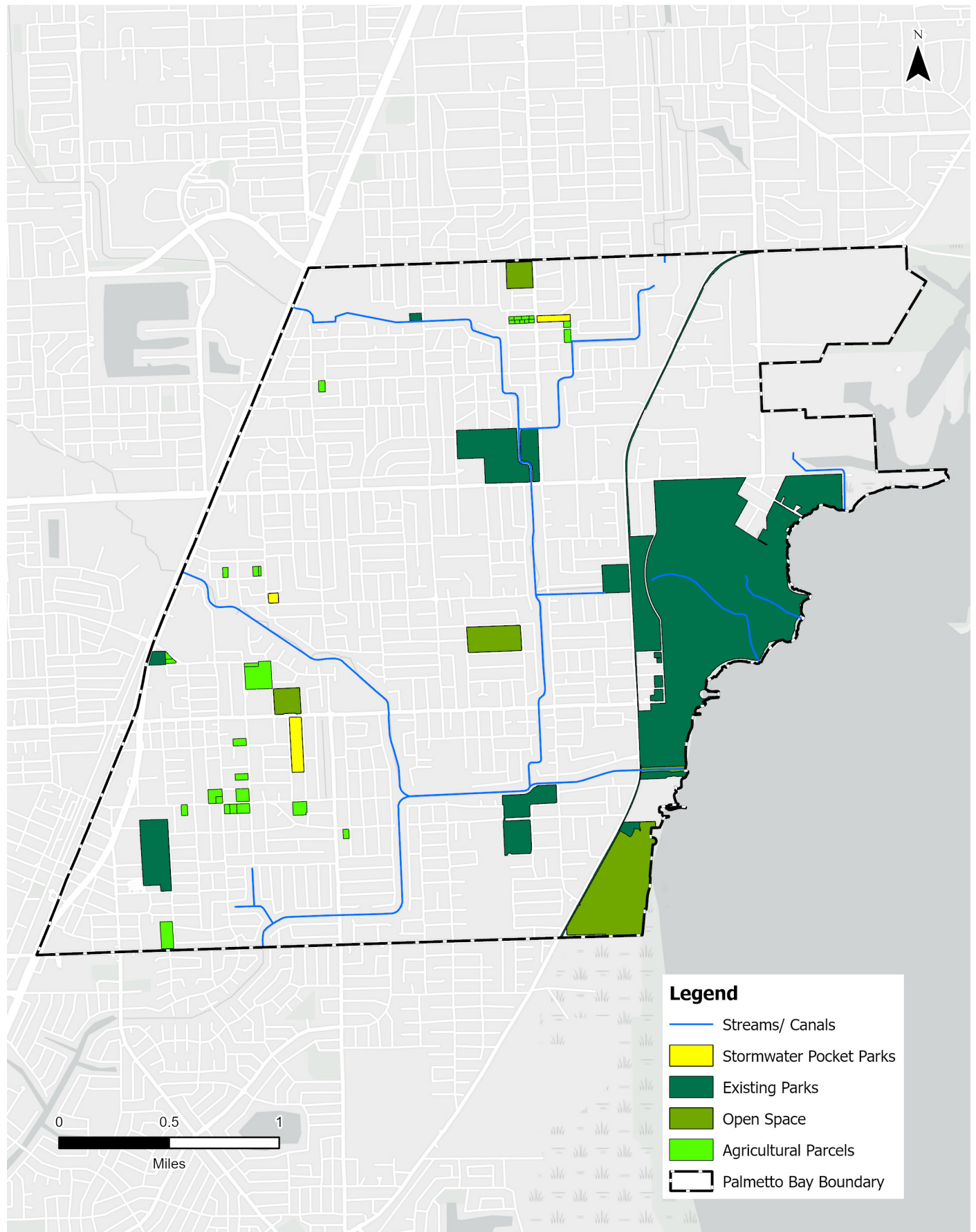


Figure 6-6: Stormwater Pocket Parks, Agricultural Parcels, Open Space, and Existing Parks



Green Infrastructure Requirement

Table 6-10: Project Details: Green Infrastructure Requirement

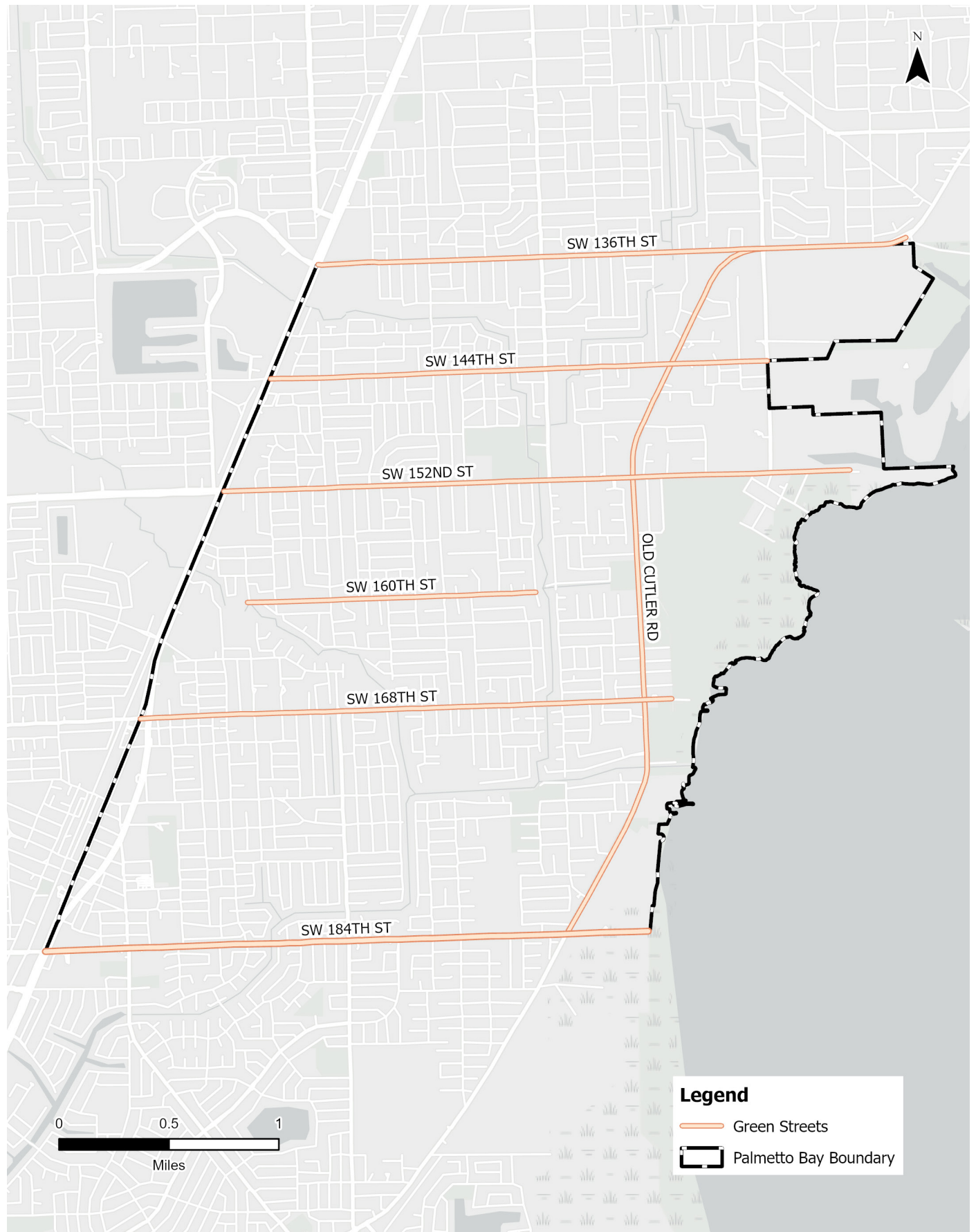
Project Name	Green Infrastructure Requirement
Project Description	Update stormwater regulations to require all development to include green infrastructure options. Approaches include retrofits to parking lots and large site redevelopments that can be designed to reduce stormwater runoff.
Location	Village-wide
Source	Steering Committee input, public survey, Miami-Dade County Sea Level Rise Strategy
Scoping Questions	What design standards should be included? How will these standards be enforced?
Hazard(s) Addressed	Rainfall induced flooding, stormwater flooding
Asset Group	Critical Infrastructure, Natural, Cultural, & Historical
Estimated Timeline	1-3 years
Responsible Entity	Palmetto Bay Planning and Zoning, Palmetto Bay Public Services
Potential Partners	Miami-Dade County
Potential Funding Sources	Operating Budget
Estimated Cost	Staff time
Anticipated Benefit	Can help reduce flooding in areas that could otherwise increase flood risk due to new development. Green infrastructure can manage the “first flush” of stormwater while producing significant cost savings for local governments. Can minimize heat islands and maintain and improve biodiversity as well as air and water quality. Can improve aesthetics of new development and surrounding area. This policy could support CRS Class 4 improvement.
Examples/Case studies/ Resources	Miami-Dade County; City of Austin, TX SITES requirements; Georgetown Climate Center Integrating <i>Green Infrastructure into Existing Processes</i>
Priority Rating	Medium

Green Streets & Urban Heat Reduction

Table 6-11: Project Details: Green Streets and Urban Heat Reduction

Project Name	Green Streets & Urban Heat Reduction
Project Description	As the village updates the transportation master plan, explore opportunities to implement green street principles and strategies into future projects. Prioritize the placement of tree in the right of way to help reduce urban heat island effect. Consider opportunities for permeable pavement, utilize the existing right of way to plant trees and install bioswales, rain gardens, and other stormwater features that help reduce runoff, filter water. Such techniques should be considered as the village takes the lead on multi-modal connectivity along the SMART corridor.
Location	Potential locations were selected based on regional bus stop locations associated with the South Dade Transitway and major corridors within the village: SW 136th St, SW 144th St, SW 152nd St, SW 160th St, SW 168th St, SW 184 th St, Old Cutler Rd
Source	Palmetto Bay Multi-Modal Transportation Master Plan, Miami-Dade County Sea Level Rise Resilience Strategy
Scoping Questions	How will these upgrades impact existing traffic patterns? What are the long-term maintenance requirements for the selected green infrastructure?
Hazard(s) Addressed	Rainfall Induced Flooding, Stormwater Flooding, Storm Surge, Extreme Heat
Asset Group	Transportation and Evacuation Routes
Estimated Timeline	3-5 years
Responsible Entity	Palmetto Bay Public Services, Miami-Dade Transportation and Public Works
Potential Partners	Palmetto Bay Planning and Zoning, Miami-Dade County Parks, Recreation, and Open Spaces
Potential Funding Sources	FDEP
Estimated Cost	Depends on the size and nature of the selected green street improvements. Planters: \$55/sq ft, \$500/tree
Anticipated Benefit	Green streets and greenways provide space for walking, biking and other recreational activities and alternatives to driving. They can reduce impacts of flooding and enhance natural habitats and water quality.
Examples/Case studies	Miami-Dade County Ludlam Trail, Naturally Resilient Communities, EPA Green Street Practices
Priority Rating	High

Figure 6-7: Green Streets & Urban Heat Reduction Project Locations

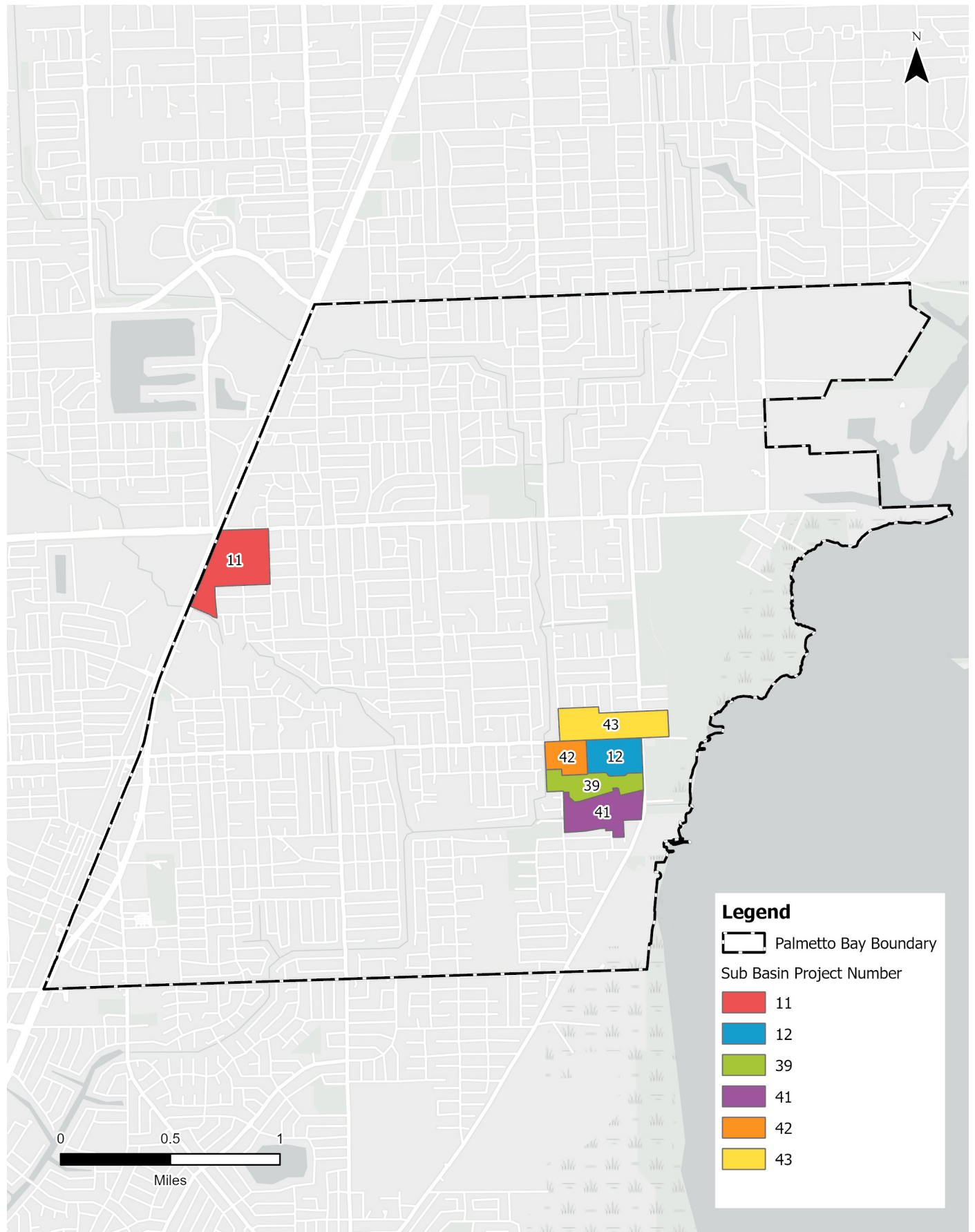


Stormwater System Modifications and Sea Level Rise Protection

Table 6-12: Project Details: Stormwater System Modifications and Sea Level Rise Protection

Project Name	Stormwater System Modifications and Sea Level Rise Protection
Project Description	Implement stormwater system modifications outlined in the 2020 Village of Palmetto Bay Stormwater Master Plan to mitigate flood risks and increase the infrastructures resilience to sea level rise. Secure funding for the projects designed for the following sub-basins: #11, #12, #39, #41, #42, and #43. Note all projects have completed design and permitting.
Location	Sub-Basins #11, #12, #39, #41, #42, and #43
Source	Steering Committee input, public survey, Village of Palmetto Bay Stormwater Master Plan, 2020
Scoping Questions	Are there any additional features or updates that should be added to the existing design? Can any green design strategies be integrated into the existing project?
Hazard(s) Addressed	Stormwater, Rainfall Induced Flooding, Sea Level Rise
Asset Group	Critical Infrastructure
Estimated Timeline	1-3 years
Responsible Entity	Palmetto Bay Public Services
Potential Partners	Miami-Dade County Environmental Resources Management, South Florida Water Management District
Potential Funding Sources	FDEP, Capital Improvement Budget
Estimated Cost	\$930,000 - \$1,570,000 (see project design for estimated costs)
Anticipated Benefit	These stormwater projects will help reduce flooding and upgrade existing infrastructure to better handle future impacts from sea level rise. Integrating projects from the stormwater master plan creates consistency across the Villages efforts to address flooding and increase the performance of existing infrastructure.
Examples/Case studies	Village of Palmetto Bay Stormwater Master Plan
Priority Rating	Medium

Figure 6-8: Stormwater System Modification and Sea Level Rise Protection: Sub Basin Project Locations

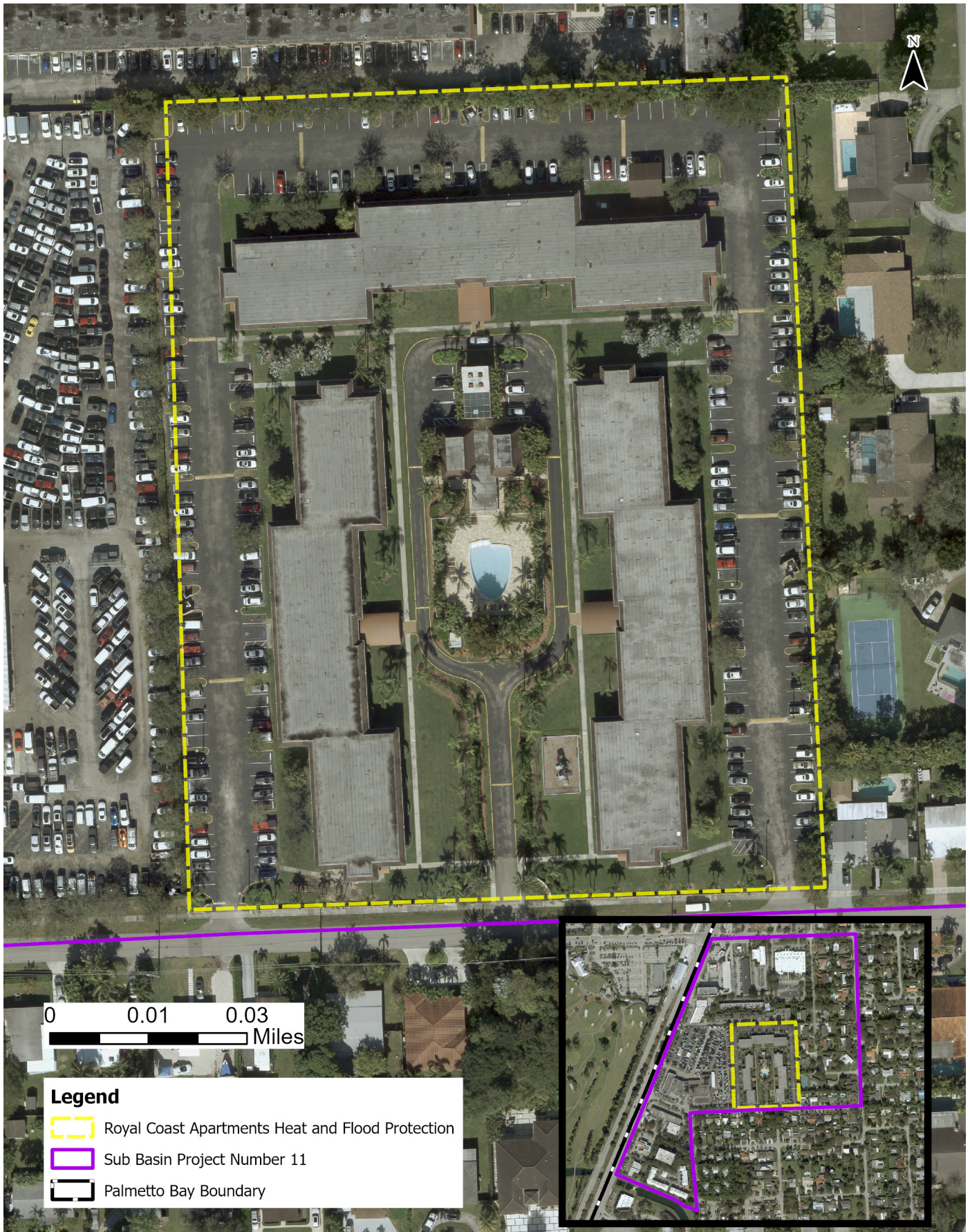


Royal Coast Apartments Heat and Flood Protection

Table 6-13: Project Details: Royal Coast Apartments Heat and Flood Protection

Project Name	Royal Coast Apartments Heat and Flood Protection
Project Description	The ongoing affordable housing crisis in Miami-Dade County is expected to be exacerbated by increasing flood risks associated with sea level rise. Many areas vulnerable to the impacts of sea level rise include areas with affordable housing. Similarly, heat vulnerability disproportionately impacts lower-income households. Explore options for flood risk reduction and heat protection at the Royal Coast Apartments. Potential projects include HVAC elevation, onsite stormwater management, and reflective roof upgrades.
Location	9001 SW 156th St, Palmetto Bay, FL 33157
Source	Miami-Dade County Sea Level Rise Strategy, Miami-Dade Heat Vulnerability Assessment
Scoping Questions	How will residents be accommodated during construction? Are there any existing or planned projects in the area that can be leveraged to address flood or heat risk and housing needs? What are the technical and financial feasibility of different mitigation options? How can the Village work with the property owner to incentivize upgrades?
Hazard(s) Addressed	Extreme Heat, Sea Level Rise, Rainfall Induced Flooding, Storm Surge
Asset Group	Critical Community & Emergency Facilities
Estimated Timeline	5+ years
Responsible Entity	Palmetto Bay Public Services, TRG Management Company
Potential Partners	Miami-Dade County Housing and Community Development
Potential Funding Sources	Miami-Dade Affordable Housing Trust Fund, HUD's Green and Resilient Retrofit Program to Combat Climate Change
Estimated Cost	Cool roof: \$0.75-\$4.50 sq/foot (depending on materials); Energy efficient window \$400/window (average)
Anticipated Benefit	Protects those that are typically disproportionately impacted by climate change and face health risks associated with extreme weather events. Climate-resilient housing can mitigate these risks by providing safe and comfortable living spaces during heatwaves and floods.
Examples/Case studies	Miami-Dade County Sea Level Rise Strategy, Miami-Dade Affordable Housing Framework, Disaster Preparedness for Affordable Housing Organizations
Priority Rating	Low

Figure 6-9: Royal Coast Apartments Heat and Flood Protection



Palmetto Bay Branch Library Resilience Upgrades

Table 6-14: Project Details: Palmetto Bay Branch Library Resilience Upgrades

Project Name	Royal Coast Apartments Heat and Flood Protection
Project Description	The Palmetto Bay Branch Library is an important place for community gathering and serves as the village's cooling center. The library should ensure that its infrastructure is protected from future flood risks and can continue to operate during periods of high demand. Verify/provide backup power sources for critical facilities with no/unknown generator access to ensure occupants and residents have access to safe spaces during extreme weather events and ensure continuity of critical services. Consider projects such as elevation of electrical equipment, purchase of back-up generator and other forms of energy, redundancy, increase shade on park/property grounds (solar shading, awnings).
Location	17641 Old Cutler Rd, Palmetto Bay, FL 33157
Source	Miami-Dade County Heat Vulnerability Assessment
Scoping Questions	What infrastructure components need to be elevated? Are there any components that cannot be elevated and require alternative flood protection measures? Will any existing equipment need to be replaced or upgraded as part of the elevation project?
Hazard(s) Addressed	Extreme Heat, Sea Level Rise
Asset Group	Critical Community & Emergency Facilities
Estimated Timeline	3-5 years
Responsible Entity	Palmetto Bay Parks and Recreation
Potential Partners	Miami-Dade County Public Library System
Potential Funding Sources	FDEP, Army Corps of Engineers, Florida Department of Water Resources (DWRM)
Estimated Cost	\$300,000 (generator installation and elevation)
Anticipated Benefit	Flood protection and power redundancy will support continued operation of the library as a cooling center during flood and extreme heat events.
Examples/Case studies	Jose Marti Park Adaptive Redesign; Monroe County, FL Harry Harris Park Resilient Redesign; South Battery Park, NY
Priority Rating	Medium

Figure 6-10: Royal Coast Apartments Heat and Flood Protection



APPENDIX A

ASSET INVENTORY

Table A-1: Asset Class and Type Table

Asset Class & Type			
CRITICAL COMMUNITY & EMERGENCY FACILITIES			
Affordable Housing			
Royal Coast			
Schools			
Westminster Christian School	Southwood Middle School	Lil Abner Foundation	Lincoln-Marti Schools - 168th St
Alexander School	Howard Drive Elementary School	Lincoln-Marti Schools - Wayne Ave	Palmetto Bay Academy
Perrine SDA School	Perrine Elementary School	Winhold Montessori Schools Inc.	Palmetto Bay Collegiate Senior High School
Palmer Trinity School	Coral Reef Elementary School	Raggedy Ann and Andys Pre School	Westminster Christian School
Alexander School (Old Cutler Rd)	KLA School of Palmetto Bay	Christ Fellowship Academy	3 C's Preschool
Alexander Montessori School	Little Wonders	-	-
Law Enforcement Facilities			
Palmetto Bay Police Department			
Dade County Metro Police Dept Cutler Ridge Mini Station			
Healthcare Facilities			
San Martin De Porras Assisted Living Facility INC. #2	BMA of South Miami; Fresenius Kidney Care South Miami	Nicklaus Children's Palmetto Bay	Adult Day Center of South of Florida
Chalet at Old Cutler LLC	Bethshalom Assisted Living Facility Corporation	Lorenzo's Enterprise Group	Casa Salcines A.L.F II Inc
Sun Bay Manor	T.L.C. Home, Inc	Lorenzo's Enterprise Group	Sun Bay Manor I
Golden Palms Assisted Living Facility Inc.	Grammercy Park Nursing & Rehabilitation Center	National Mental Healthcare, LLC	T.L.C. Retirement Home #1
Sunset Oak 1 Inc	Moseley, Katherine	Opus Hospice Center	Stein Gerontological Institute Inc
Sun Bay Manor II	Baptist Health Urgent Care		
Fire Stations			
Miami-Dade Fire Rescue St 50 (Perrine)			
Miami-Dade Fire Rescue St 62			
Community Centers			
Palmetto Bay Branch Library			
Local Government Facilities			
Village of Palmetto Bay Village Hall			
CRITICAL INFRASTRUCTURE			
Radio Communication Towers			
T-Mobile South LLC			
Post Office			
Perrine Post Office			
Electric Substations			
Florida Electric Substation			
Electric Transmission			
WHISPERING PINES - TAP150685 100-161-AC; OVERHEAD		CUTLER - SUNILAND 100-161-AC; OVERHEAD	
CUTLER - MITCHELL 100-161-AC; OVERHEAD		CUTLER - SOUTH MIAMI 100-161-AC; OVERHEAD	
CUTLER - NOT AVAILABLE 100-161-OVERHEAD		CUTLER - CORAL REEF 100-161-AC; OVERHEAD	
CUTLER - DAVIS 100-161-AC; OVERHEAD			

Asset Class & Type

Wastewater Treatment/Lift Stations

Casa Granada Condominium Association

Solid and Hazardous Waste Facilities – Municipal (FDEP)*

17535 SW 95TH AVE – Facility	7271 SW 168TH ST – Waste Processing Area
17535 SW 95TH AVE – Waste Processing Area	7895 SW 152 STREET – Facility
7271 SW 168TH ST – Facility	7895 SW 152 STREET – Waste Processing Area

Solid and Hazardous Waste Facilities – Small Quantity Generators (SQG)

LCA/South Motors Infiniti	Mainstreet Children's Dentistry	Industrial Conveyor Systems, Inc	Nations Auto Repairs
Zuzel Trujillo, DMD, PA.	Fall Chiropractic Center	J & R Engine Service	Harley-Davidson South, L.L.C.
Sardinas Corp./DBA Soler Auto Repair	Garrido Auto Repair, Corp.	Javier Sanchez, D.D.S., P.A.	Coral Reef Chiropractic Center
4WD Shop, Inc.	Auto Technician Benjamin Corp.	Jose Luis Ruiz, M.D.	Rattan Art Furniture, Inc.
Print 2000, LLC./ DBA Copy Express	South Japanese Care Corp.	Juan F. Quintero, DMD, PA	Valdes Auto Repairs
CME Arma	Morgan Tire & Auto, Inc./DBA Tires Plus	LCA/South Motors Infiniti	Banner Tire South
Garrido Auto Repair, Corp.	All In One I.R.A., Inc.	Mac Ivor Animal Hospital	H & H Power Steering Specialist
Efficient Automotive Inc.	USDA-ARS-SHRS	K & E Tire Shop, Inc.	Sega Brakes Inc.
Adams Electric Service Inc.	Anwaar's Auto Repair, Inc.	Zima's	Betty K Agencies (USA) L.L.C.
Dixie Animal Hospital	Abo Automotive, Inc.	Bello Enterprises Inc.\DBA Buckeye Body	Midway South Body Shop
Sarlaz International, Inc. DBA	Cutler Ridge Radiator	Scott's Auto Refinishing	Chadwell & Sons, Inc.
Oil Change USA of Perrine, Inc.	Mark A. Yaffey, D.D.S.	Motor Service Group Llc.	Coral Reef Animal Clinic
JS Auto Leasing & Sales, Inc.	All Pro Paint & Body Shop, Inc.	Walgreens Store 10470	Dixie Animal Hospital
Shift Transmissions, Inc./DBA A-AAA-A NA	Perfection Transmission & Auto	Toyo R, Inc./DBA Toyoar	Car Care International
Lord + Paul Auto Repair, Inc.	B & D Auto Tech, Inc.	AA & J South Dade Auto Paint and Body Shop	Perrine Cutler Press, Inc.
Miami Auto Collision	Banner Tire South	Land Rover South Dade LLC. Db a Land Rove	Al's Lawnmower Sales And
Ammunition Reloaders, Inc.	J.P. Custom Metals, Inc.	Verde Speed Machine Shop	Best Choice Silk Screen & Embr
Beautiful Smiles South Miami, PA.	C.L.R. Motor Sports	Best Choice Silk Screen & Embroidery, Inc	Chisyaswe, Inc./DBA Second Dim
Develop Miami Transmission Group	Aad Auto Repair Services, Inc.	Chadwell & Sons, Inc.	Aljoma Lumber, Inc.
Romi Dry Cleaners	City Graphics USA, Inc.	Floralba Vuelta, DDS, PA	Courtesy Ford Inc. DBA
Valdes Auto Repairs	Compete Medical Rehap	Bellsouth - M2650	Publix Store #0223
Main Street Children's Dentistry of Palm	Coral Reef Animal Clinic	Hydraulic Sales & Service Inc.	Anthony Auto Collision Center Inc.
Coral Reef Chiropractic Center P.A.	Coral Reef Standard, Inc./DBA	Shell #136630	Alt Mar Marine Service
Stephen E. Ezell, D.D.S., P.A.	Potamkin Hy Palmetto, L.L.C.\DBA Kendall H	Battery Sales	Badd Auto Service & Sale LLC
Bramart Jeeps & Auto Repair, Inc.	Dadeland Dodge Inc.\DBA Dadeland Dodge C	B & D Auto Tech, Inc.	Banner Tire South
Scott's Auto Refinishing	Dee V's, Inc./ DBA Dee V's Aut	Morgan Tire & Auto, Inc./DBA T	Marlin Motors Inc D/B/A South Florida Co
Nations Auto Repairs	Deering Bay Yacht & Country Club	South Japanese Care Corp.	J R Auto Sales of Miami, Inc.

Asset Class & Type			
Dade Pump & Supply Co. D/B/A	Easy Oil Change Corp. DBA Castrol Premiu	Courtesy Ford, Inc.	Adan Batteries
The Ed's Shop Corp.	CVS Pharmacy # 3421	Warren Henry Automobiles Inc/L	Morejon's Pro Automotive Specialist, Inc
Douglas B. Weinman D.D.S.	Eduardo's Auto Repair, Inc.	Badd Auto Service & Sale LLC	World Of Wheels Motorsports
One Low Price Cleaners	Amores Dental Care, P.A.	Glasspec Corporation	Anwaar's Auto Repair, Inc.
Padilla Auto Care	Glasspec Corporation	Viking Cabinets, Inc.	Quality Auto Repair
Cancas Services, Inc/DBA Nibaj	Harley-Davidson South, L.L.C.	Venus Labs\DBA Earth Friendly Products	Pitman Photo, Inc.
Shirley F. Simmonds, D.M.D.,P.A.	Carshop 24, L.L.C	Aramark Uniform Services	Trotta Tire of Miami, LLC.
Stormwater Ponds			
Six stormwater ponds			
SFWMD Infrastructure (culverts w/ risers)			
S118			
S123			
S700			
Canals and Levees			
C-100 - Canal	C-100B – Canal		
C-100 north levee – Levee segment (4)	C-100B north levee – Levee segment (2)		
C-100 south levee – Levee segment (4)	C-100B south levee – Levee segment (1)		
C-100 west levee – Levee segment (2)	C-100C – Canal		
C-100A – Canal	C-100C east levee – Levee segment (3)		
C-100A east levee – Levee segment (3)	C-100C north levee – Levee segment (3)		
C-100A south levee – Levee segment (2)	C-100C south levee – Levee segment (1)		
C-100A west levee – Levee segment (4)	C-100C west levee – Levee segment (1)		
Outfalls			
78 outfalls – see attribute data for outfall ID			
TRANSPORTATION AND EVACUATION ROUTES			
Bridges			
Structure: 874293	Structure: 874423	Structure: 874417	Structure: 874418
Structure: 870233	Structure: 874421	Structure: 870232	Structure: 870016
Structure: 874422	Structure: 874292	Structure: 874424	Structure: 870015
Airports			
Palmetto Bay Village Heliport			
Major Roadways – NTD			
1,232 road segments			
Major Roadways – FDOT			
Road: 87000067	Road: 87042500	Road: 87020001	Road: 87000081
Road: 87000502	Road: 87092500	Road: 87000498	Road: 87000074
Road: 87039000	Road: 87067508	Road: 87000451	Road: 87020000
Road: 87000496	Road: 87039500	Road: 87000068	Road: 87000069
Road: 87000065	Road: 87000080	Road: 87000071	Road: 87048500
Marinas and Boat Ramps			
Deering Point Canoe / Kayak Launch		Bill Sadowski Park and Nature Center - Canoe and Kayak Launch Beach	
Coral Reef Park - Canoe and Kayak Launch Beach		People's Dock	

Asset Class & Type			
NATURAL, CULTURAL, HISTORICAL ASSETS			
Historic Resources			
Old Cutler Road Historic Highway			
Charles Deering Estate			
US-1			
S.W. 72nd Avenue Road Segment			
Historic and Cultural Structures			
DA02807 : 8315 SW 153RD Terrace (Private Residence)	DA02758 : 16553 Old Cutler Rd (Private Residence)	DA05636 : 7201 SW 166 Street (Private Residence)	DA16447 : Boat Turning Basin
DA02815A : Charles Deering House	DA02759 : 16870 Old Cutler Rd (Private Residence)	DA15239 : 8001 SW 148TH Drive (Private Residence)	DA16448 : South Estate Wall
DA02815B : Richmond House and Cottage	DA02760 : 17301 Old Cutler Rd (Park)	DA15240 : 8025 SW 148TH Drive (Private Residence)	DA16449 : Carriage House (Coach House)
DA02815D : Charles Deering Estate Oolite Wall	DA02761 : 17800 Old Cutler Rd (Private Residence)	DA15241 : 8101 SW 148TH Drive (Private Residence)	DA16450 : Power House
DA02816 : 7253 SW 168th St (Private Residence)	DA06925 : Harry Troeger House	DA15242 : 8125 SW 148TH Drive (Private Residence)	DA16451 : Pump House (Water Storage House)
DA03185 : Perrine Elementary School	DA05626 : 6725 SW 144 Street (Private Residence)		
Churches			
Christ Fellowship		Old Cutler Presbyterian Church	
Chabad of Palmetto Bay		St. Andrews Episcopal Church	
Kingdom Hall of Jehovah's Witnesses		Christ Congregational United Church of Christ	
St. Thomas Lutheran Church		Perrine Seventh-day Adventist Church	
St. Richards Catholic Church		Amar Jyoti Mandir	
National Parks			
Biscayne National Park			
Shorelines (categorized by type)			
10D/4: Scrub-shrub wetlands/Coarse-grained sand beaches: 1		8A/10D: Sheltered rocky shores and sheltered scarps in bedrock, mud, or clay/Scrub-shrub wetlands: 1	
10D: Scrub-shrub wetlands: 10		8A: Sheltered rocky shores and sheltered scarps in bedrock, mud, or clay: 4	
1B: Exposed, solid man-made structures: 2		8B: Sheltered solid man-made structures: 7	
4: Coarse-grained sand beaches: 1		9B: Vegetated low banks: 12	
5: Mixed sand and gravel beaches: 2			
Wetlands			
Wetland Hardwood Forests: 7			
Surface Flowlines			
19 flowlines (see attribute data for asset ID)			
Surface Waters			
Biscayne Bay			
USGS Lake/Pond			
Conservation Lands			
Coral Reef Park	Ludlam Pineland	Deering Estate South Addition	Chapman Field Park
Deering Estate at Cutler	Deering Estate Powers Addition	Biscayne National Park	Biscayne Coastal Wetlands
Deering Estate North Addition	Bill Sadowski Park	Subtropical Horticultural Research Station	C100/Bayfront Property (Hass)

APPENDIX B

EXPOSURE ANALYSIS

FLOOD
SCENARIO
MAPS

Figure B-1: Current Conditions: 1%-Annual-Chance Flood

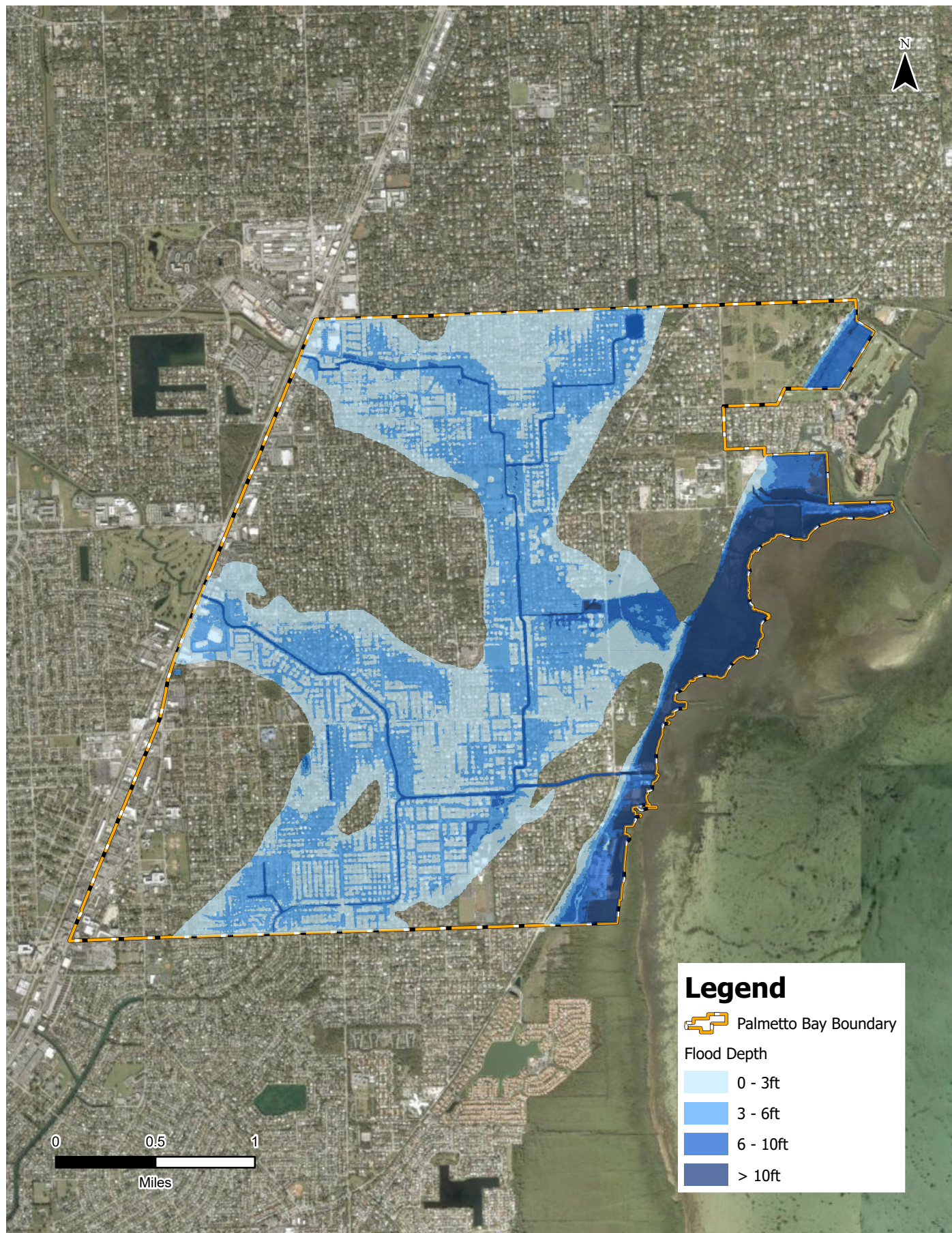


Figure B-2: Current Conditions: 25yr Precipitation Event

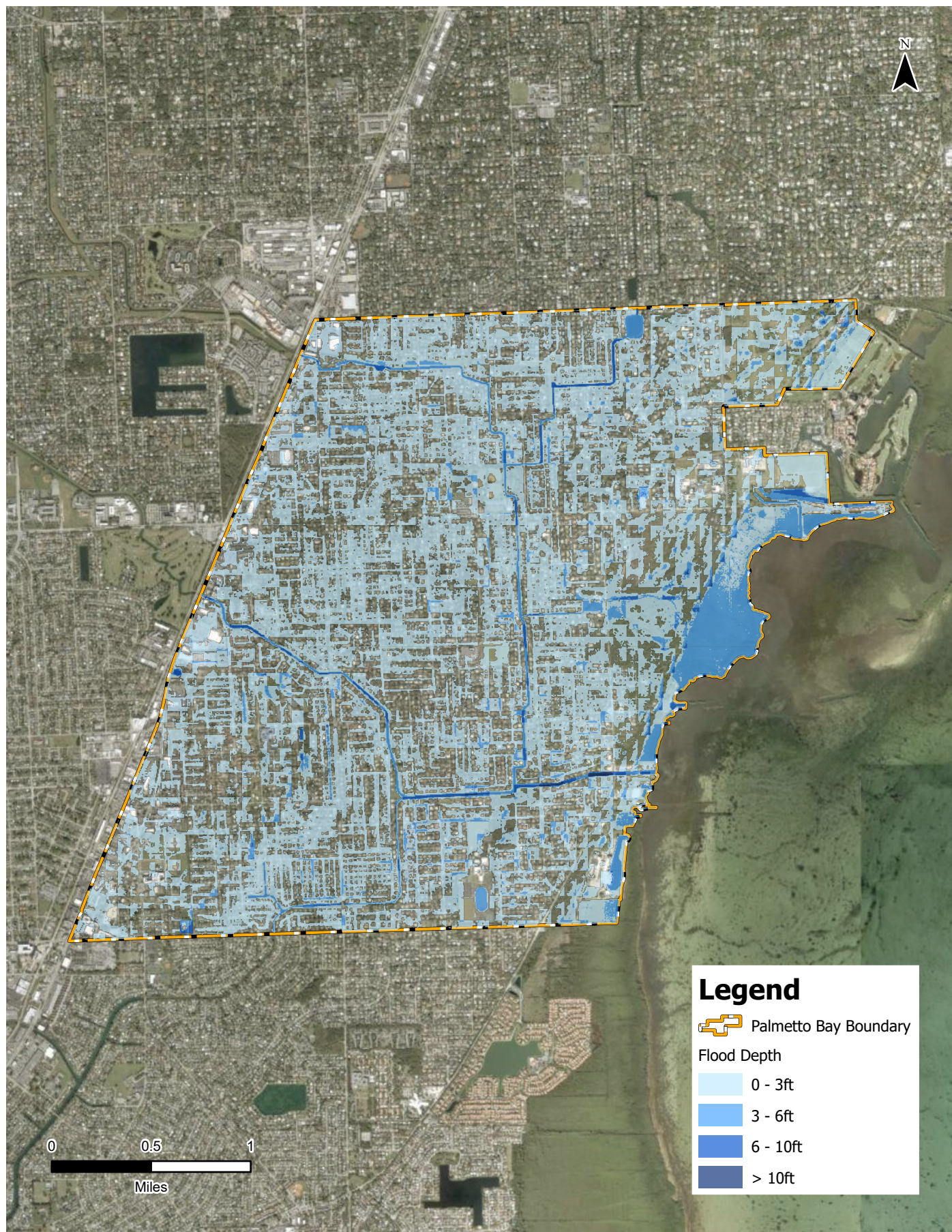


Figure B-3: Current Conditions: High Tide



Figure B-4: Current Conditions: Storm Surge (5yr)

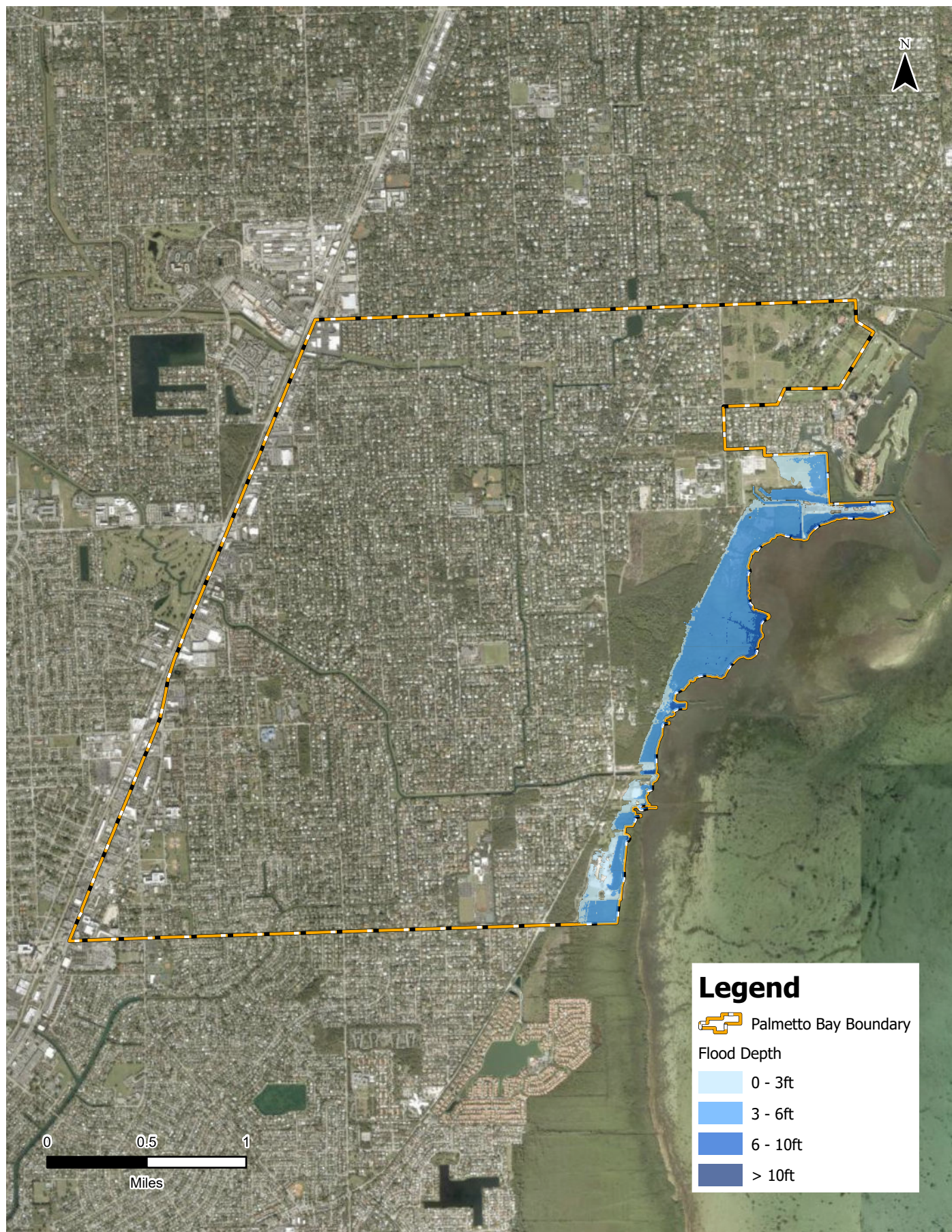


Figure B-5: Current Conditions: Storm Surge (100yr)

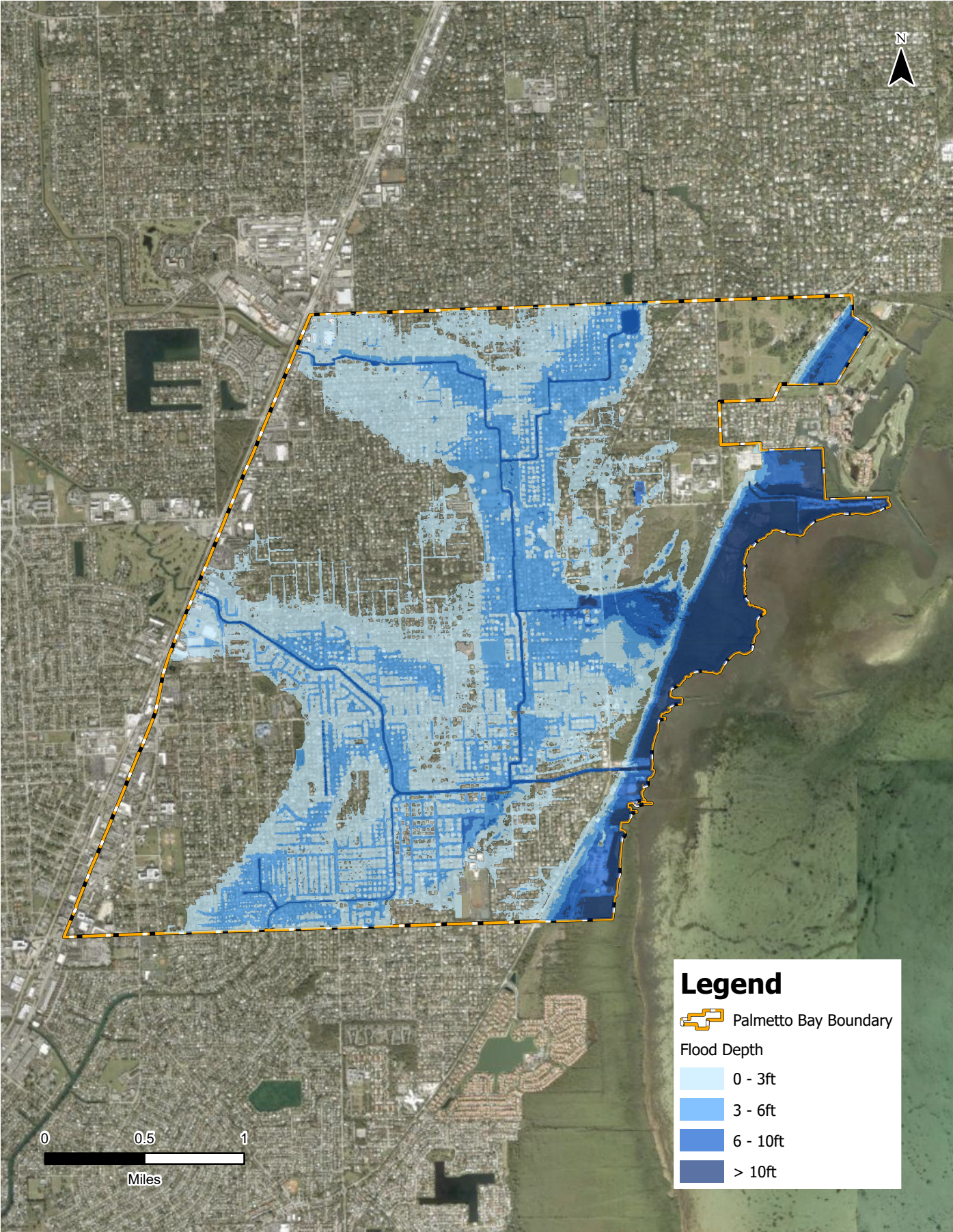


Figure B-6: Current Conditions: Storm Surge (1,000yr)

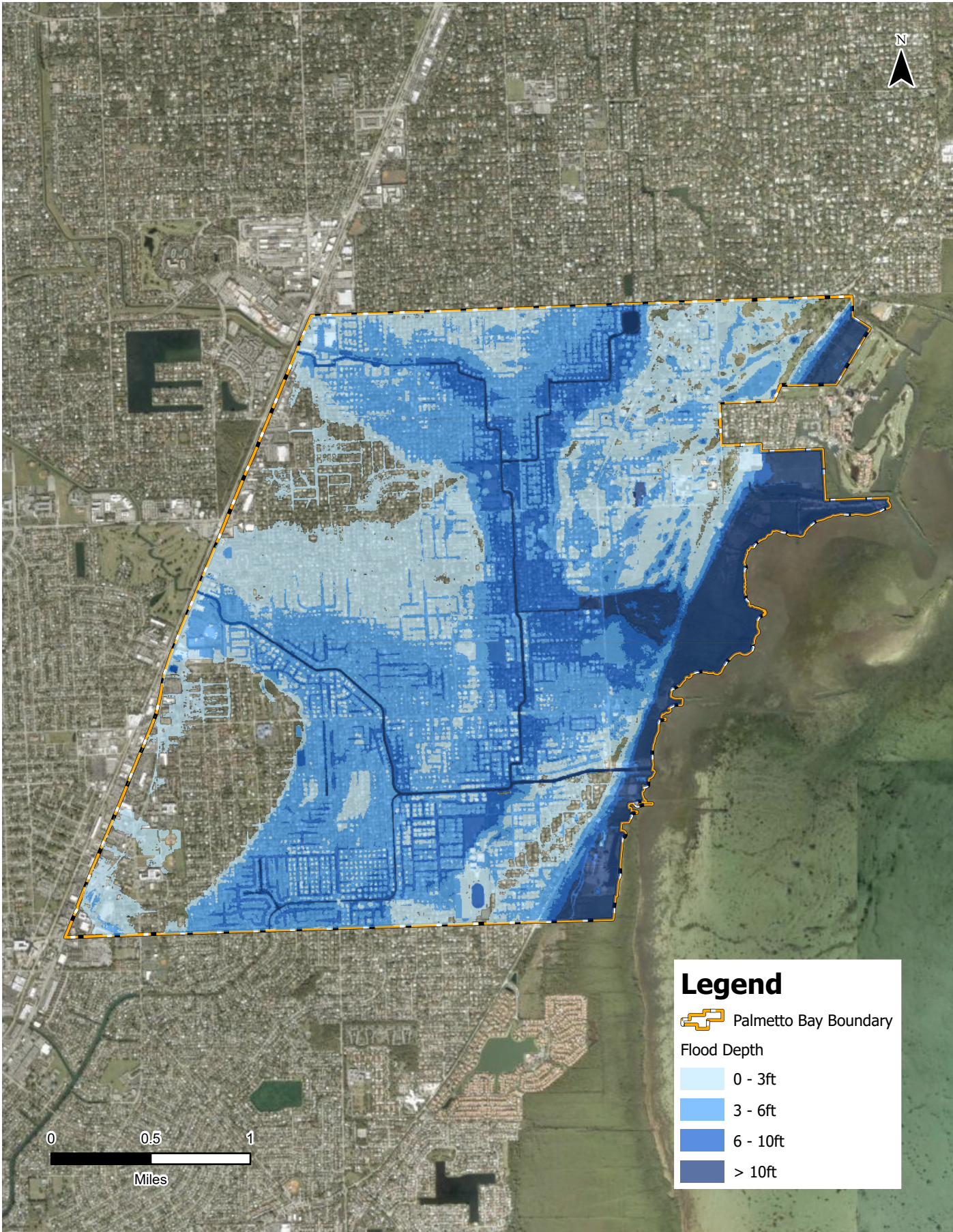


Figure B-7: 2030 Conditions: 2030 Sea Level Rise – Intermediate Low



Figure B-8: 2030 Conditions: 2030 Sea Level Rise – Intermediate High



Figure B-9: 2030 Conditions: Storm Surge (5yr) & 2030 Sea Level Rise – Intermediate Low

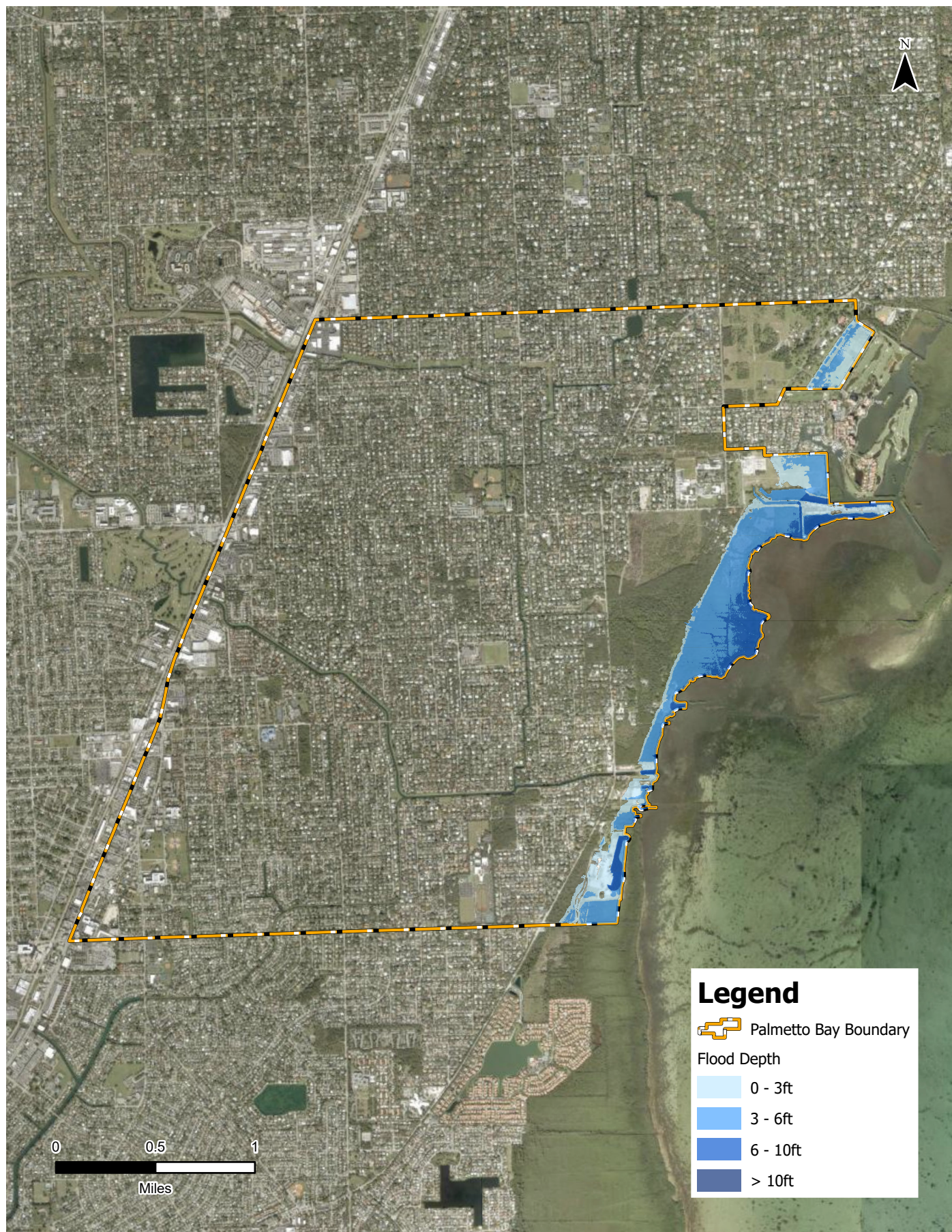


Figure B-10: 2030 Conditions: Storm Surge (5yr) & 2030 Sea Level Rise – Intermediate High



Figure B-11: 2030 Conditions: Storm Surge (100yr) & 2030 Sea Level Rise – Intermediate Low

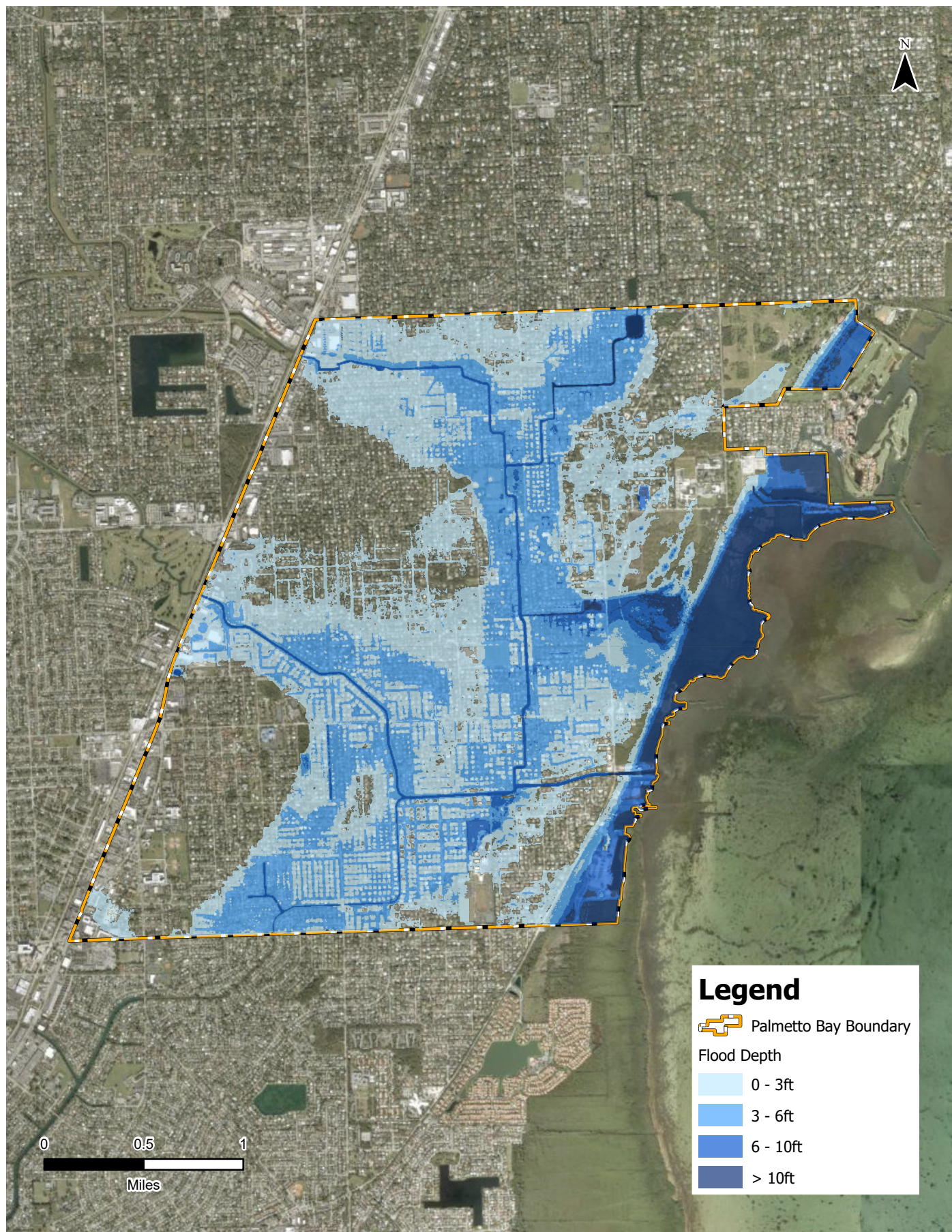


Figure B-12: 2030 Conditions: Storm Surge (100yr) & 2030 Sea Level Rise – Intermediate High

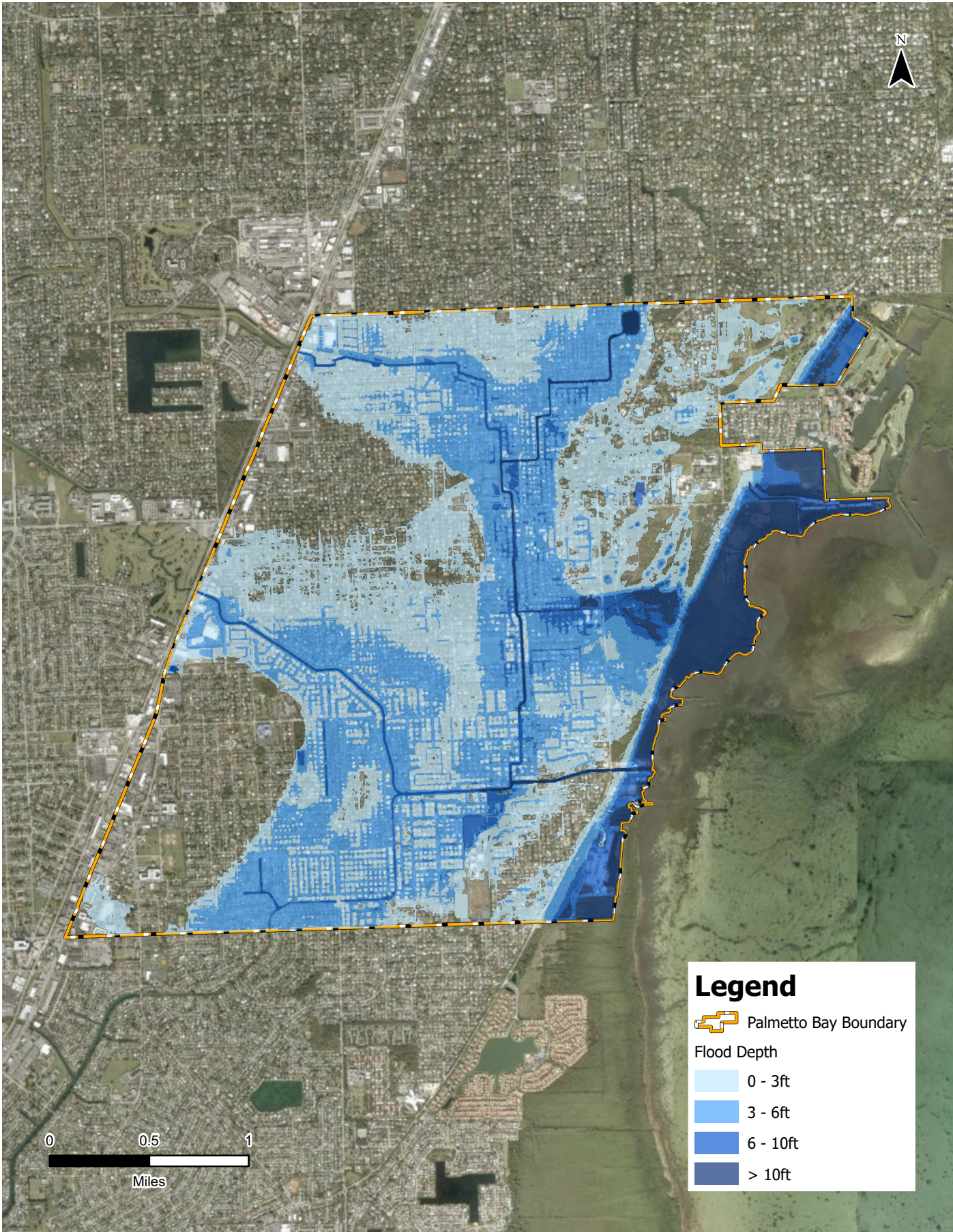


Figure B-13: 2030 Conditions: Storm Surge (1,000yr) & 2030 Sea Level Rise – Intermediate Low

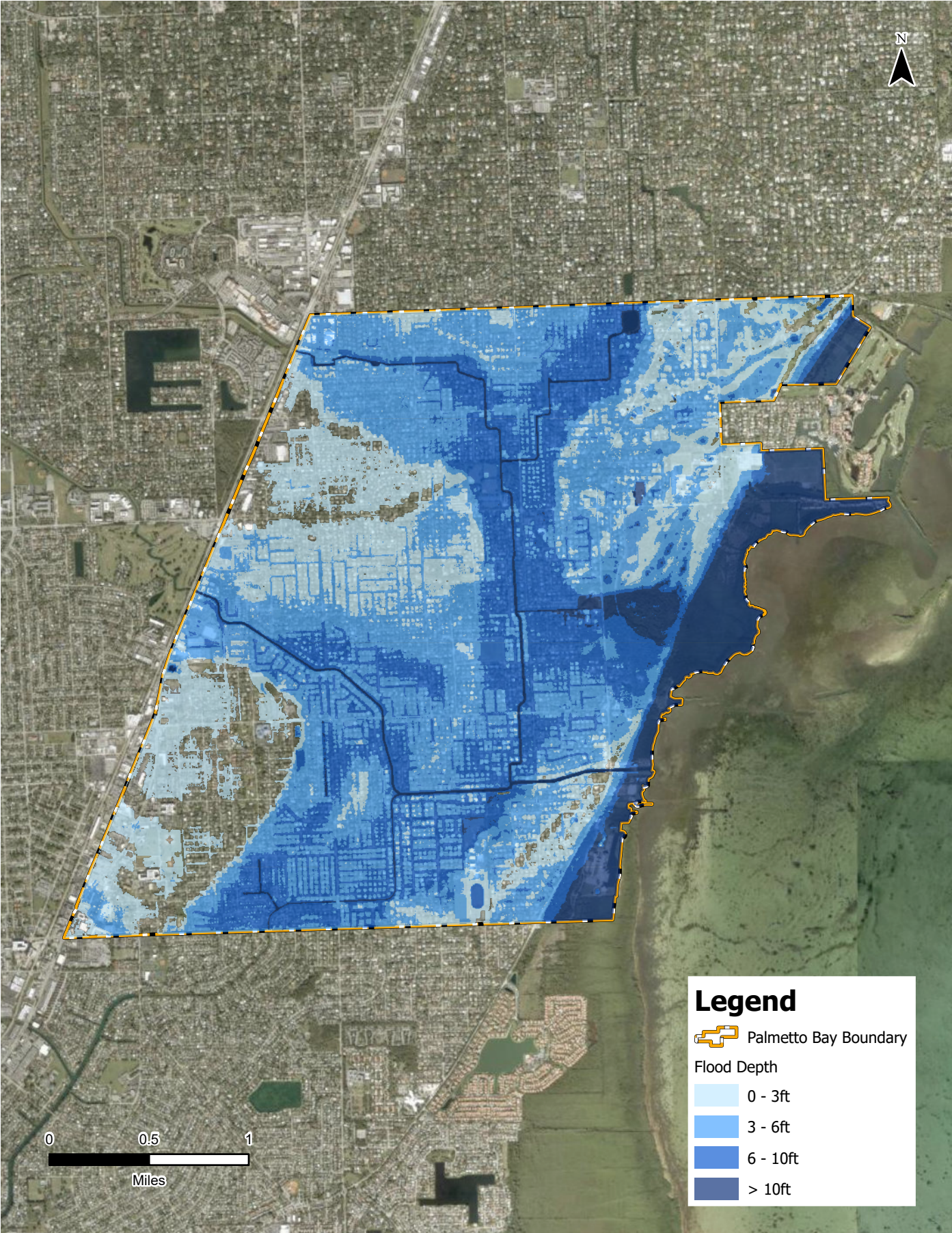


Figure B-14: 2030 Conditions: Storm Surge (1,000yr) & 2030 Sea Level Rise – Intermediate High

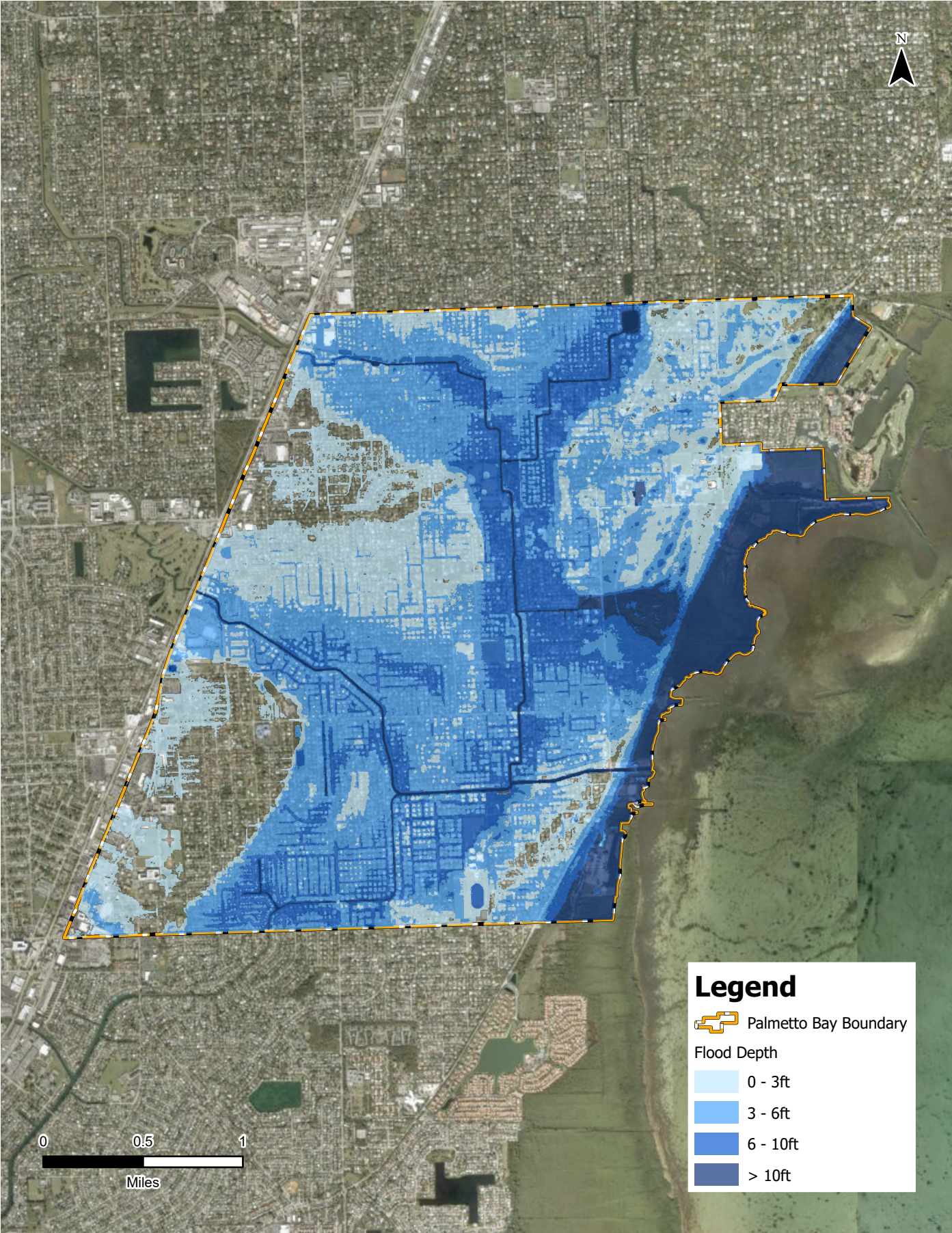


Figure B-15: 2040 Conditions: 2040 Sea Level Rise – Intermediate Low



Figure B-16: 2040 Conditions: 2040 Sea Level Rise – Intermediate High



Figure B-17: 2040 Conditions: 25yr Precipitation Event & 1ft Sea Level Rise

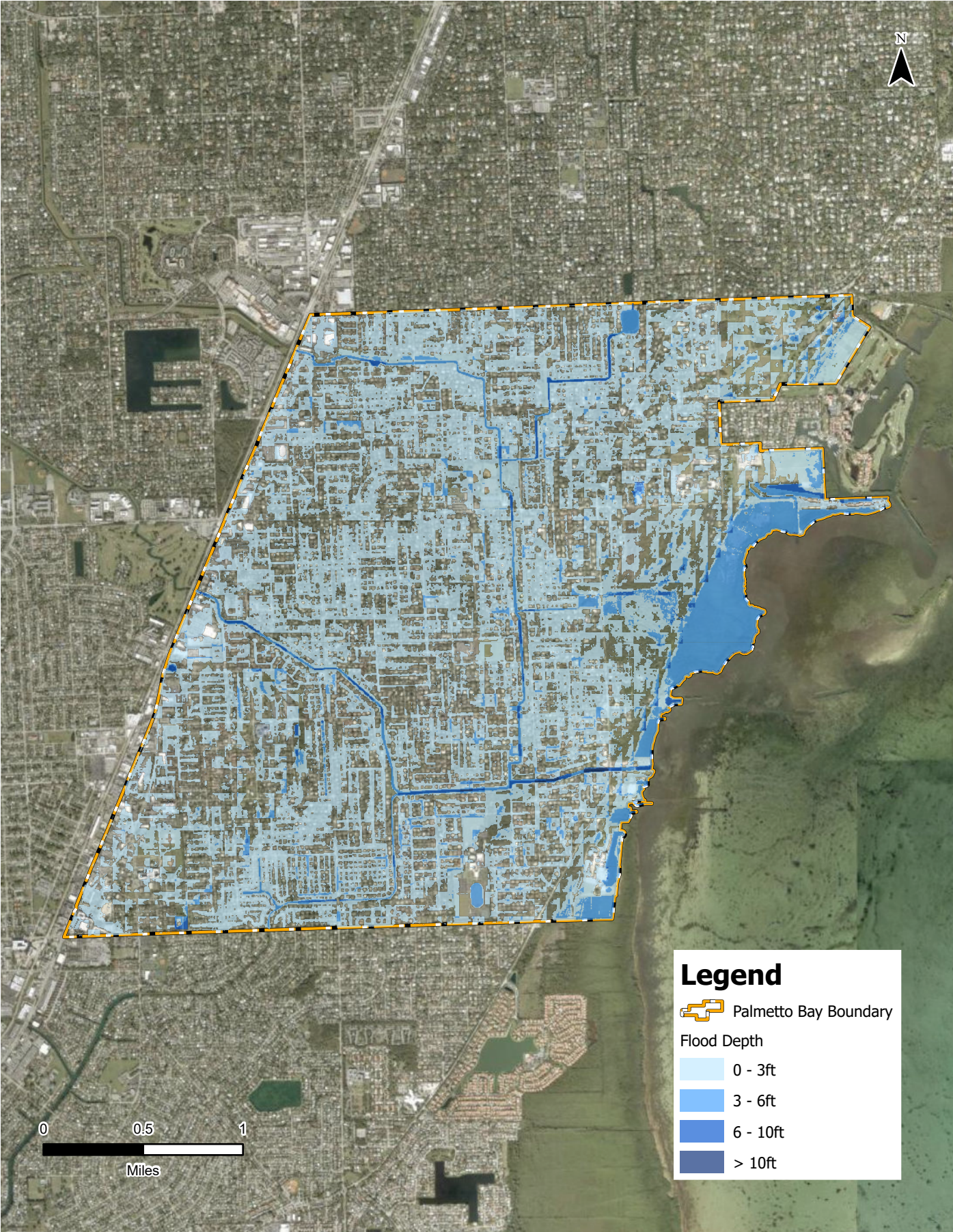


Figure B-18: 2040 Conditions: Storm Surge (5yr) & 2040 Sea Level Rise – Intermediate Low

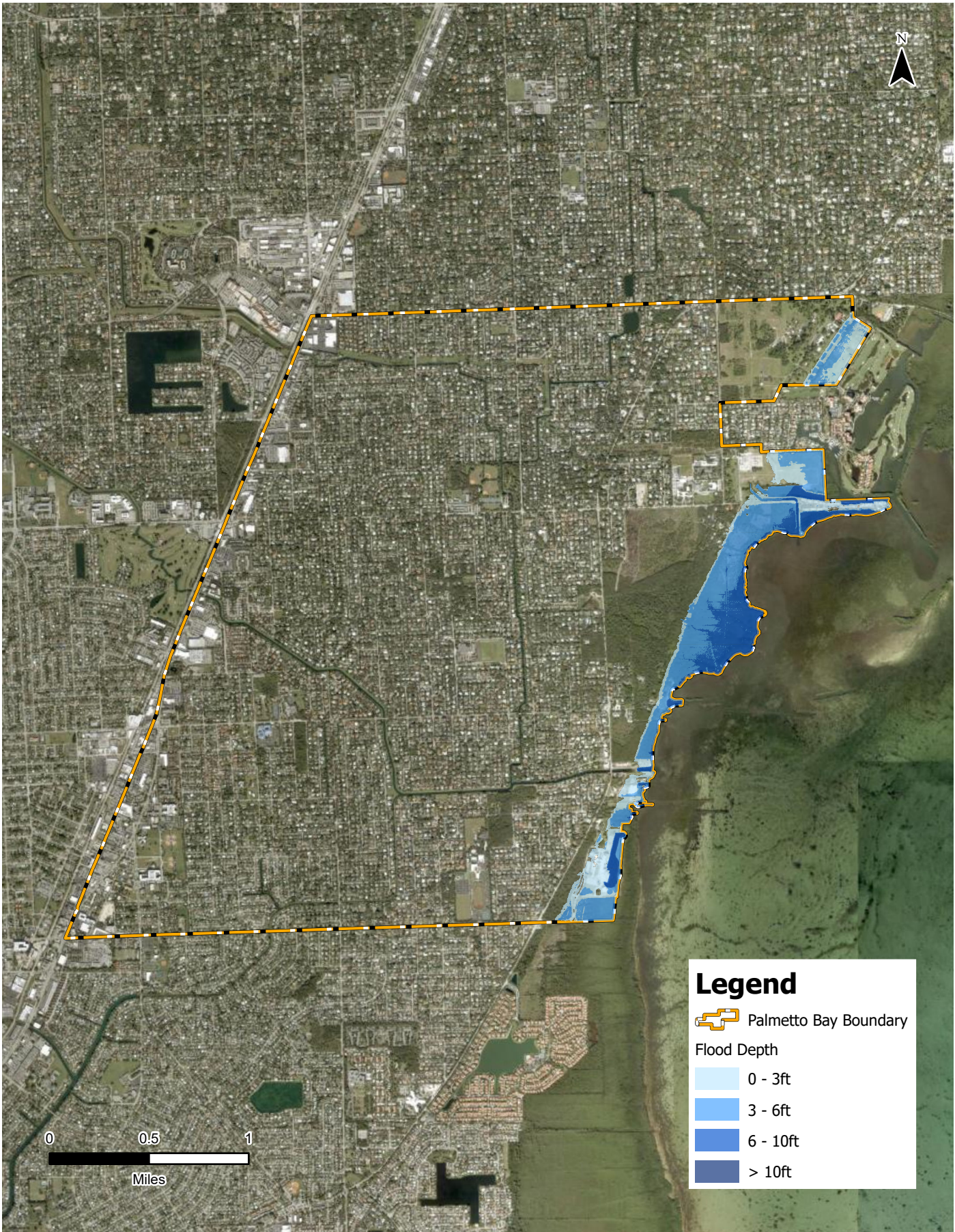


Figure B-19: 2040 Conditions: Storm Surge (5yr) & 2040 Sea Level Rise – Intermediate High



Figure B-20: 2040 Conditions: Storm Surge (100yr) & 2040 Sea Level Rise – Intermediate Low

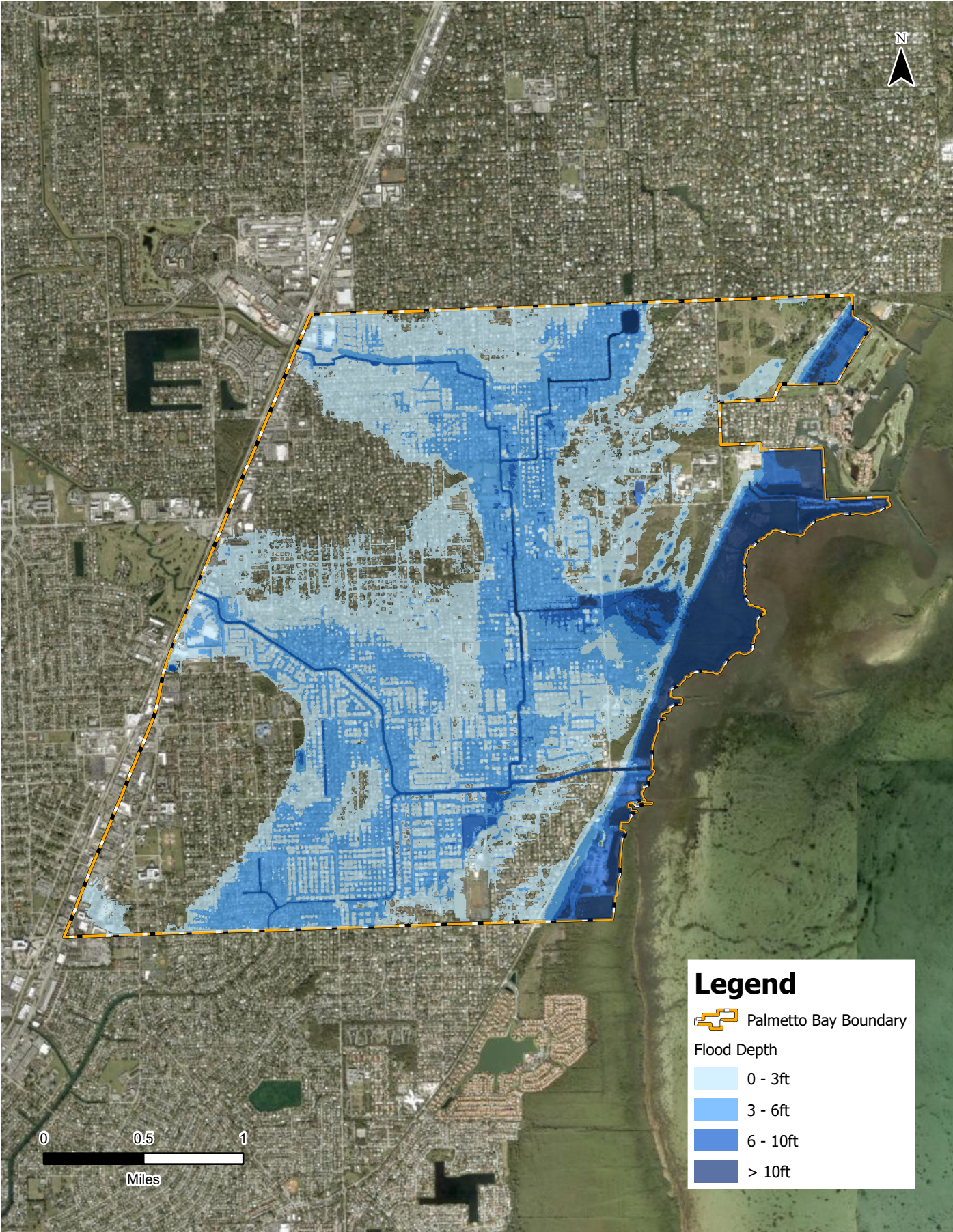


Figure B-21: 2040 Conditions: Storm Surge (100yr) & 2040 Sea Level Rise – Intermediate High

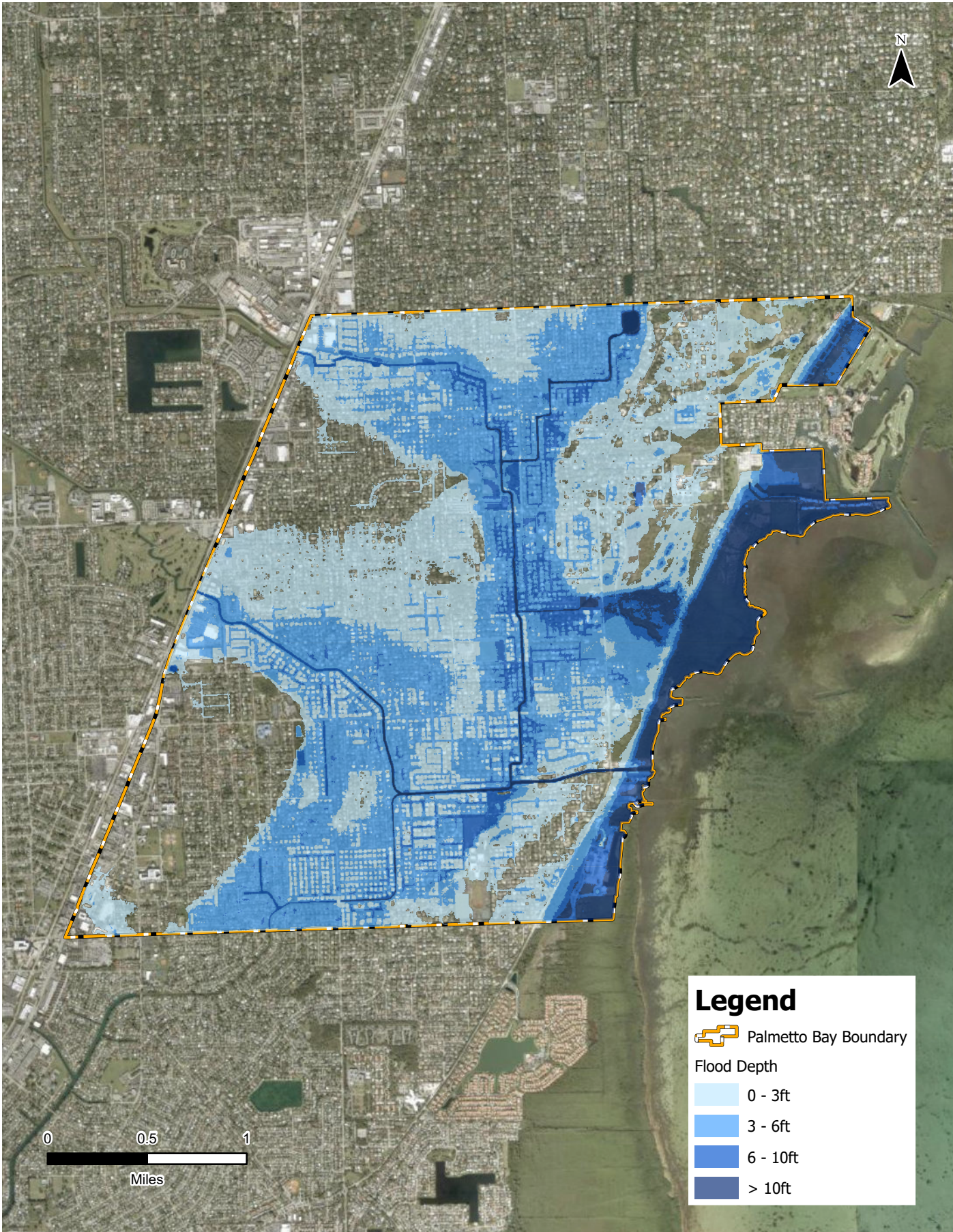


Figure B-22: 2040 Conditions: Storm Surge (1,000yr) & 2040 Sea Level Rise – Intermediate Low

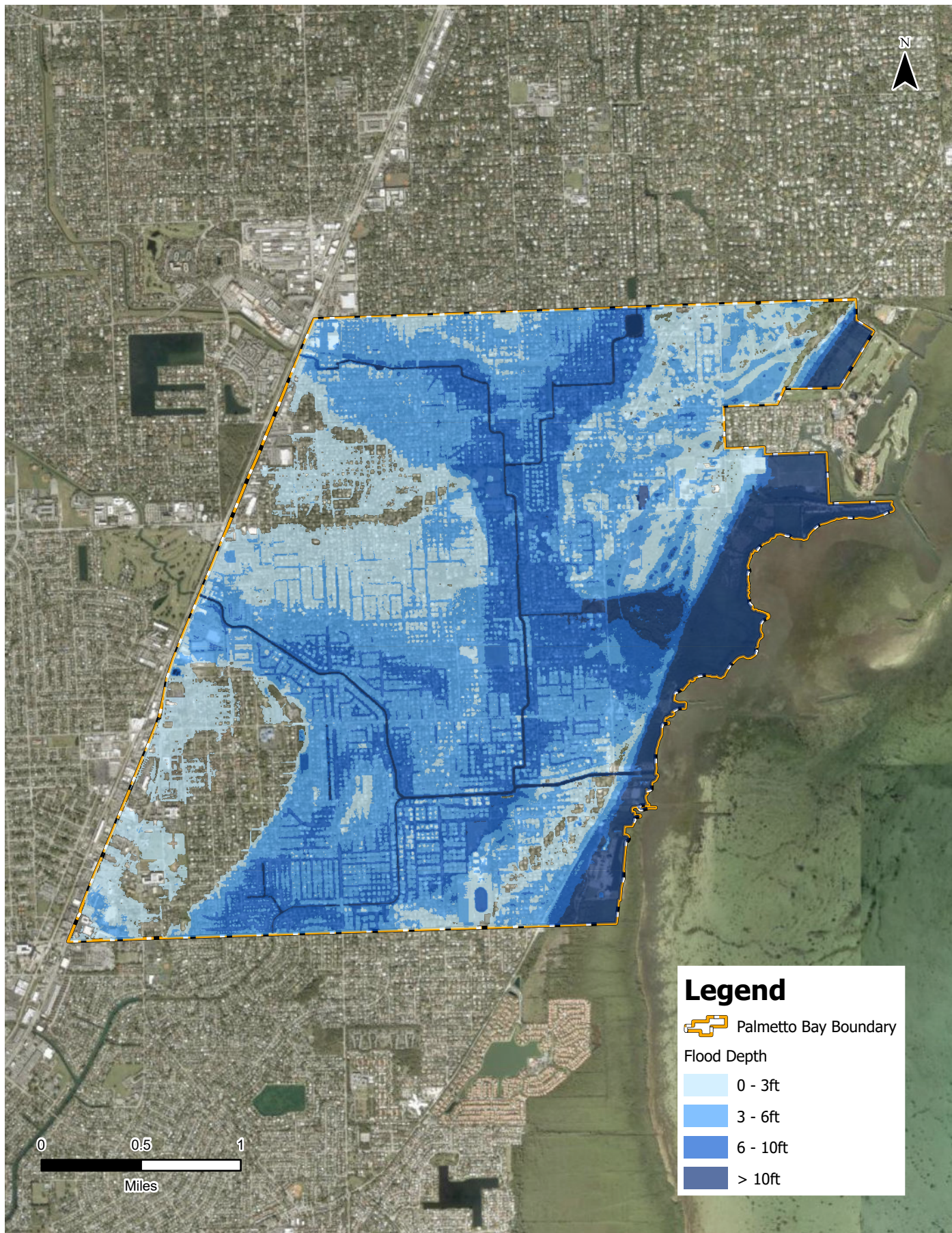


Figure B-23: 2040 Conditions: Storm Surge (1,000yr) & 2040 Sea Level Rise – Intermediate High

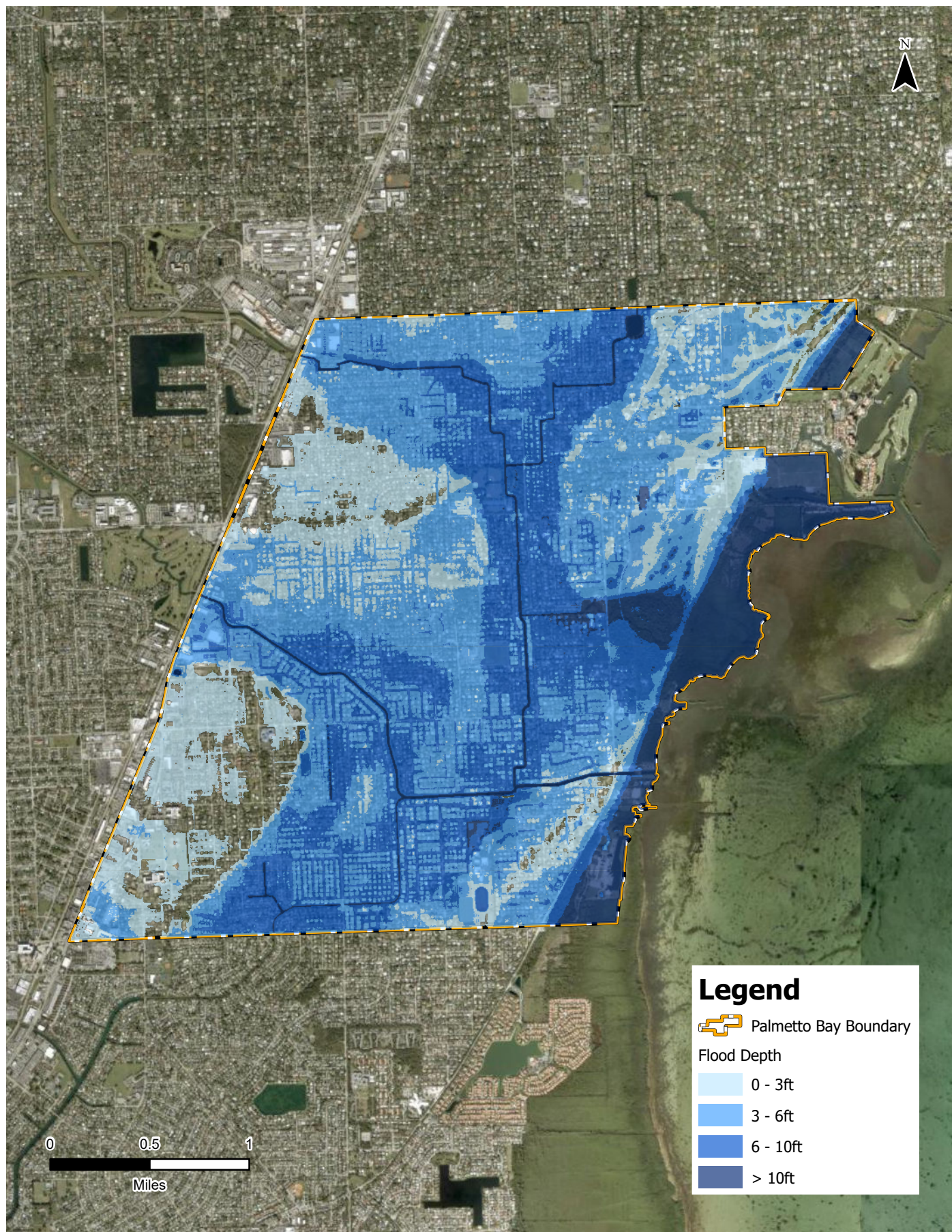


Figure B-24: 2070 Conditions: 2070 Sea Level Rise - Intermediate Low



Figure B-25: 2070 Conditions: 2070 Sea Level Rise – Intermediate High



Figure B-26: 2070 Conditions: 25yr Precipitation Event & 2ft Sea Level Rise

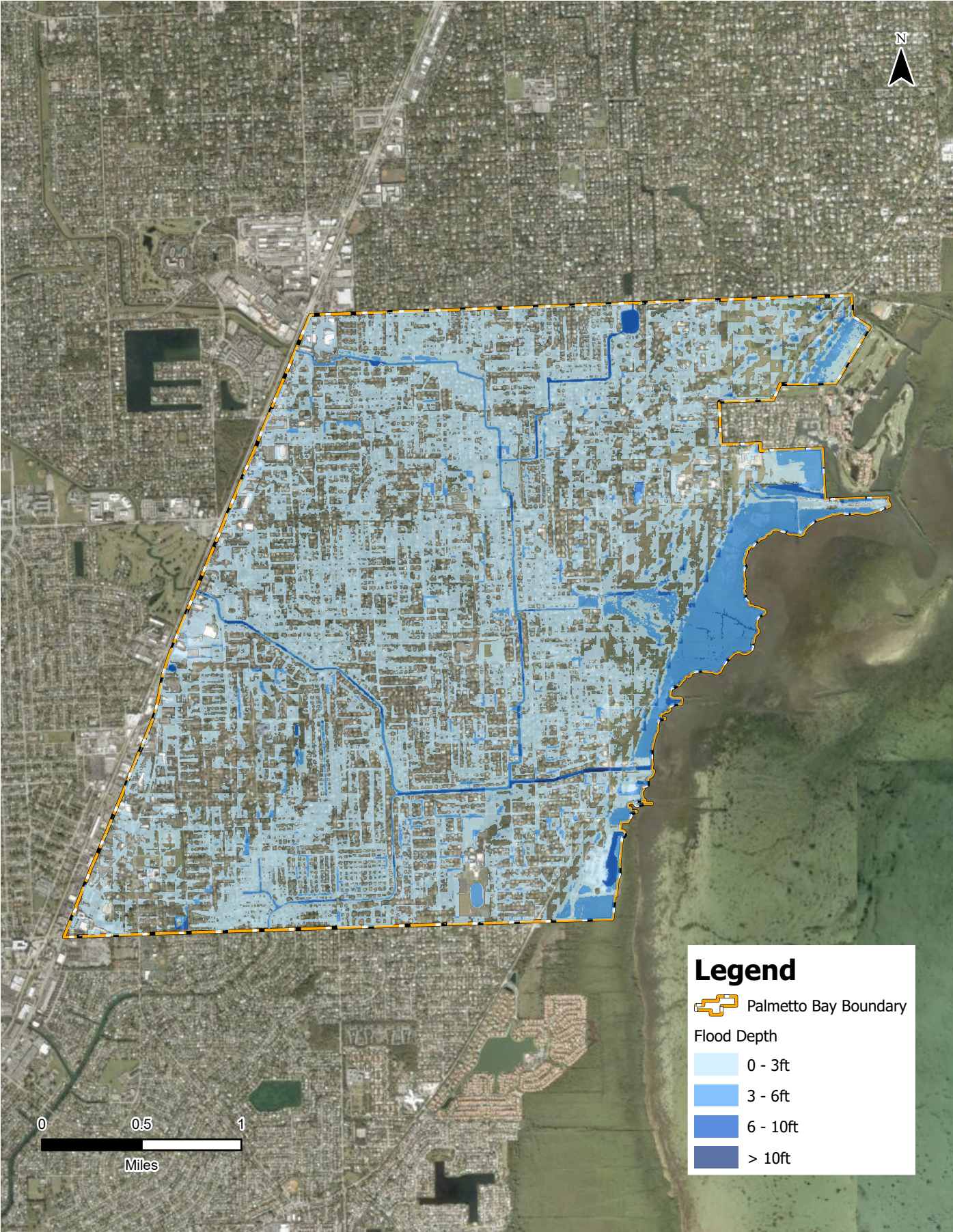


Figure B-27: 2070 Conditions: Storm Surge (5yr) & 2070 Sea Level Rise – Intermediate Low

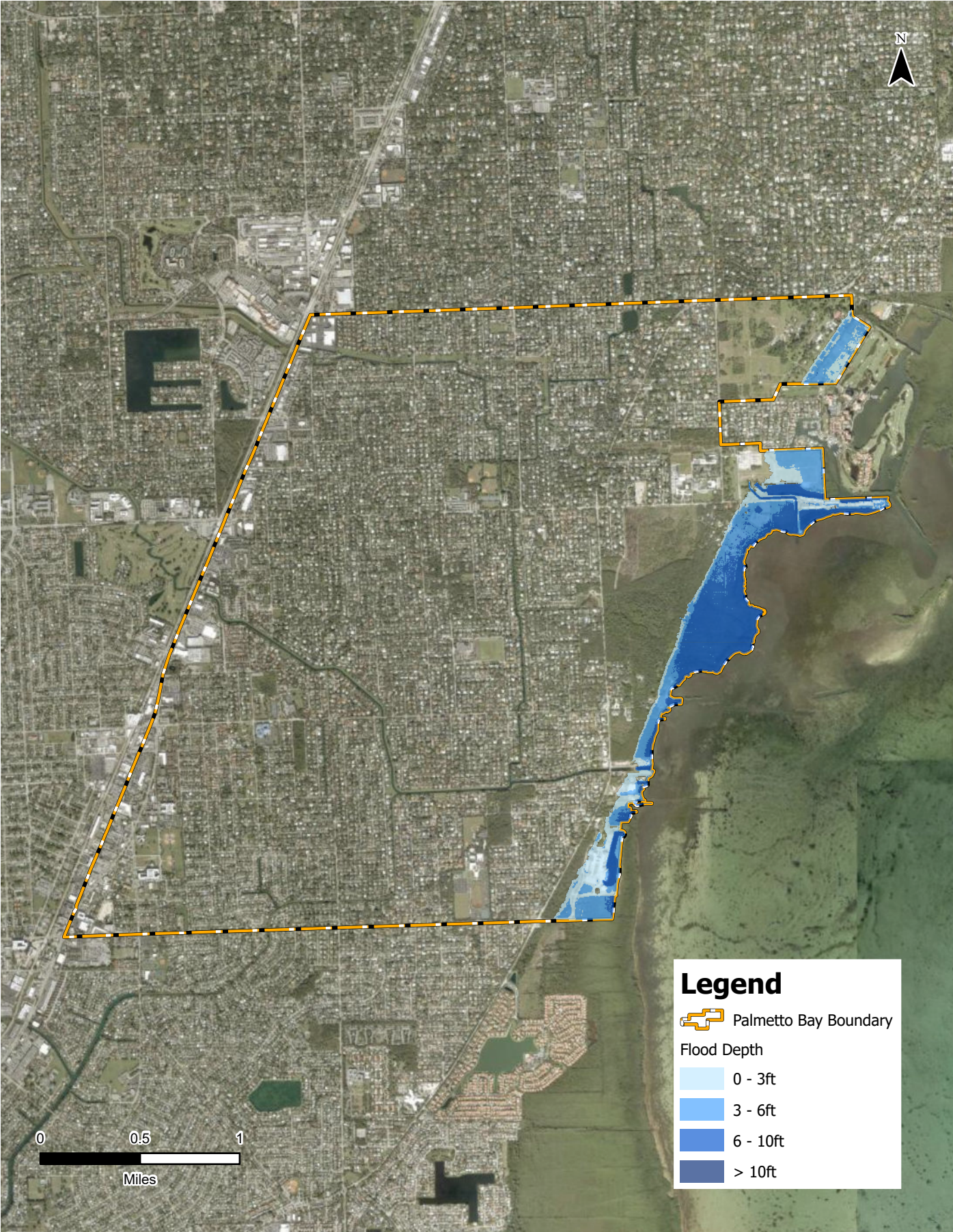


Figure B-28: 2070 Conditions: Storm Surge (5yr) & 2070 Sea Level Rise – Intermediate High

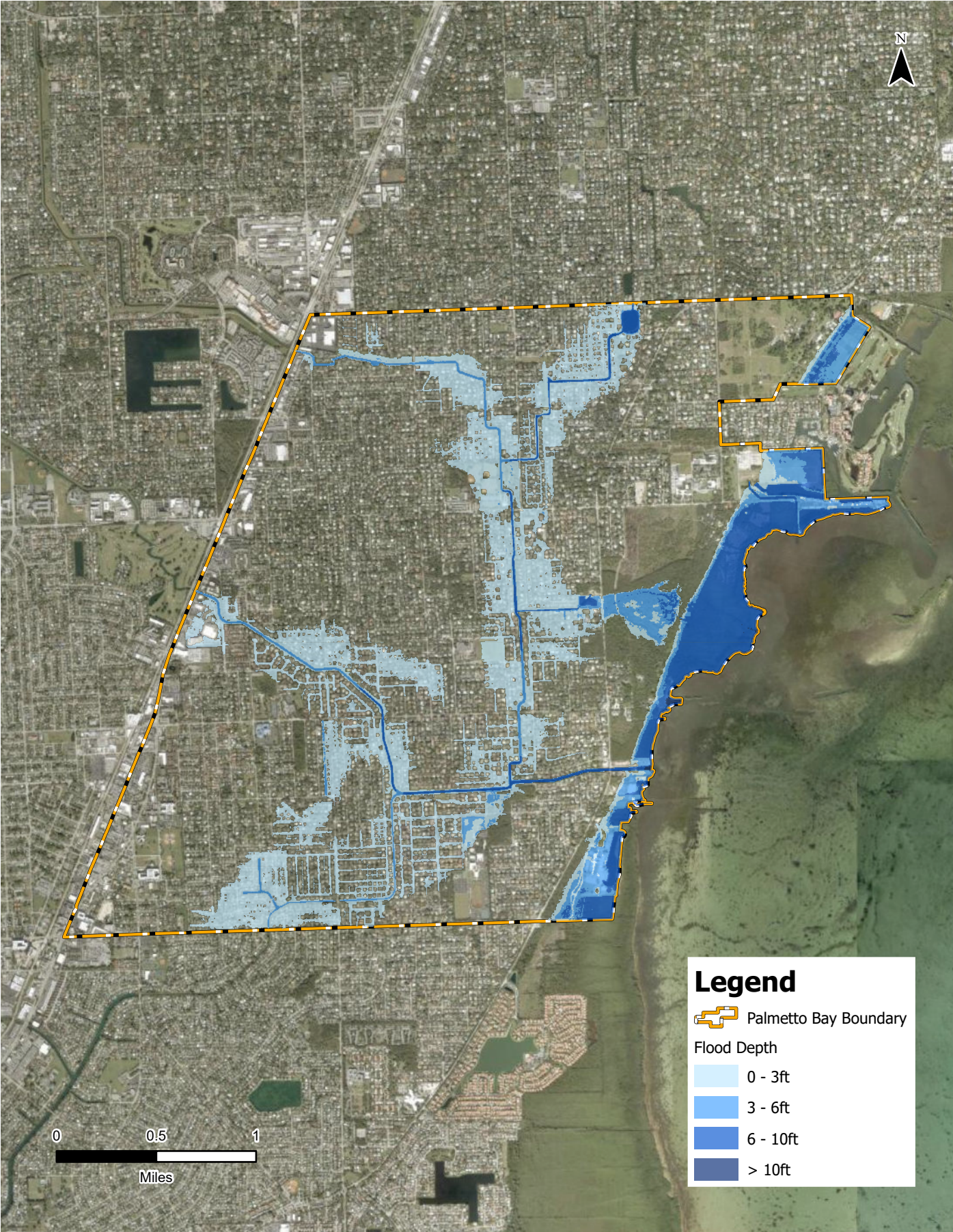


Figure B-29: 2070 Conditions: Storm Surge (100yr) & 2070 Sea Level Rise – Intermediate Low

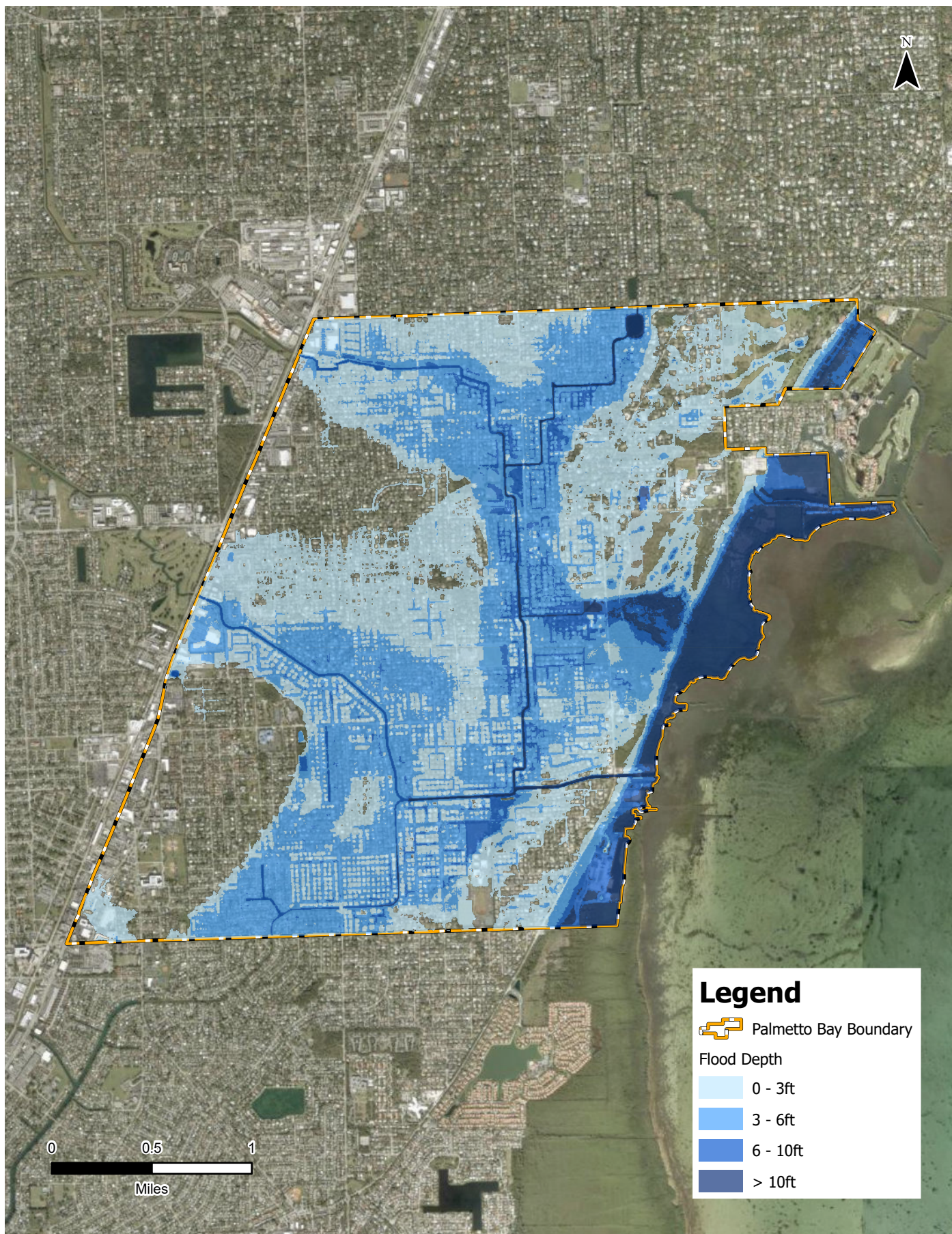


Figure B-30: 2070 Conditions: Storm Surge (100yr) & 2070 Sea Level Rise – Intermediate High

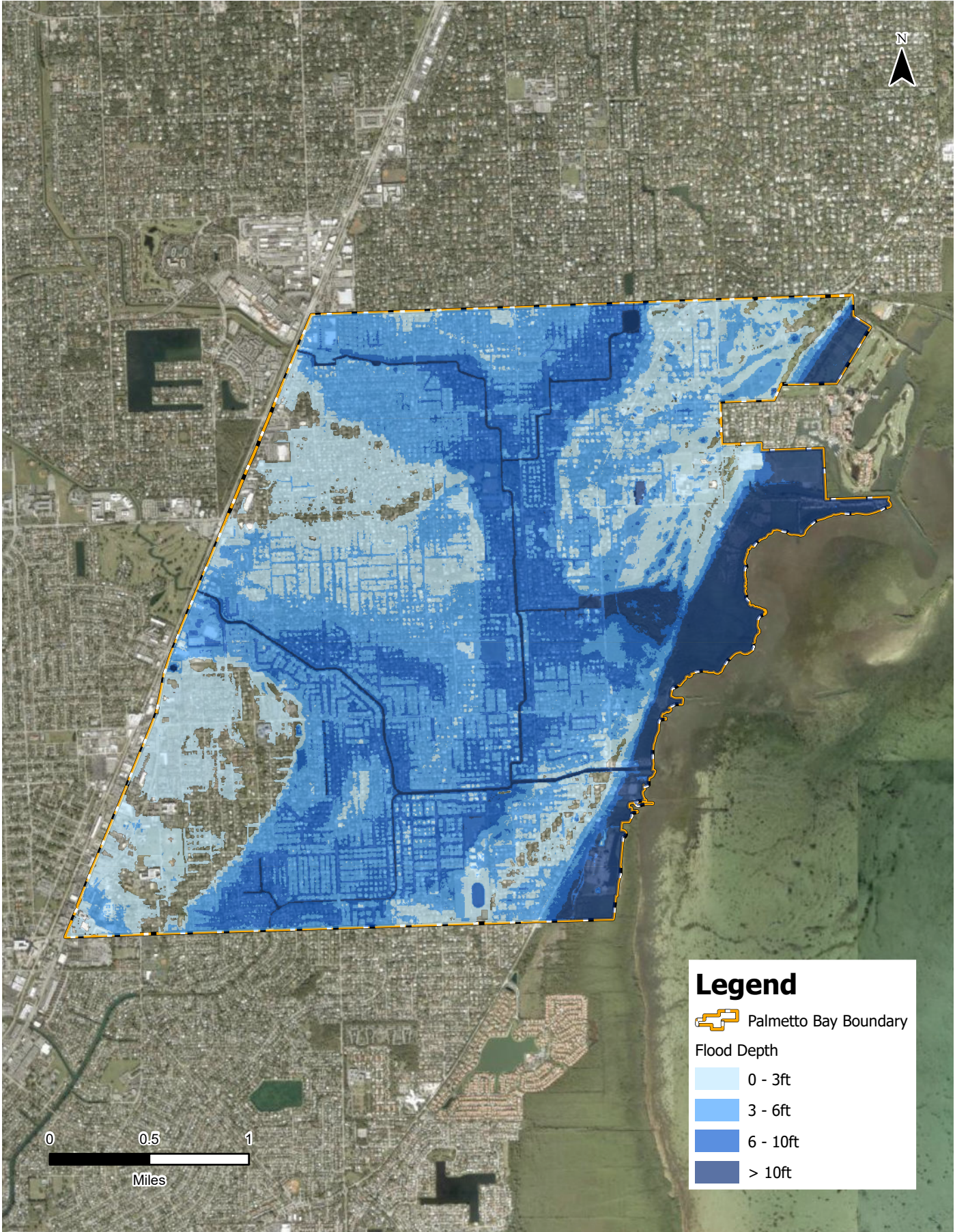


Figure B-31: 2070 Conditions: Storm Surge (1,000yr) & 2070 Sea Level Rise – Intermediate Low

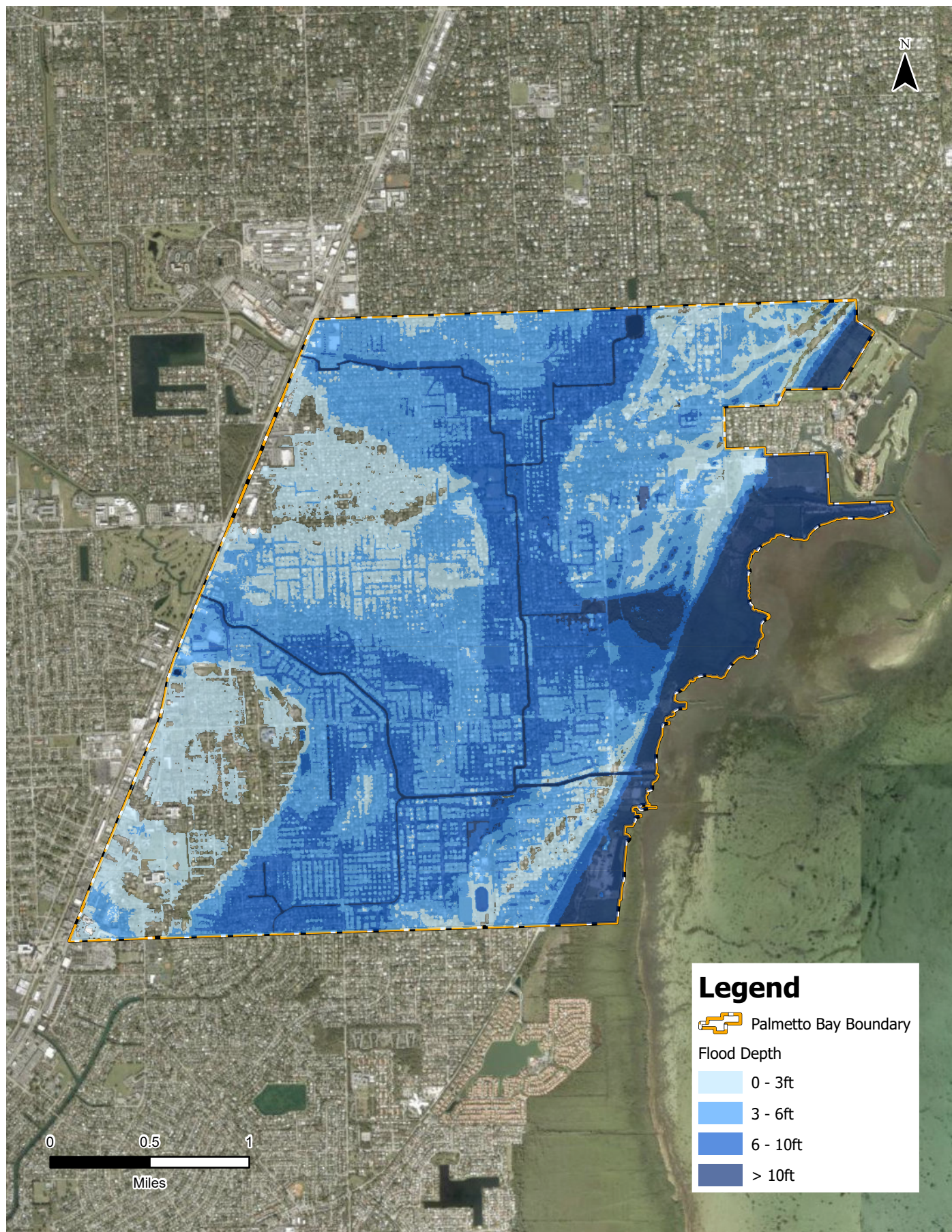
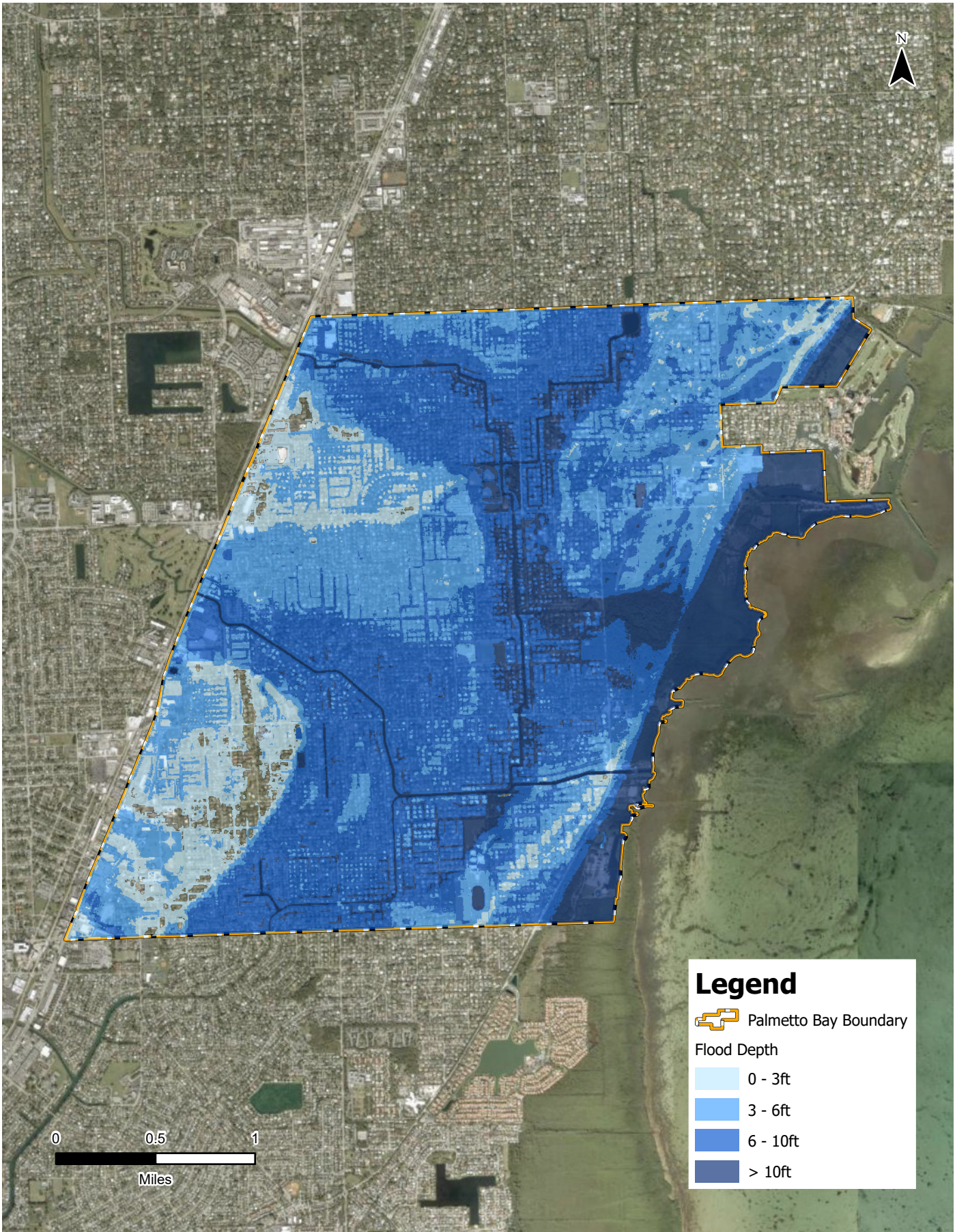


Figure B-32: 2070 Conditions: Storm Surge (1,000yr) & 2070 Sea Level Rise – Intermediate High



EXPOSURE MAPS

Figure B-33: Exposure Analysis: 1%-Annual-Chance Flood

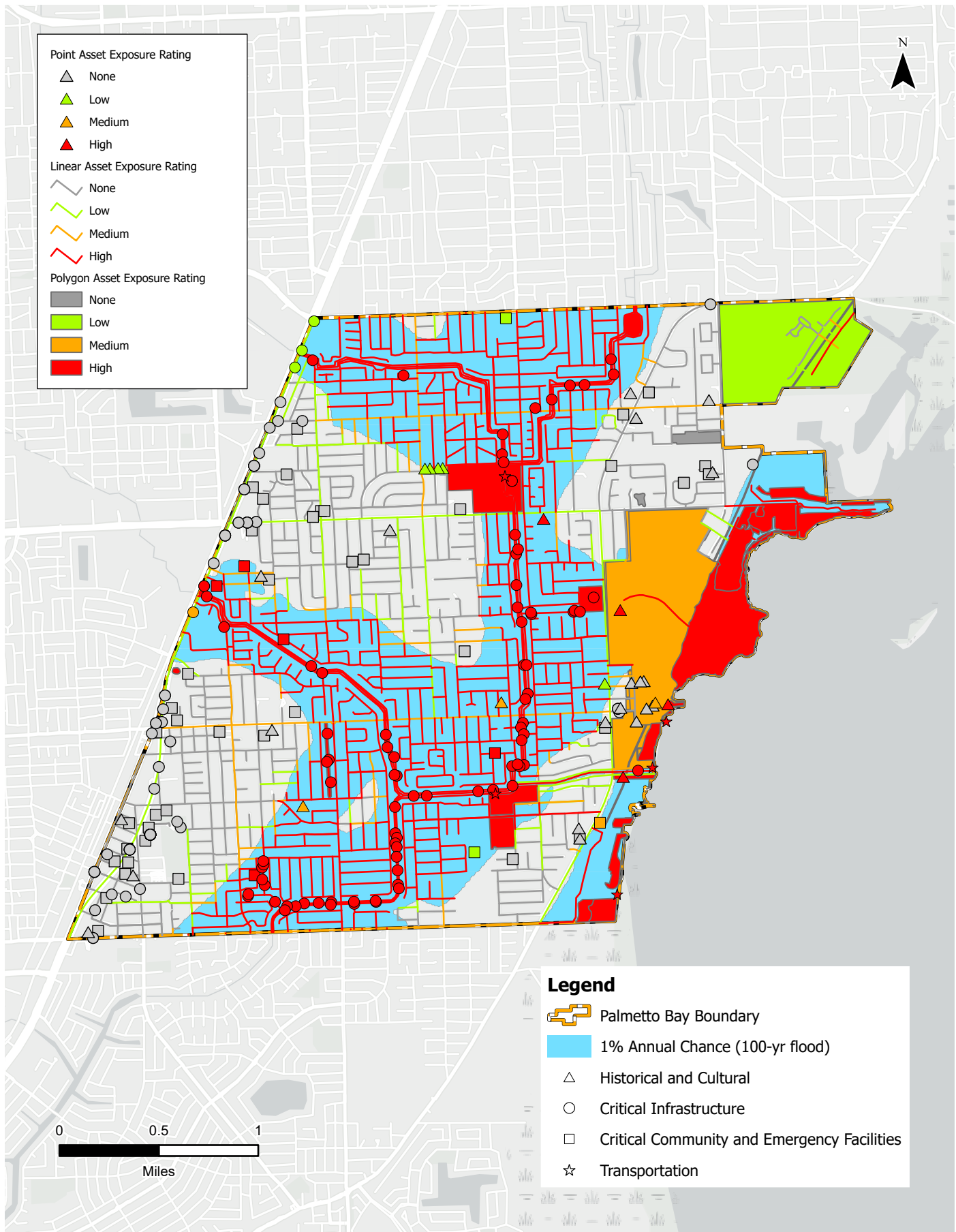


Figure B-34: Exposure Analysis: 25yr Precipitation Event

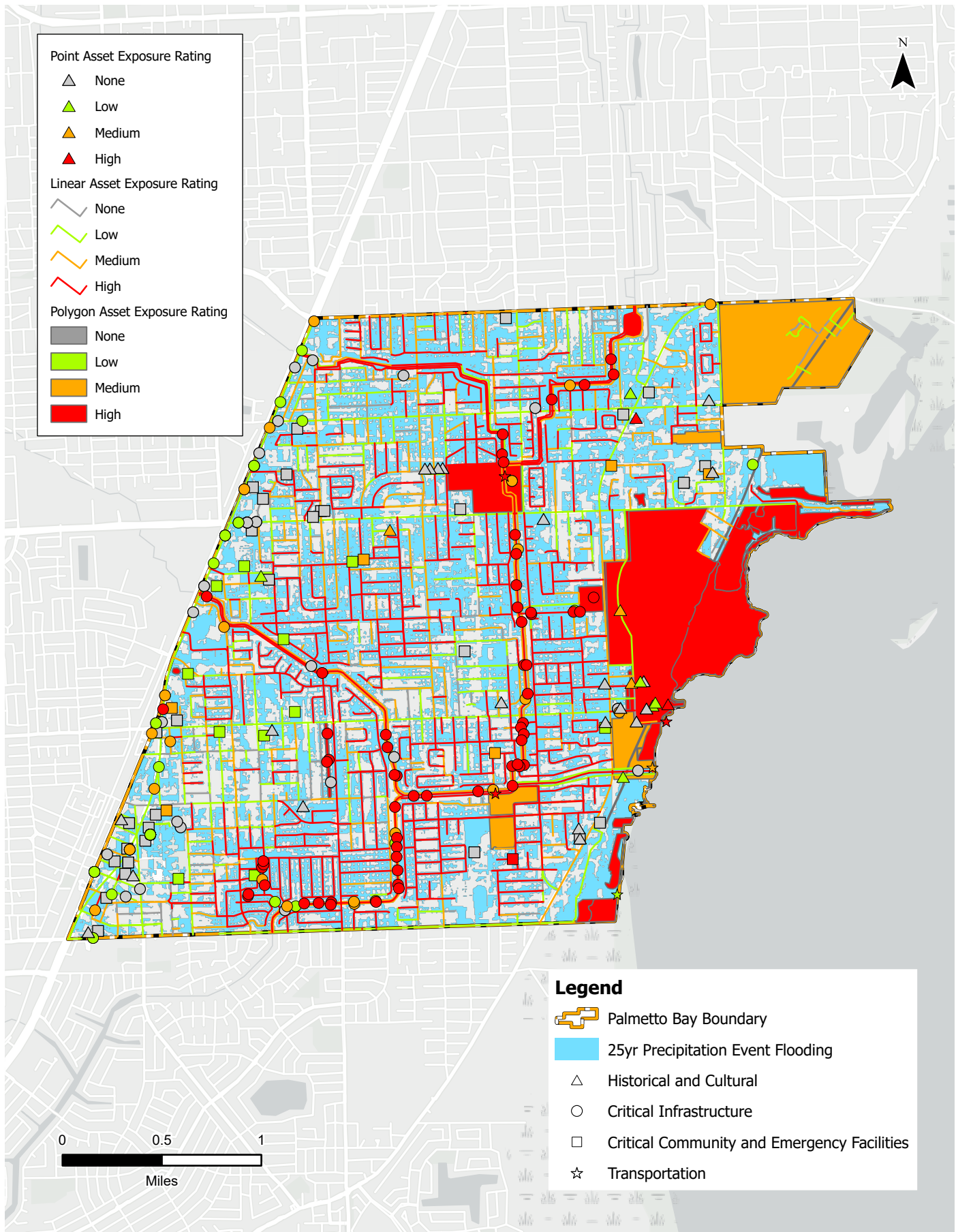


Figure B-35: Exposure Analysis: High Tide

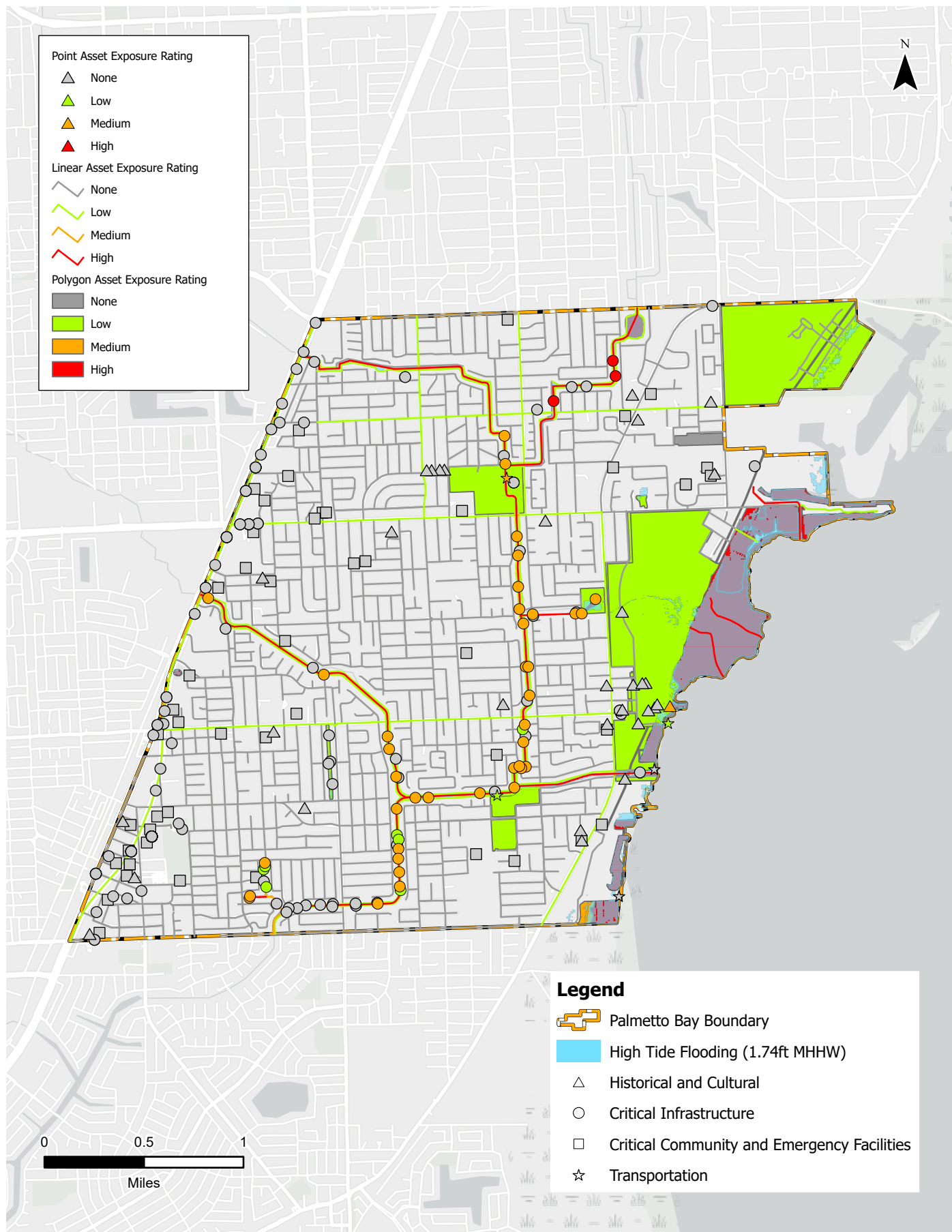


Figure B-36: Exposure Analysis: Storm Surge (5yr)

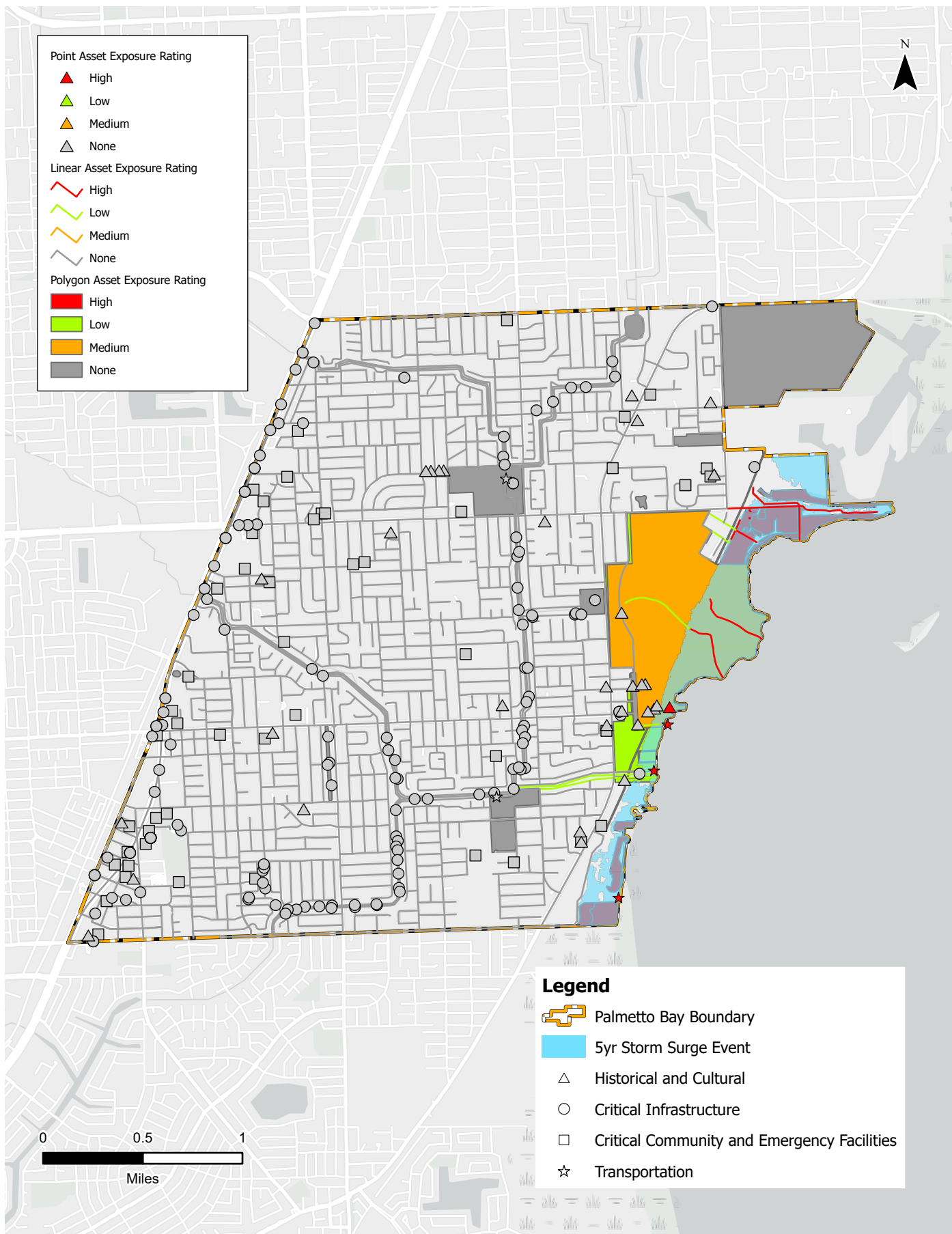


Figure B-37: Exposure Analysis: Storm Surge (100yr)

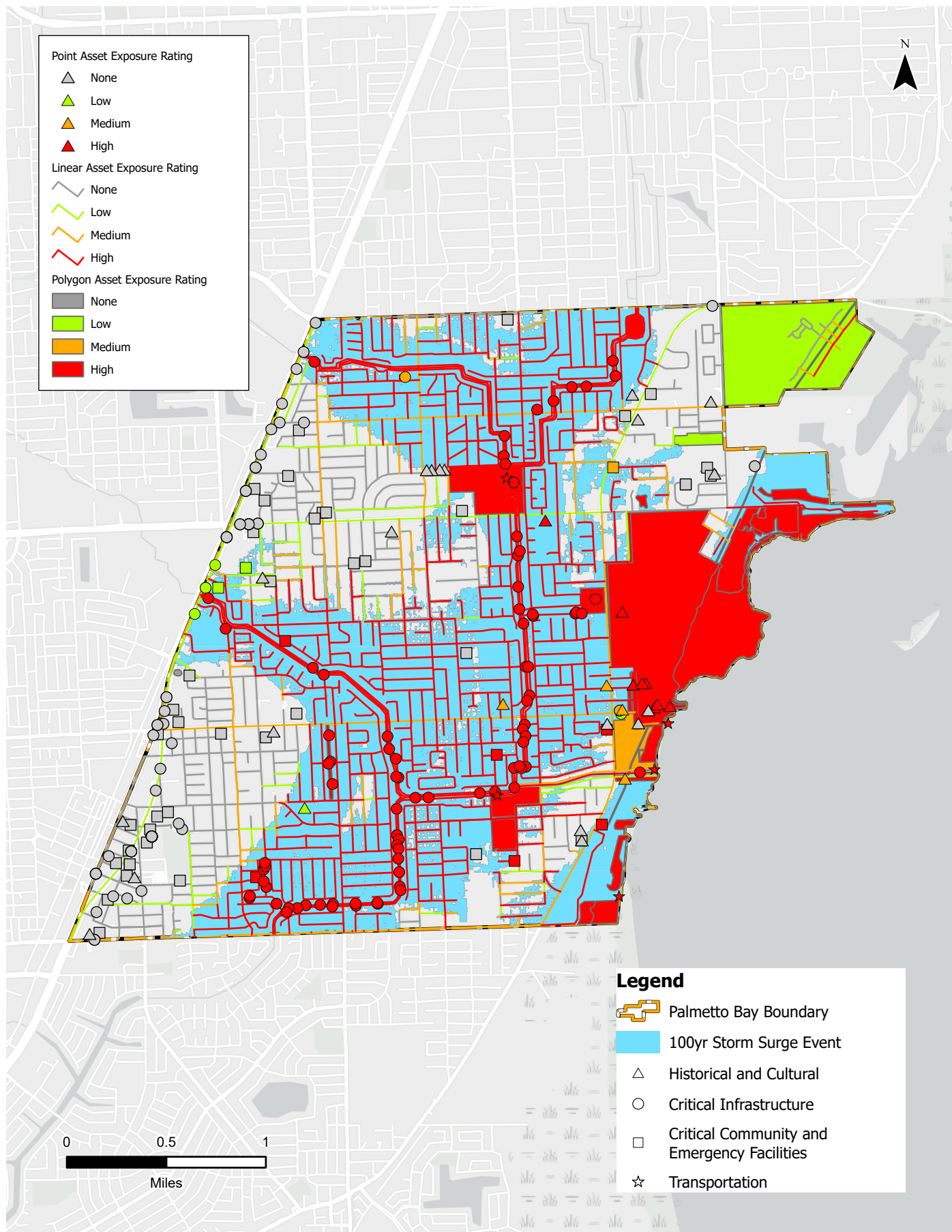


Figure B-38: Exposure Analysis: Storm Surge (1,000yr)

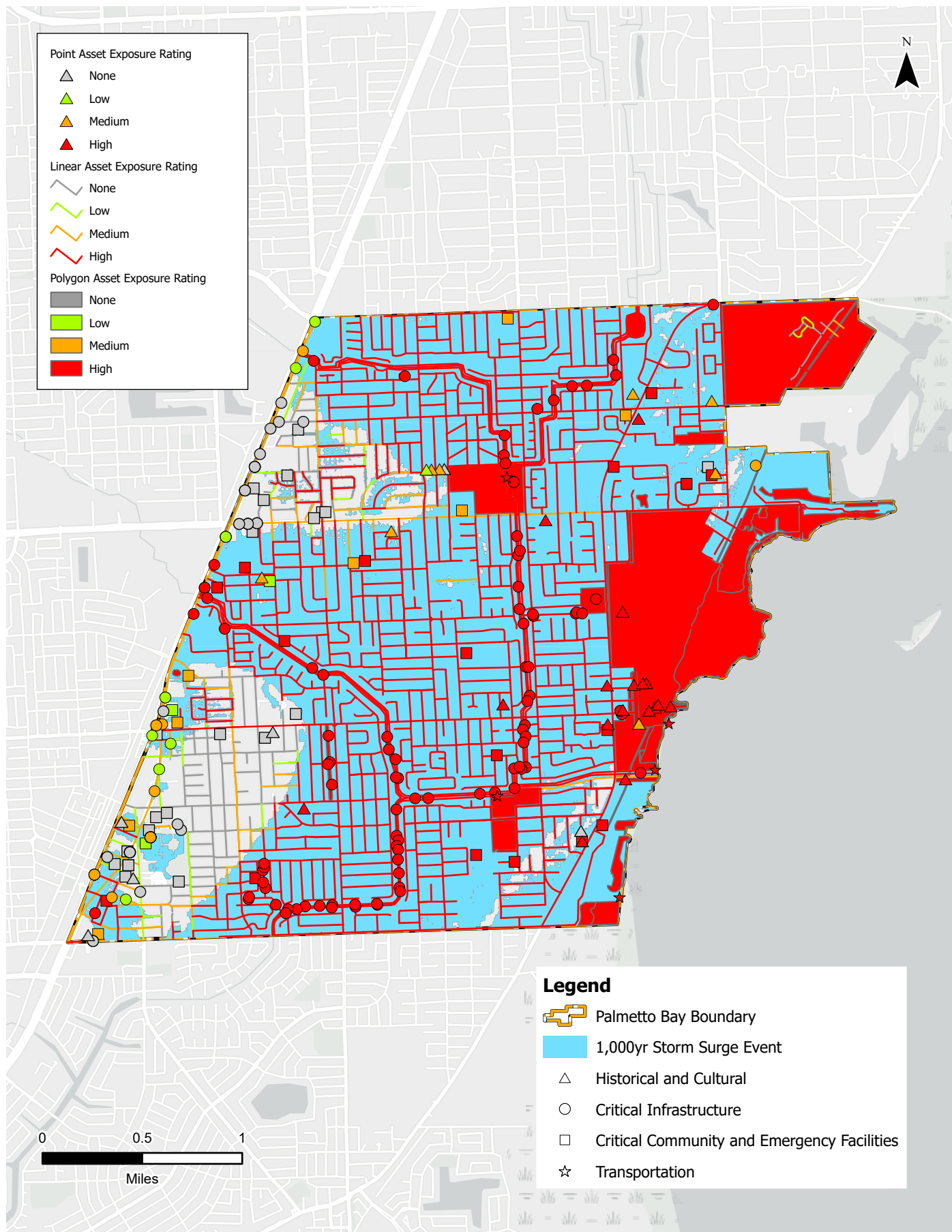


Figure B-39: 2030 Sea Level Rise – Intermediate Low

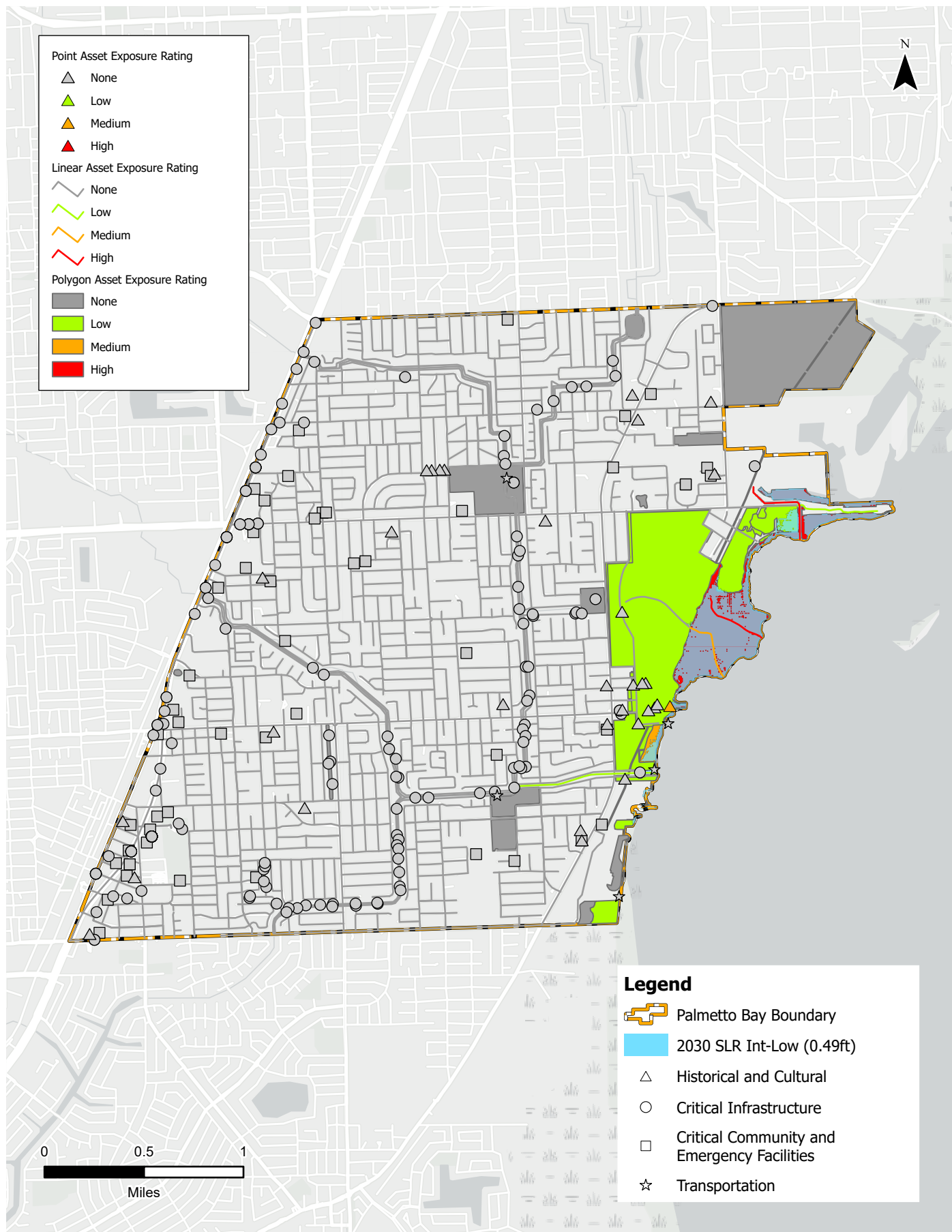


Figure B-40: Exposure Analysis: 2030 Sea Level Rise – Intermediate High

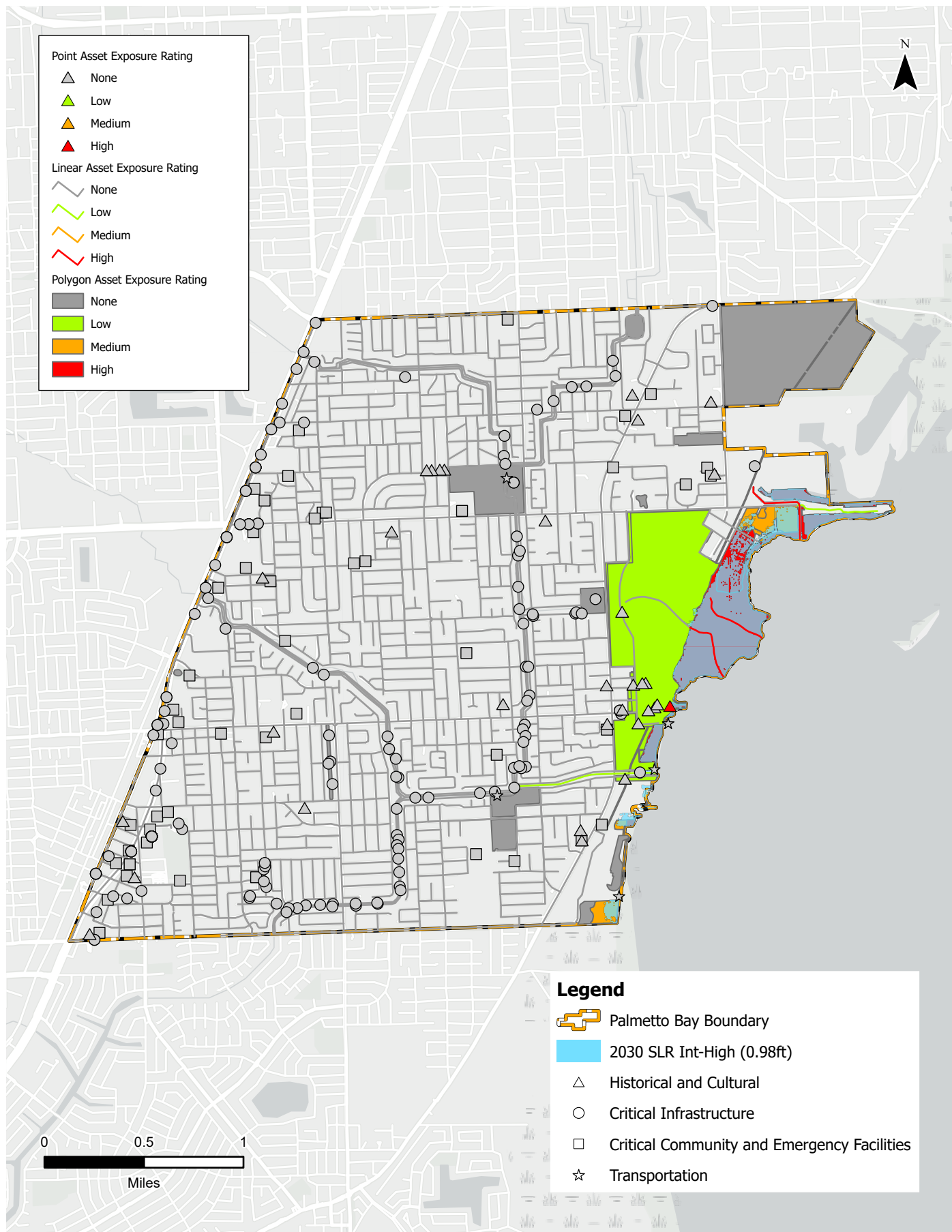


Figure B-41: Exposure Analysis: Storm Surge (5yr) & 2030 Sea Level Rise – Intermediate Low

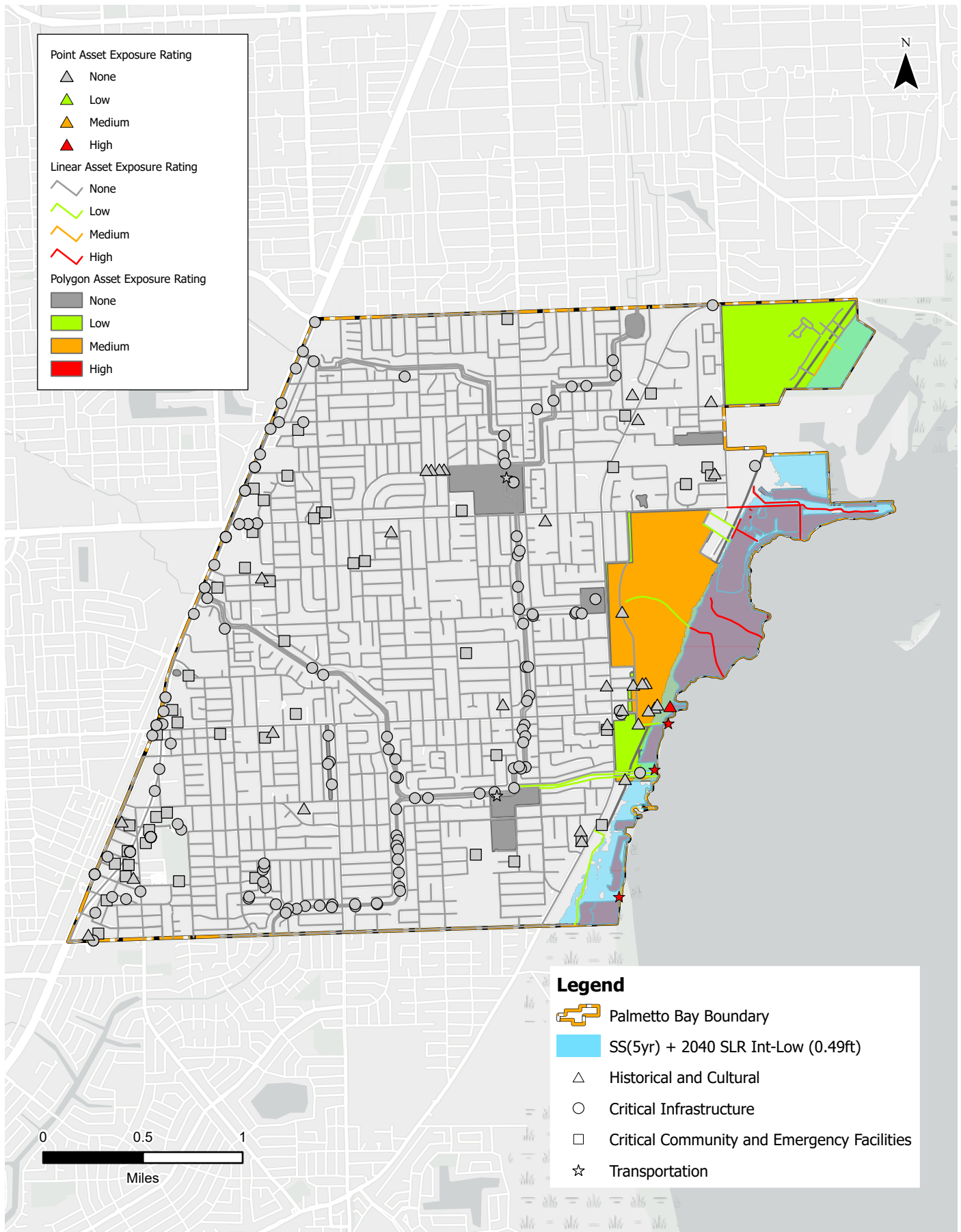


Figure B-42: Exposure Analysis: Storm Surge (5yr) & 2030 Sea Level Rise – Intermediate High

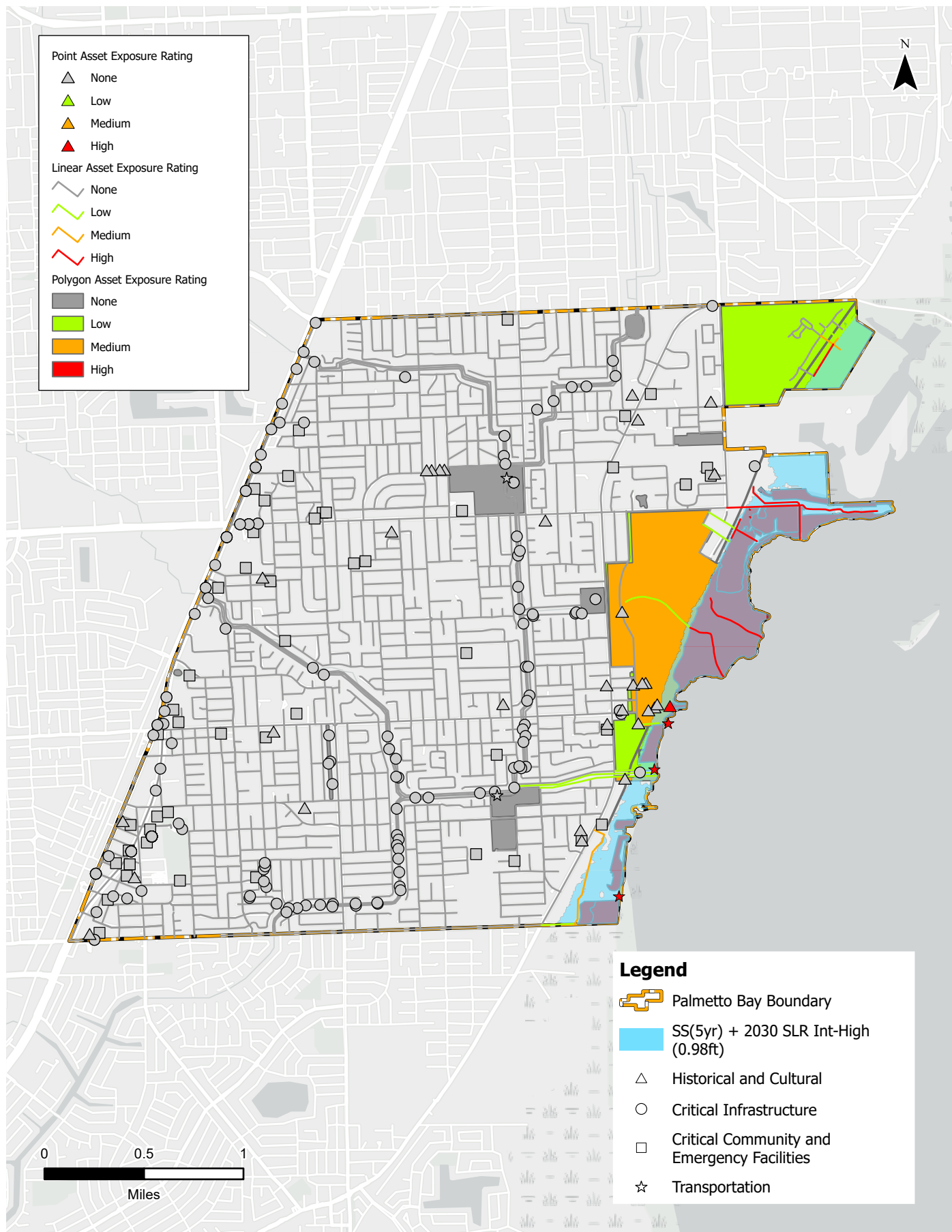


Figure B-43: Storm Surge (100yr) & 2030 Sea Level Rise – Intermediate Low

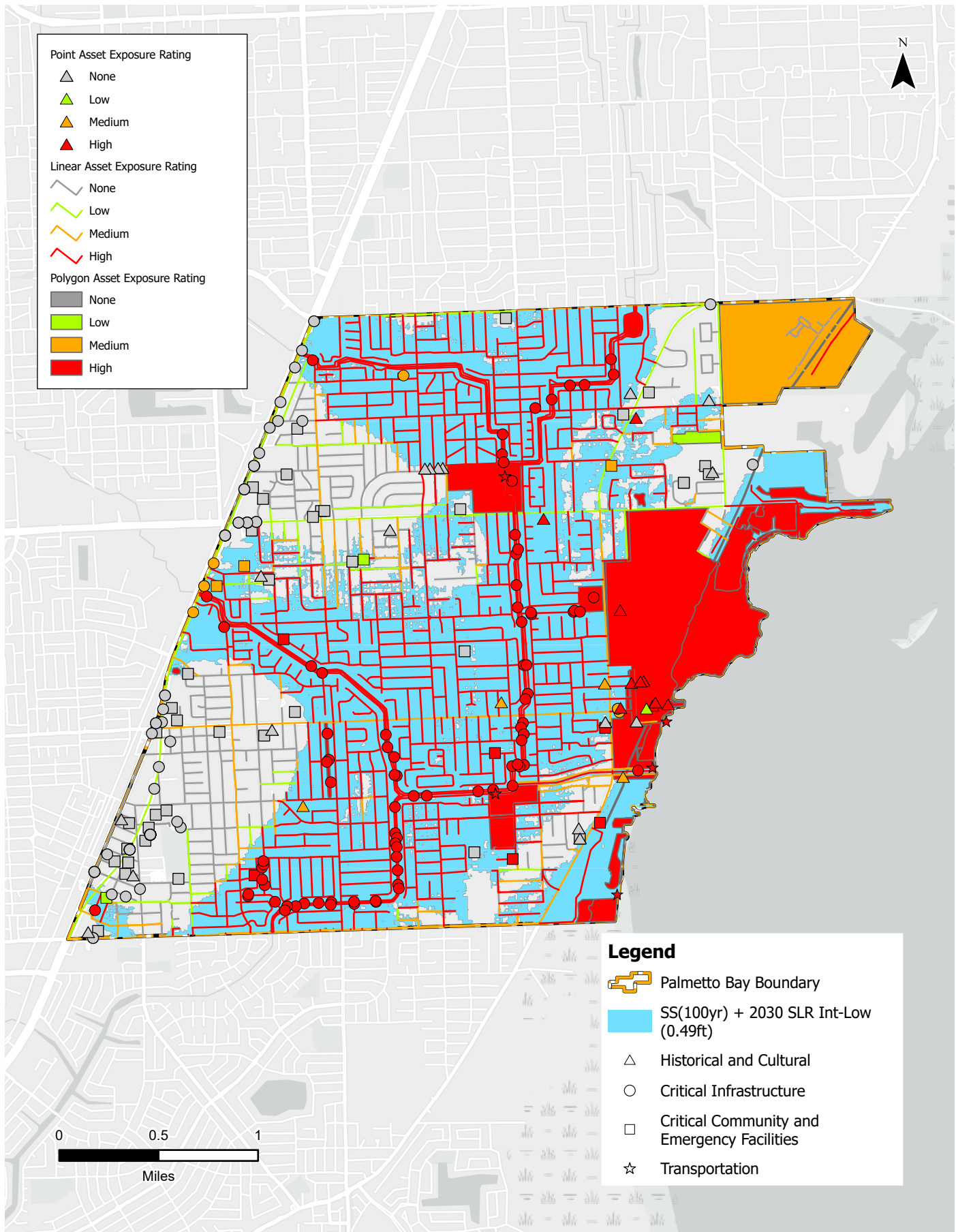


Figure B-44: Storm Surge (100yr) & 2030 Sea Level Rise – Intermediate High

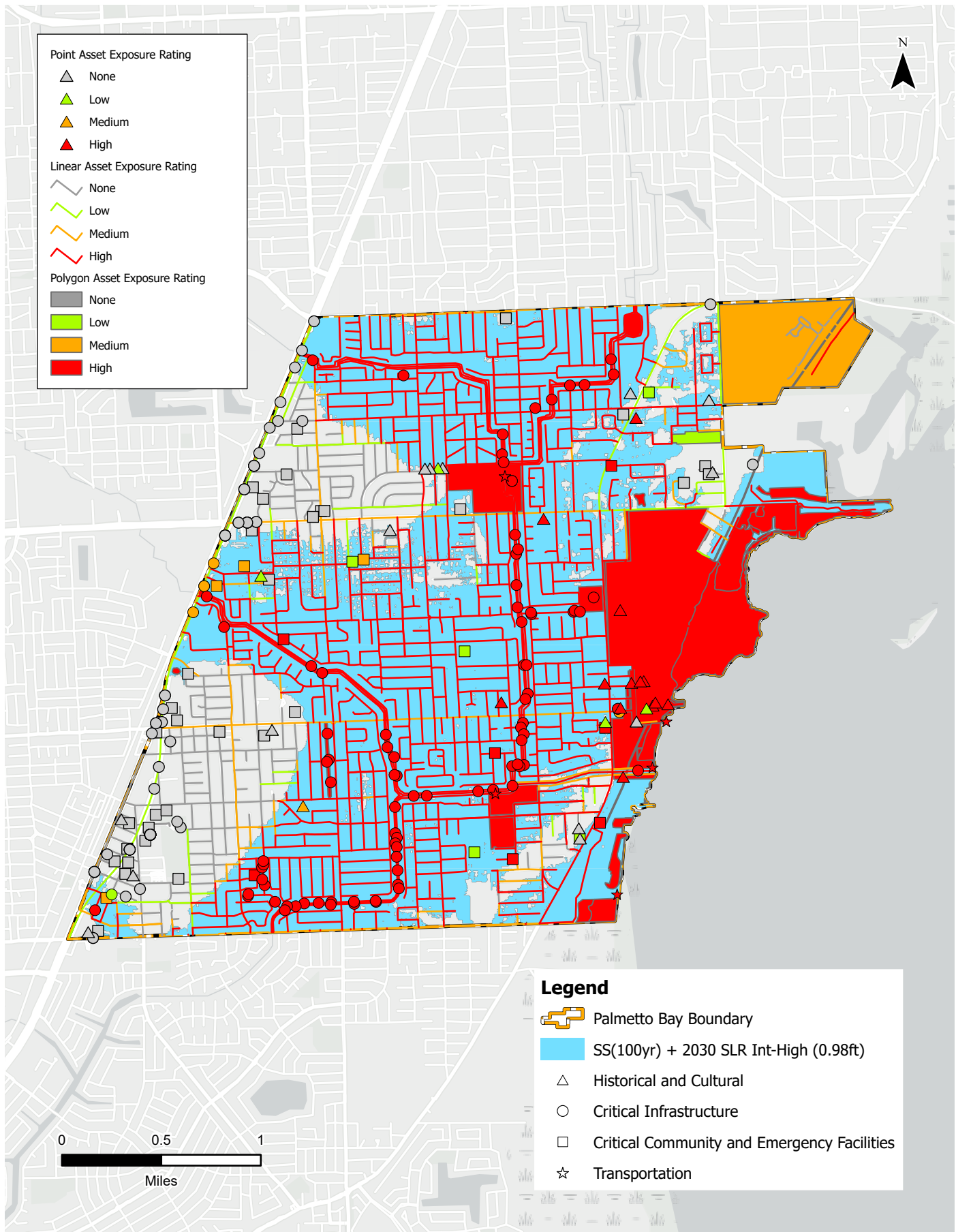


Figure B-45: Exposure Analysis: Storm Surge (1,000yr) & 2030 Sea Level Rise – Intermediate Low

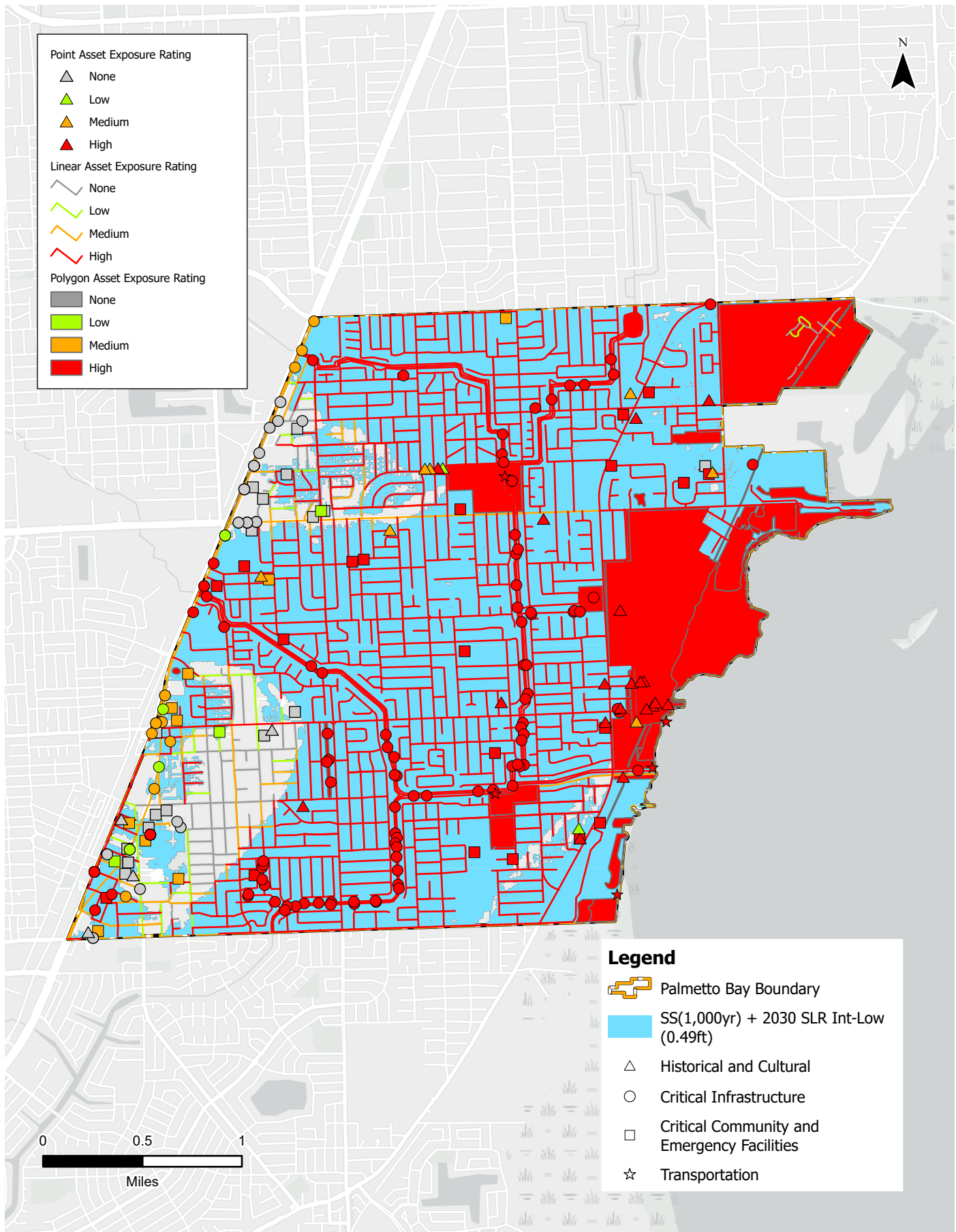


Figure B-46: Exposure Analysis: Storm Surge (1,000yr) & 2030 Sea Level Rise – Intermediate High

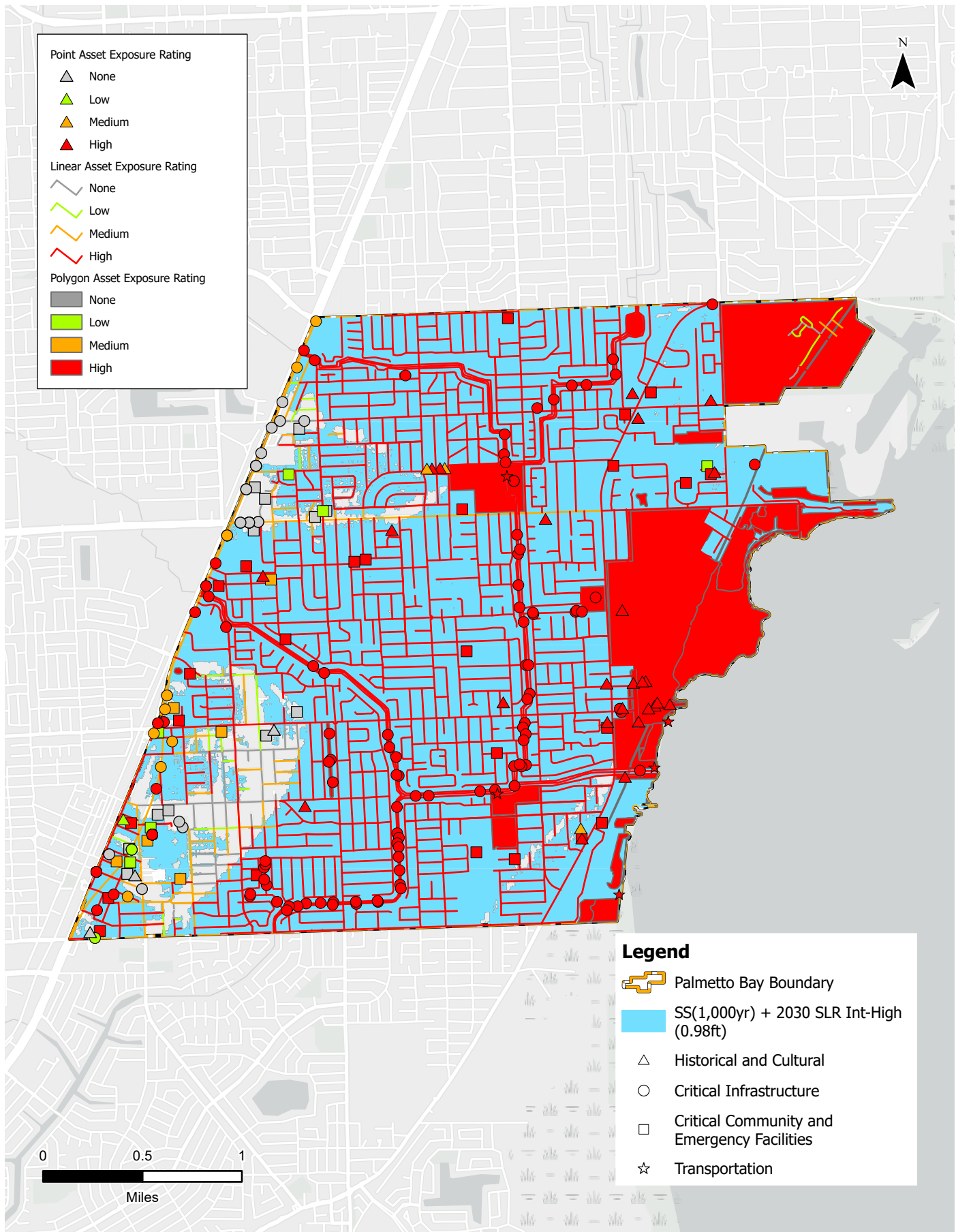


Figure B-47: Exposure Analysis: 2040 Sea Level Rise – Intermediate Low

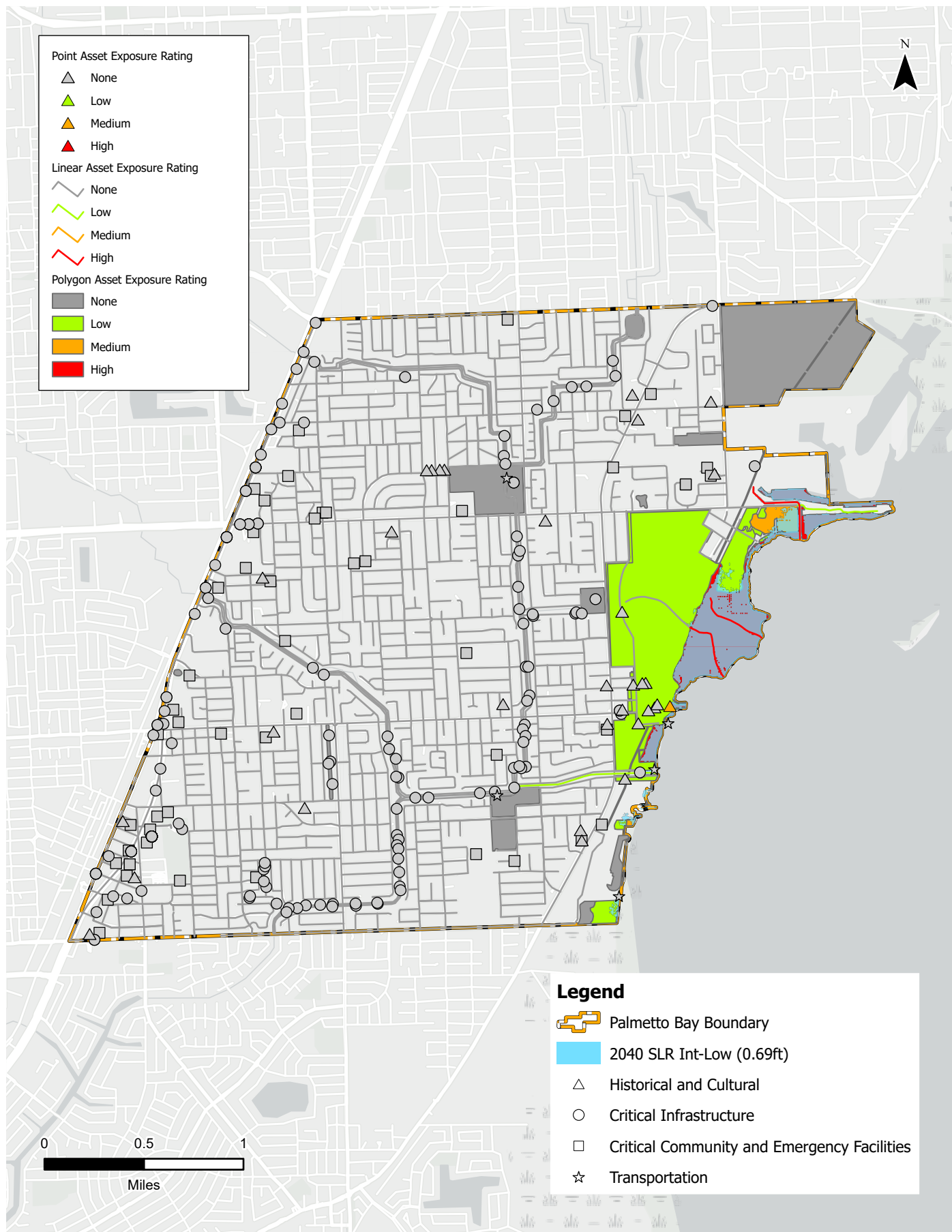


Figure B-48: Exposure Analysis: 2040 Sea Level Rise – Intermediate High

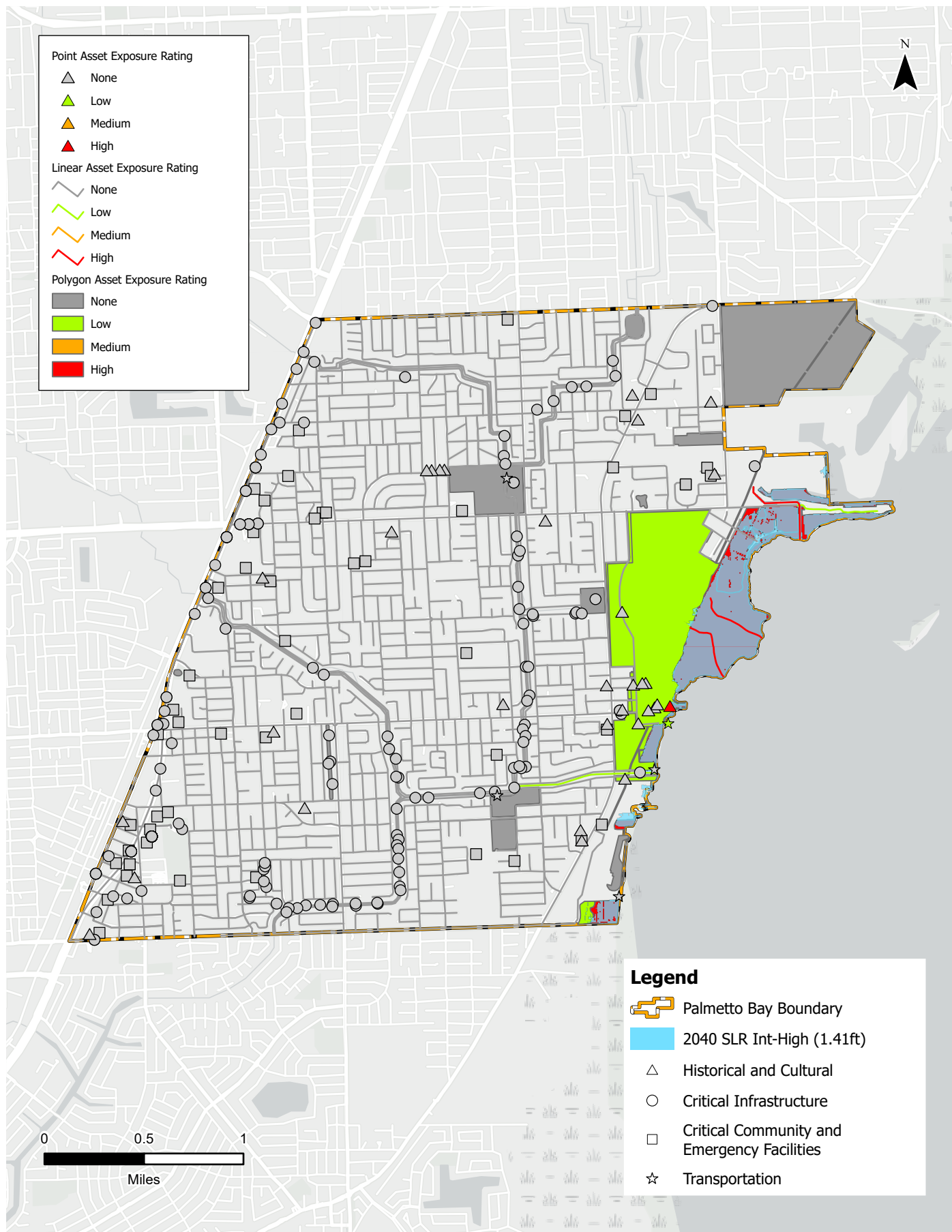


Figure B-49: Exposure Analysis: 25yr Precipitation Event & 1ft Sea Level Rise

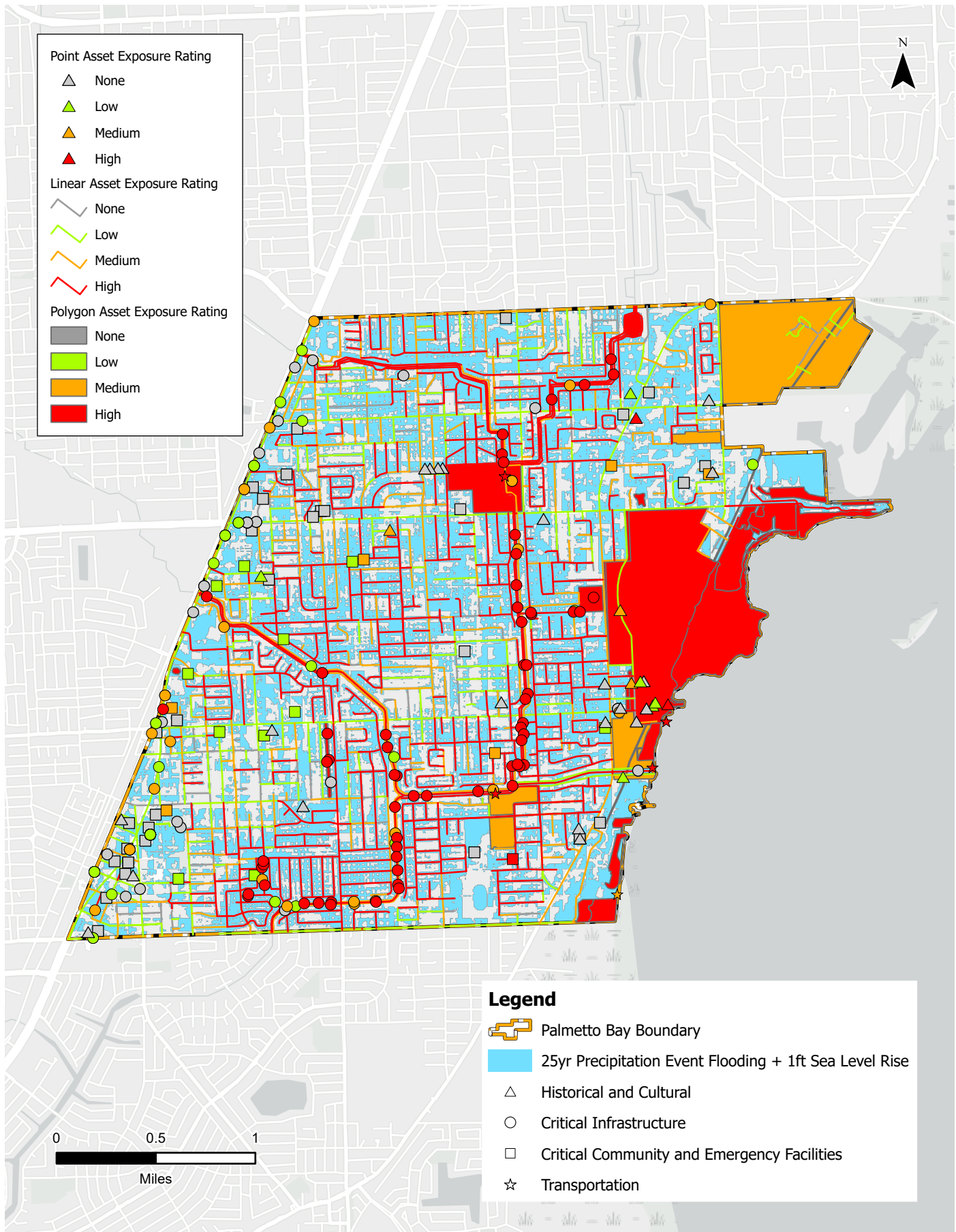


Figure B-50: Exposure Analysis: Storm Surge (5yr) & 2040 Sea Level Rise – Intermediate Low

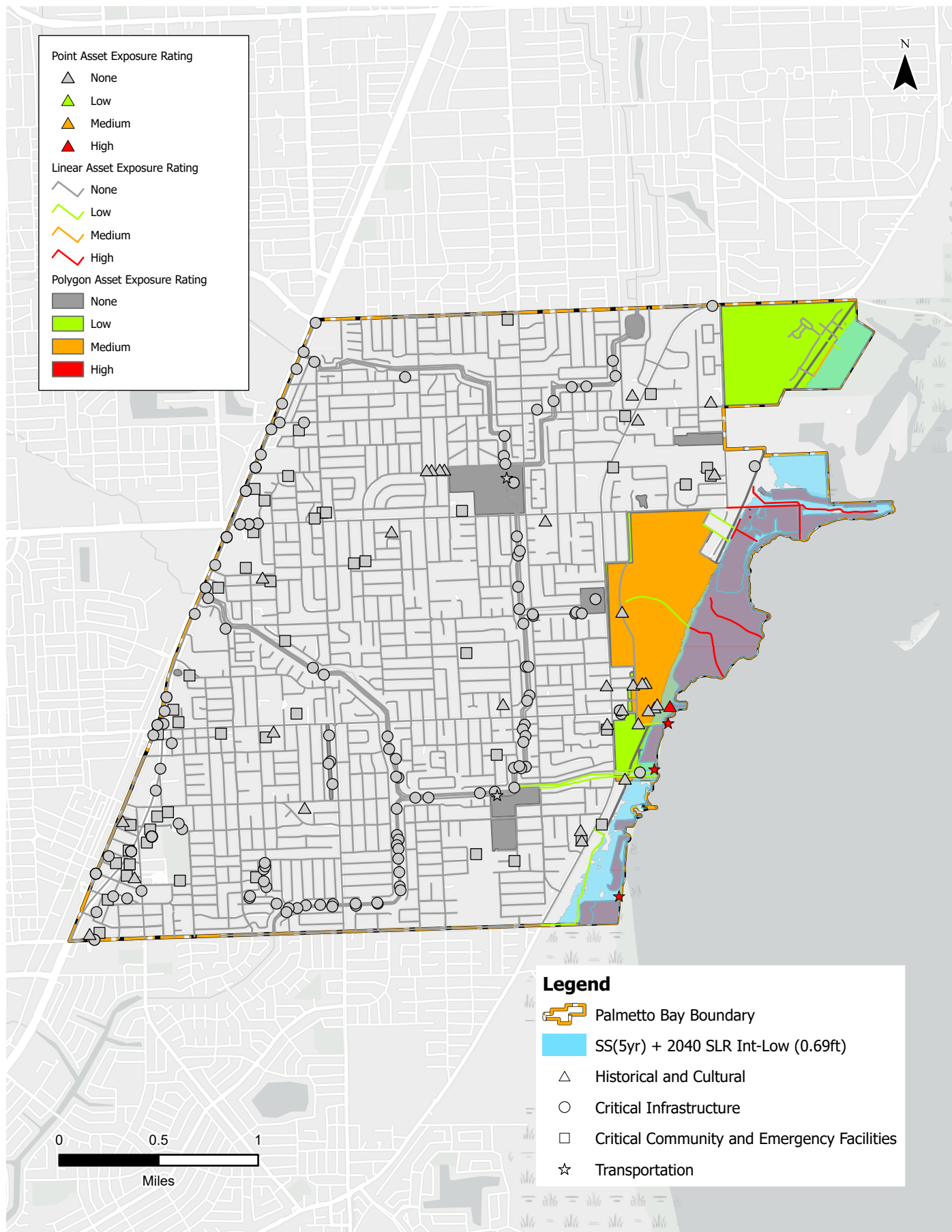


Figure B-51: Exposure Analysis: Storm Surge (5yr) & 2040 Sea Level Rise – Intermediate High

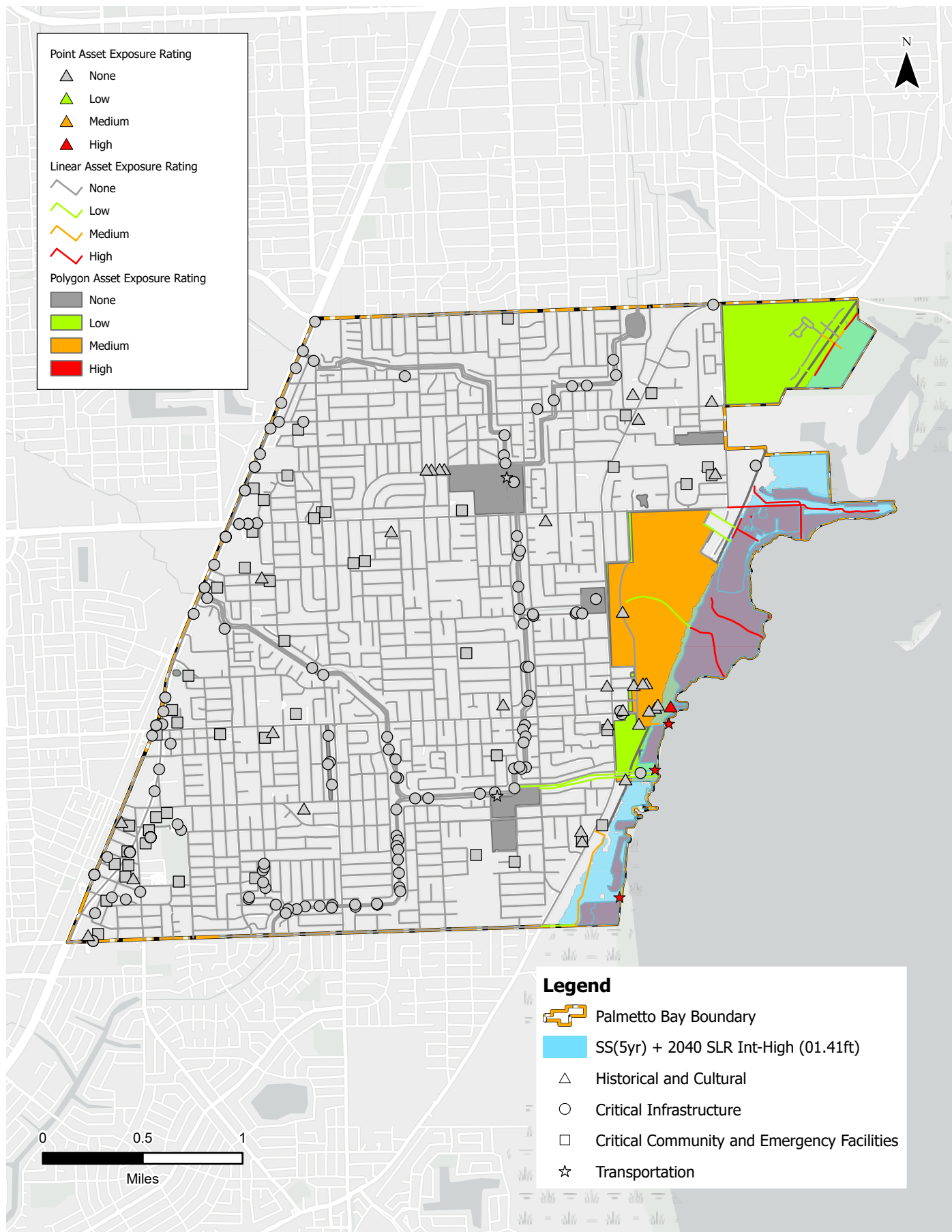


Figure B-52: Exposure Analysis: Storm Surge (100yr) & 2040 Sea Level Rise – Intermediate Low

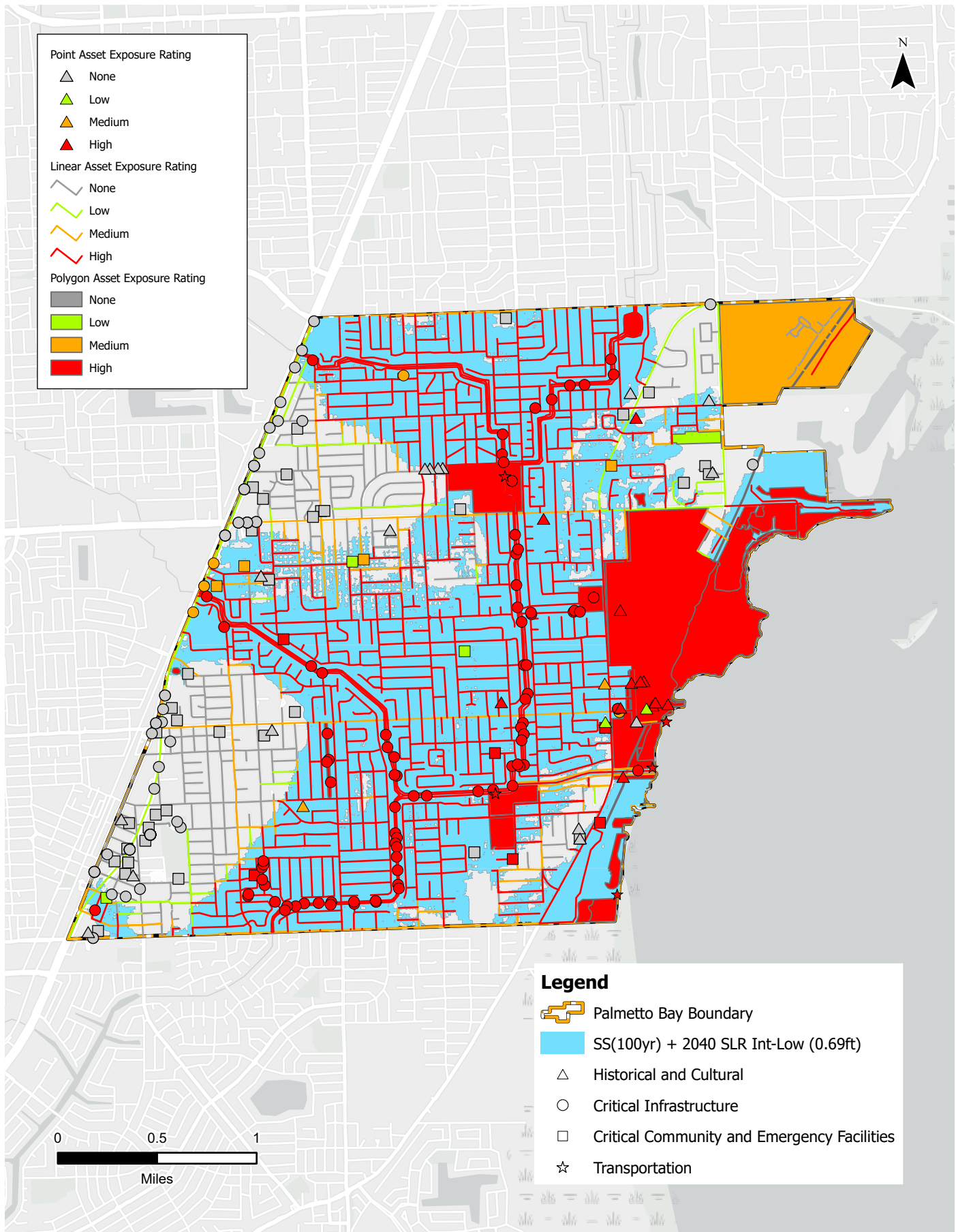


Figure B-53: Exposure Analysis: Storm Surge (100yr) & 2040 Sea Level Rise – Intermediate High

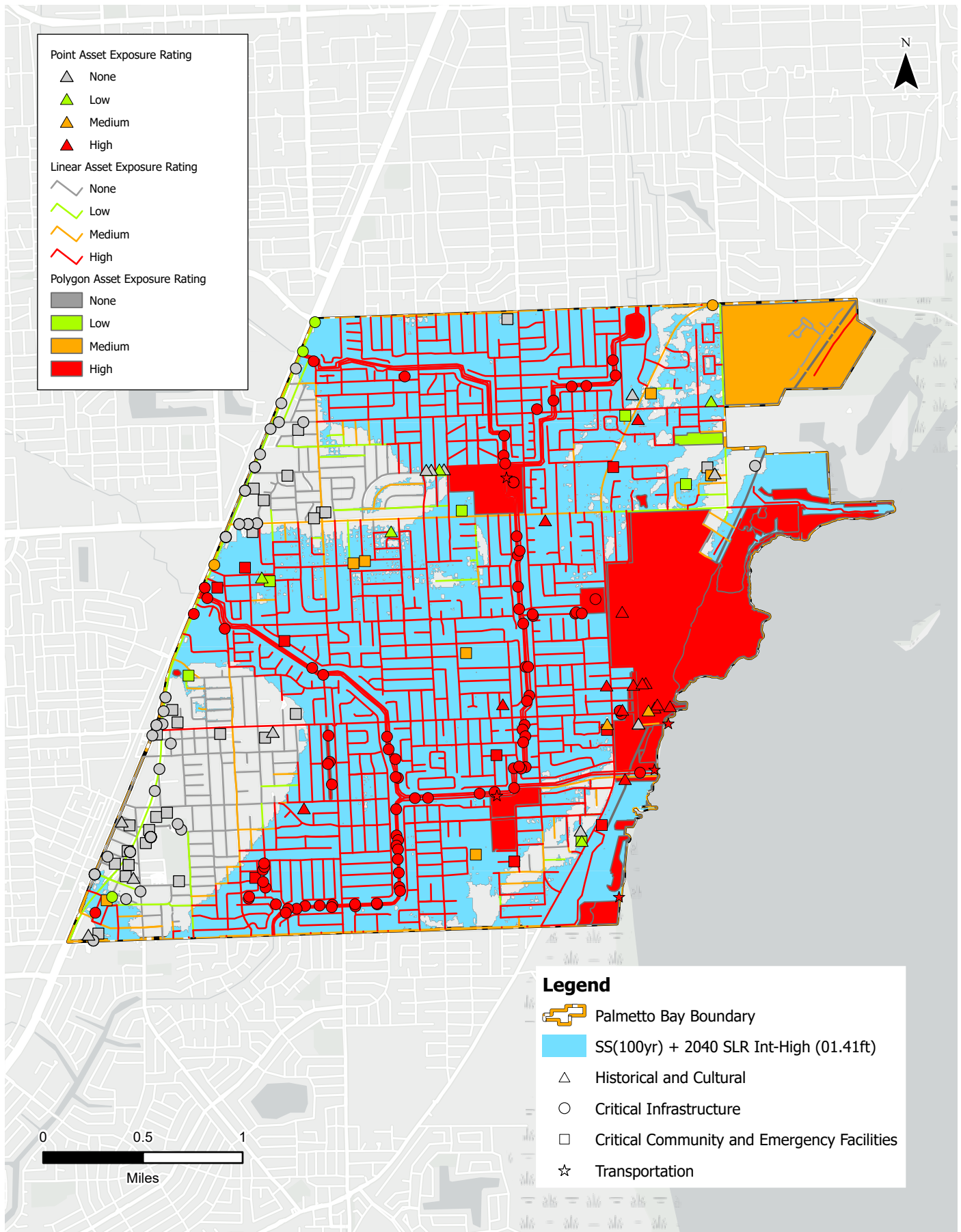


Figure B-54: Exposure Analysis: Storm Surge (1,000yr) & 2040 Sea Level Rise – Intermediate Low

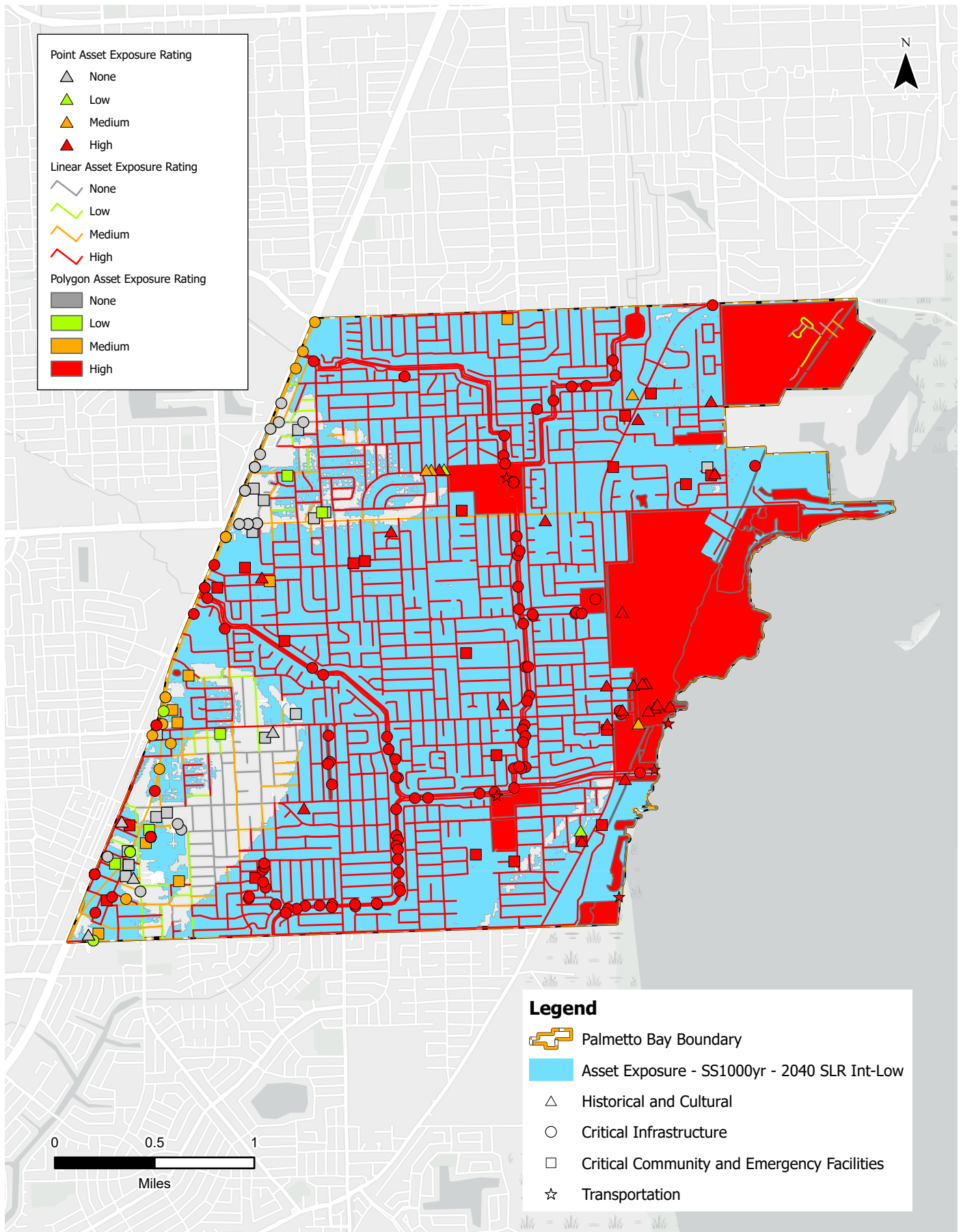


Figure B-55: Exposure Analysis: Storm Surge (1,000yr) & 2040 Sea Level Rise – Intermediate High

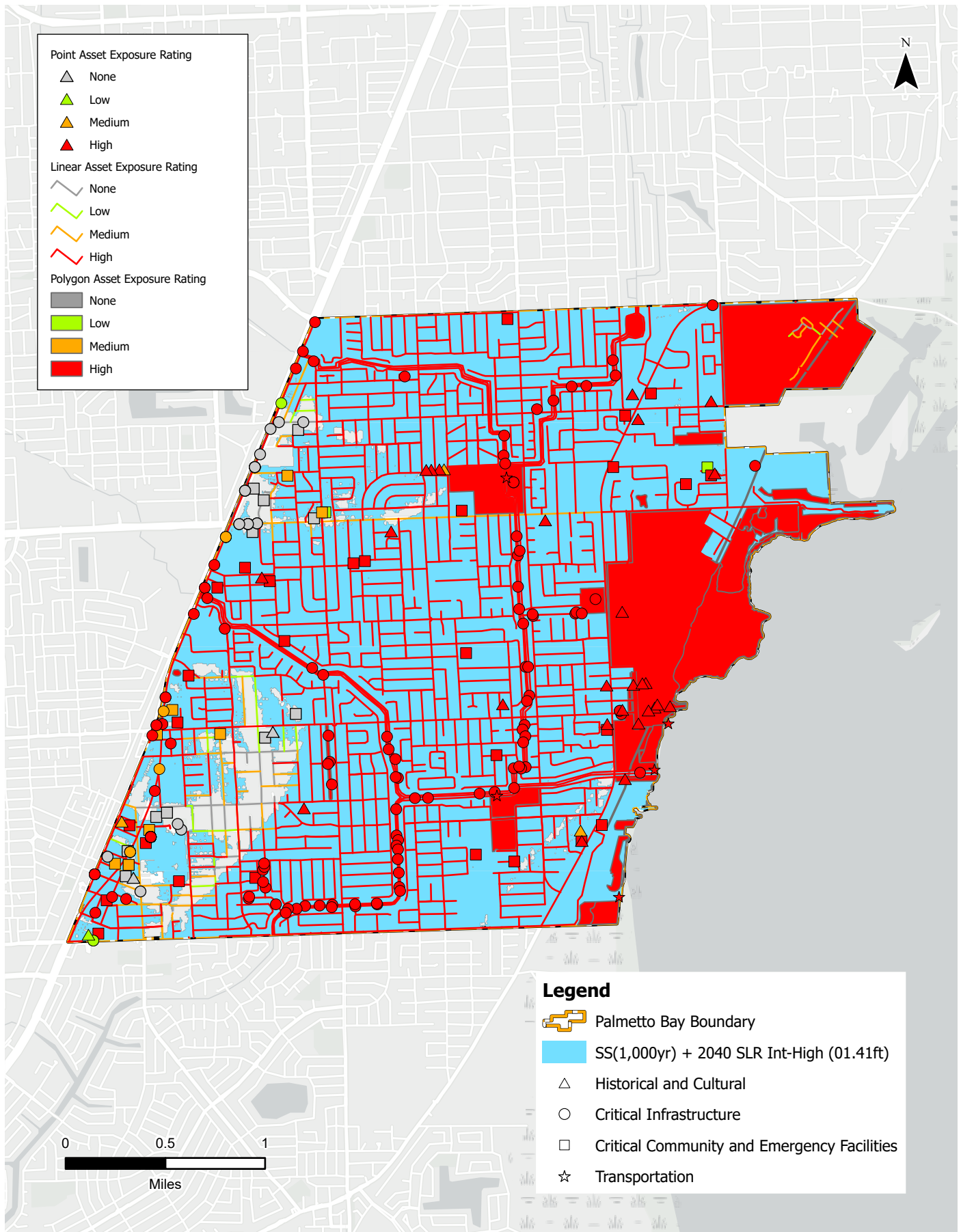


Figure B-56: Exposure Analysis: 2070 Sea Level Rise – Intermediate Low

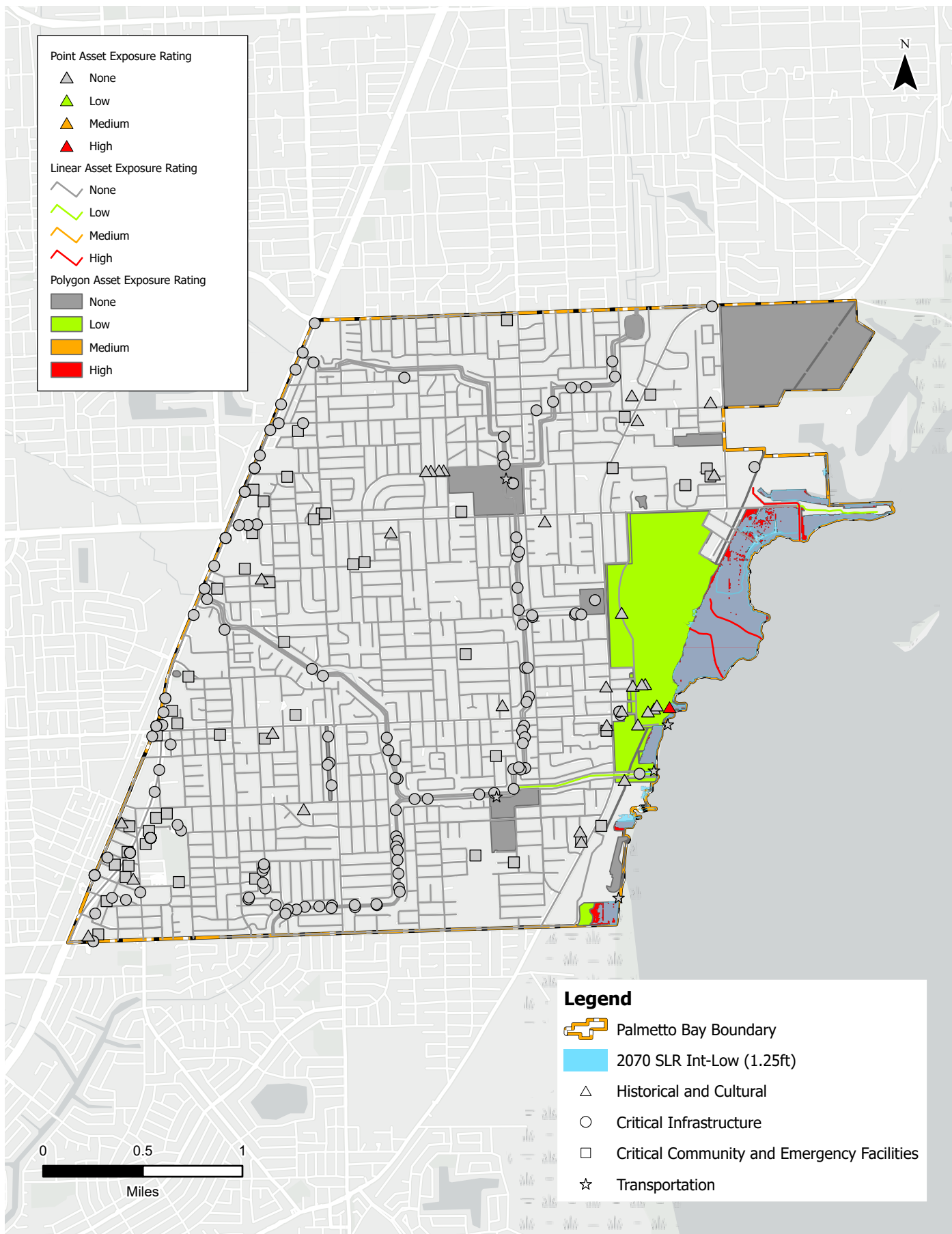


Figure B-57: Exposure Analysis: 2070 Sea Level Rise – Intermediate High

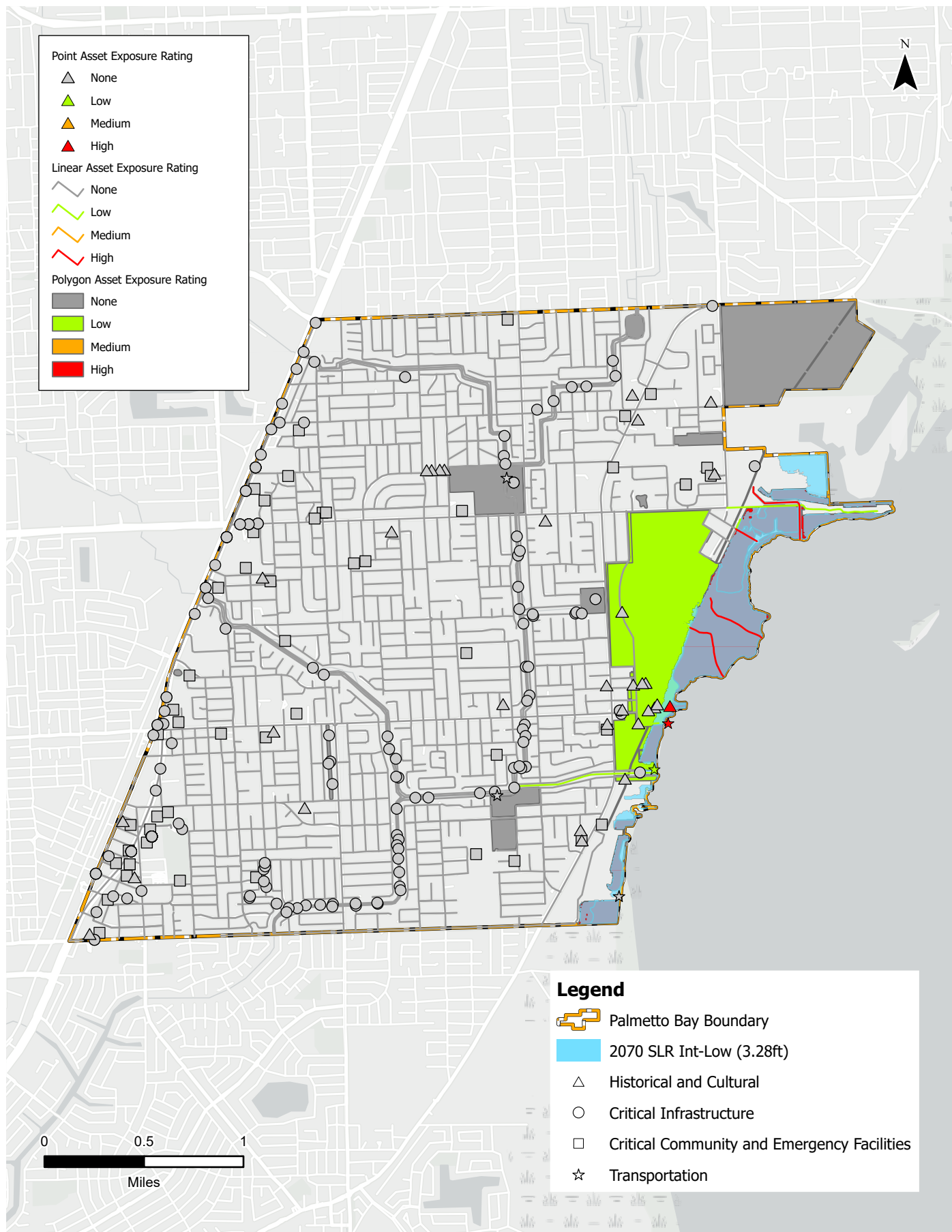


Figure B-58: Exposure Analysis: 25yr Precipitation Event & 2ft Sea Level Rise

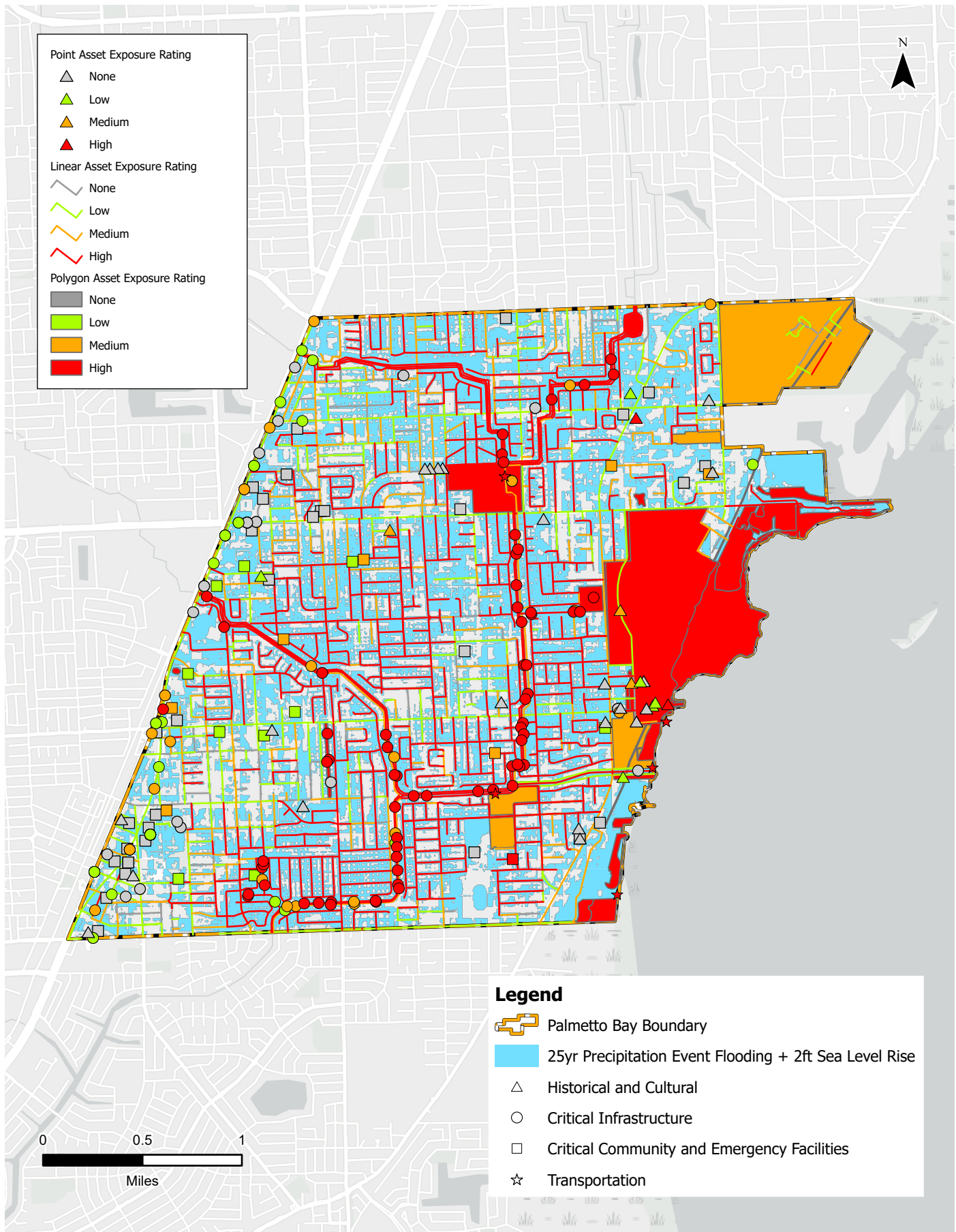


Figure B-59: Exposure Analysis: Storm Surge (5yr) & 2070 Sea Level Rise – Intermediate Low

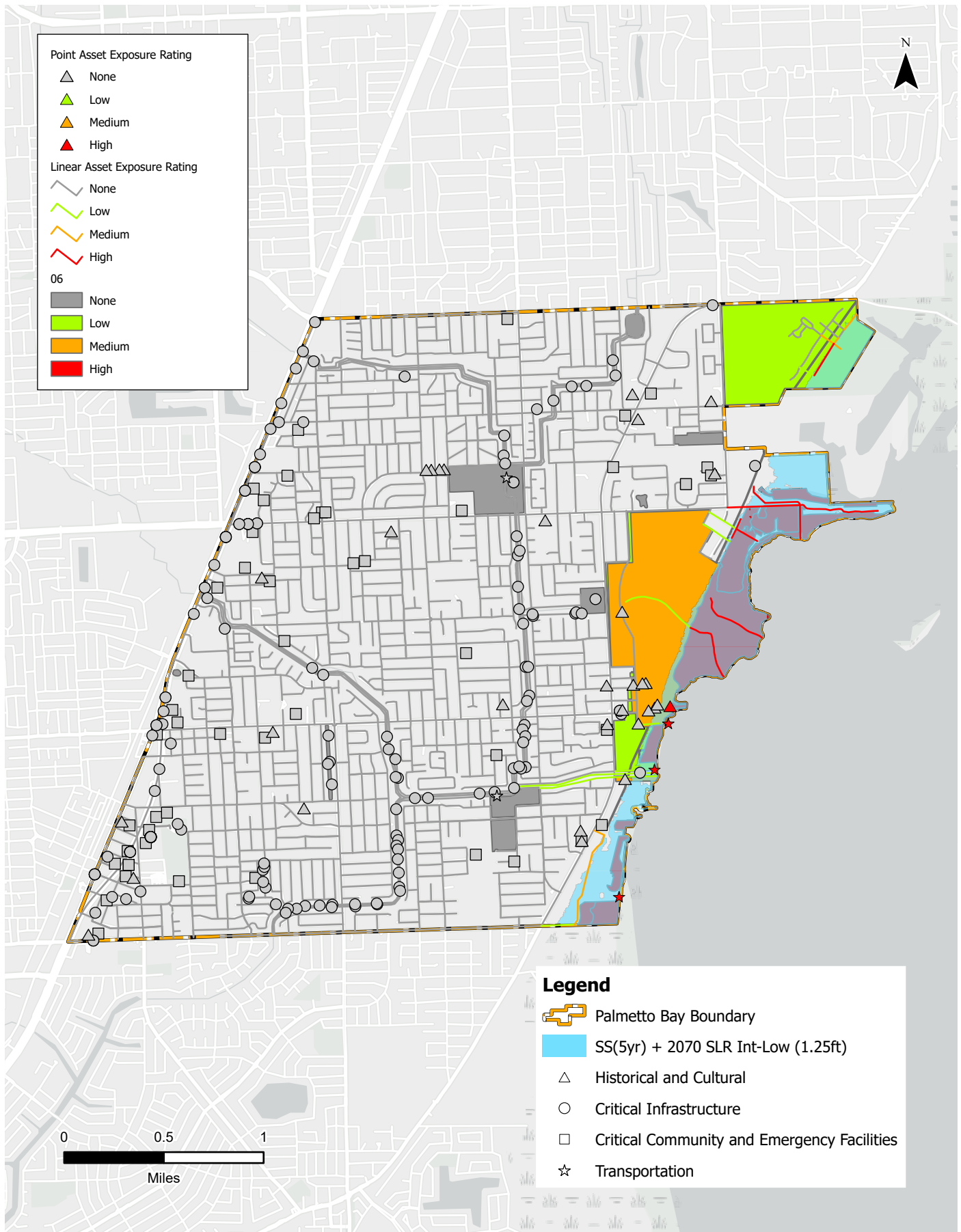


Figure B-60: Exposure Analysis: Storm Surge (5yr) & 2070 Sea Level Rise – Intermediate High

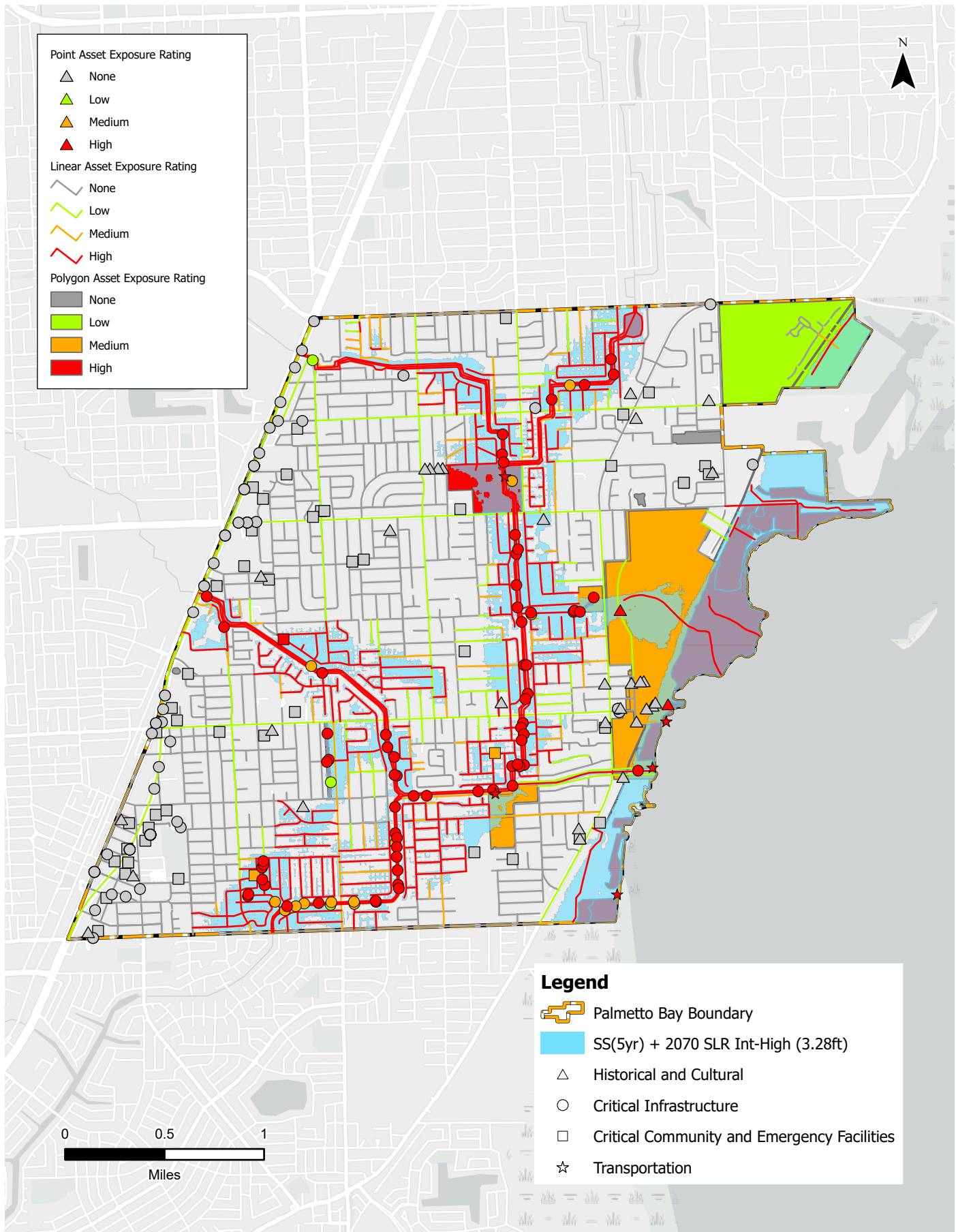


Figure B-61: Exposure Analysis: Storm Surge (100yr) & 2070 Sea Level Rise – Intermediate Low

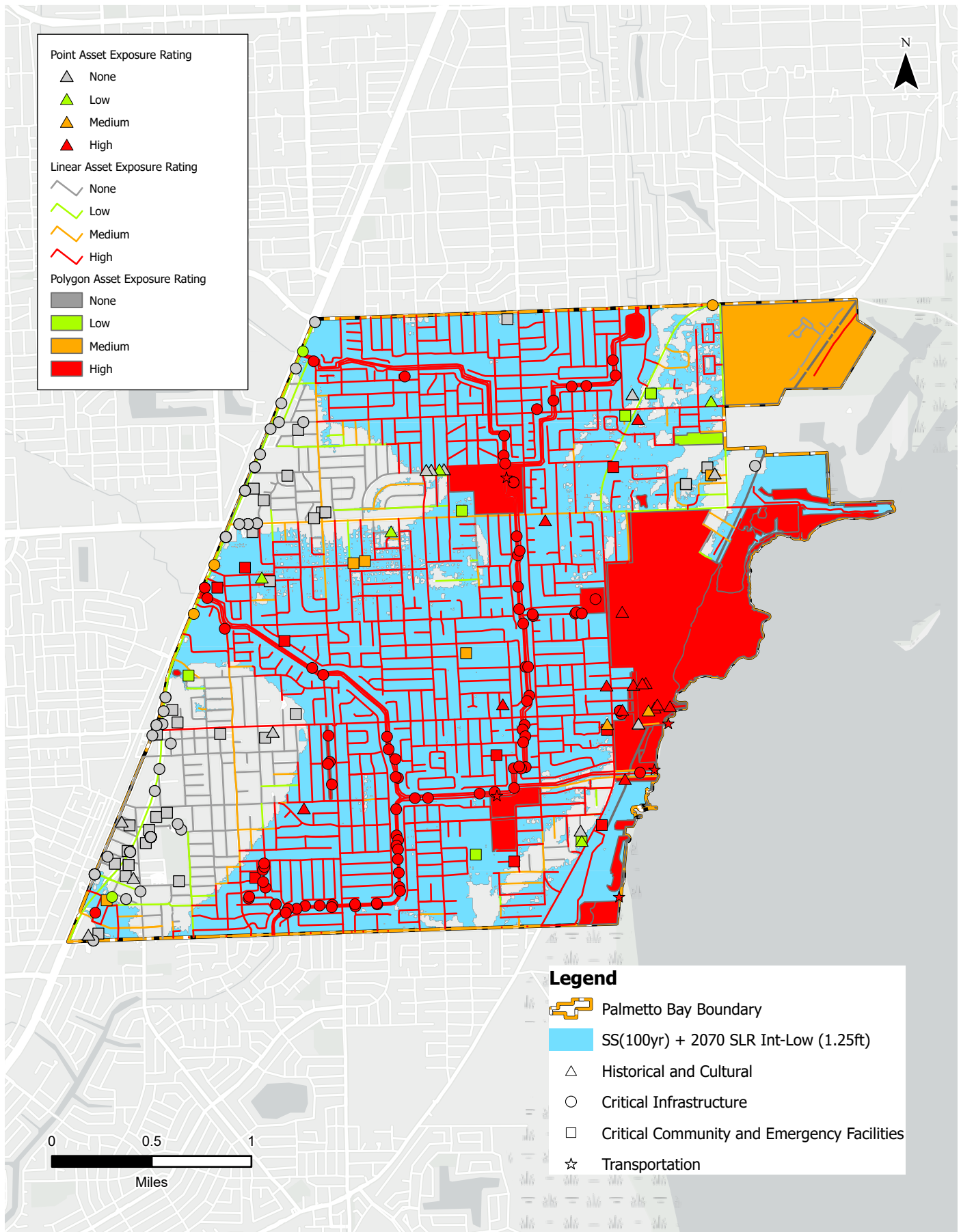
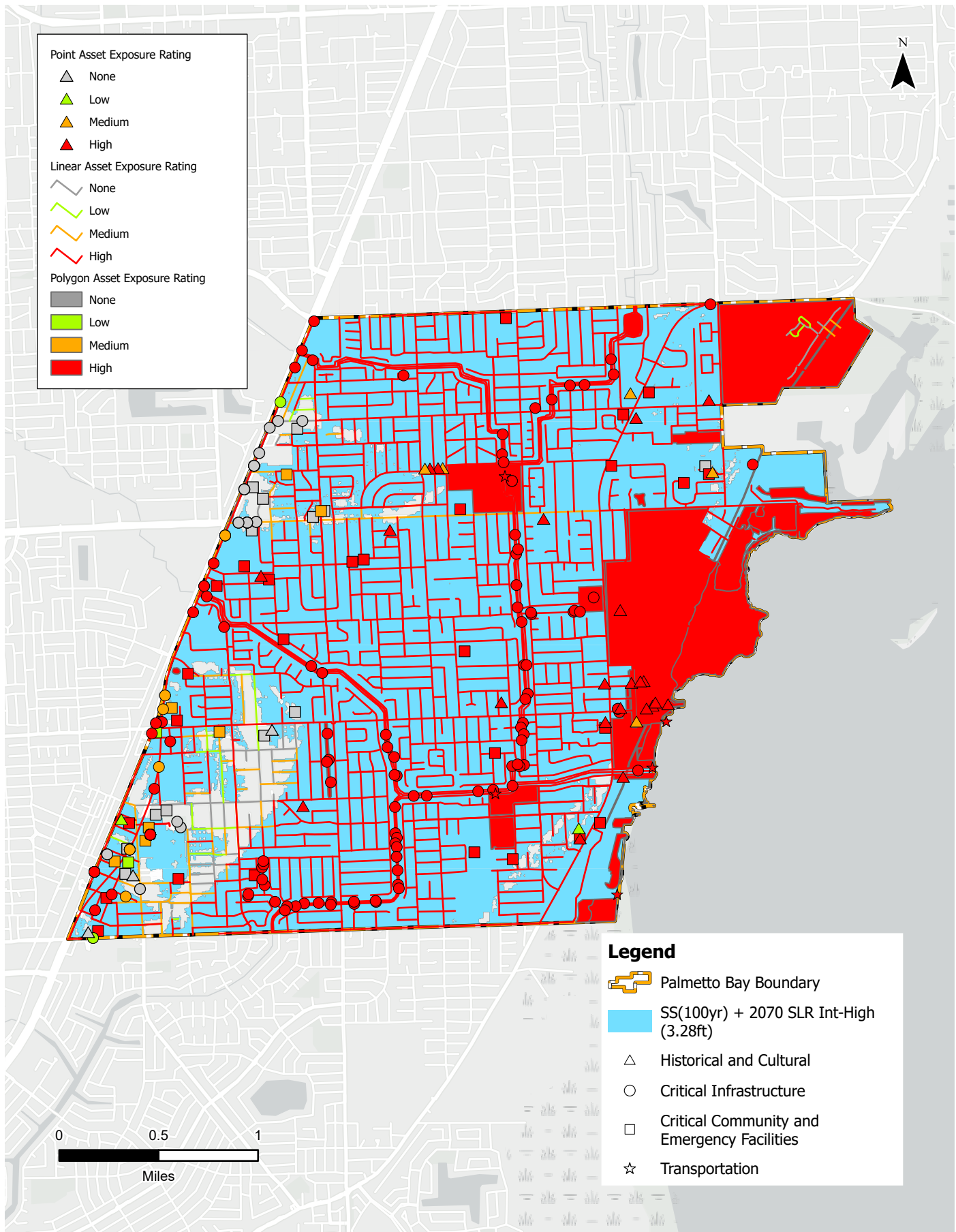


Figure B-62: Exposure Analysis: Storm Surge (100yr) & 2070 Sea Level Rise – Intermediate High



Point Asset Exposure Rating

- △ None
- ▲ Low
- ▲ Medium
- ▲ High

Linear Asset Exposure Rating

- None
- Low
- Medium
- High

Polygon Asset Exposure Rating

- None
- Low
- Medium
- High

Legend

- ▭ Palmetto Bay Boundary
- SS(100yr) + 2070 SLR Int-High (3.28ft)
- △ Historical and Cultural
- Critical Infrastructure
- Critical Community and Emergency Facilities
- ☆ Transportation

Figure B-63: Exposure Analysis: Storm Surge (1,000yr) & 2070 Sea Level Rise – Intermediate Low

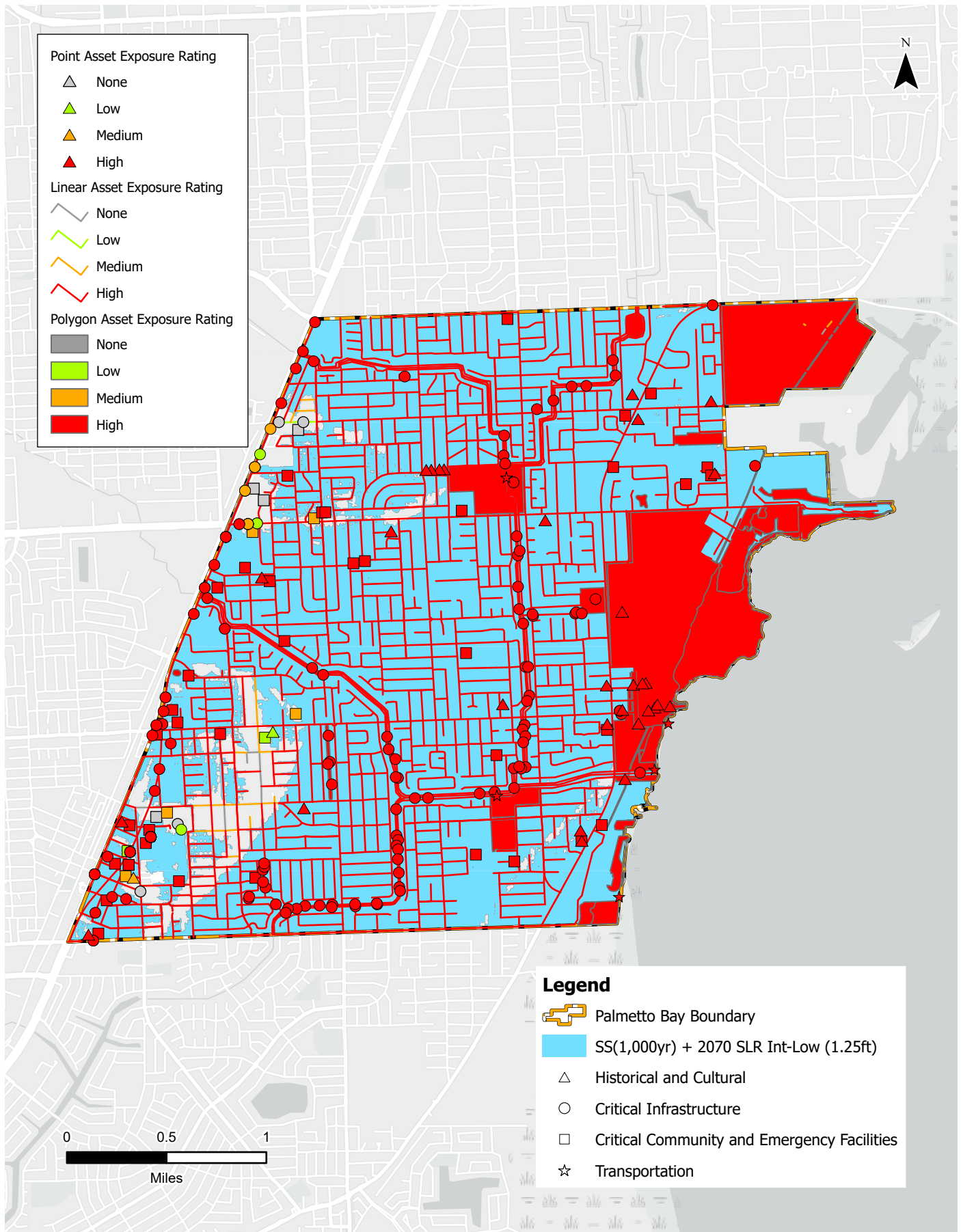
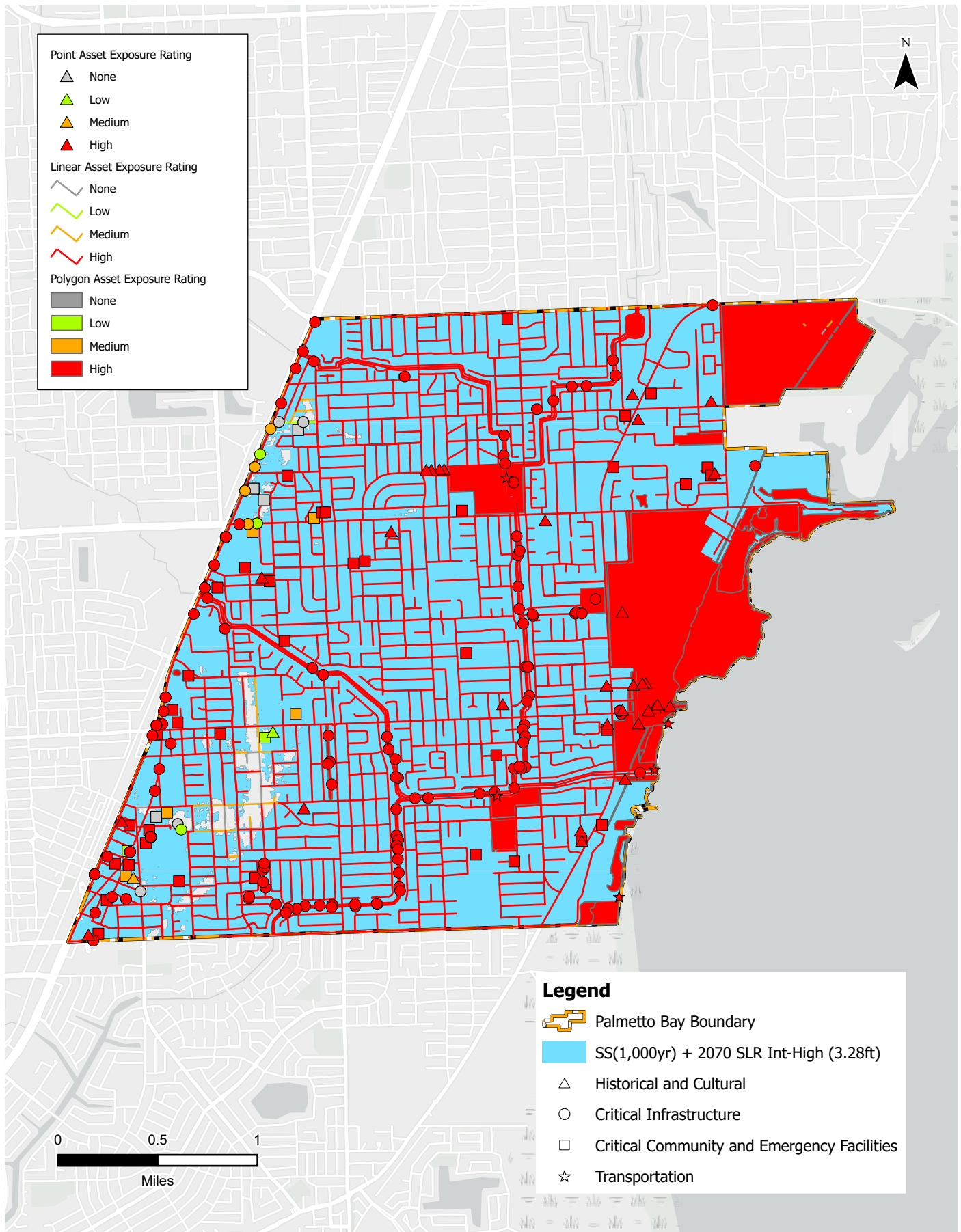


Figure B-64: Exposure Analysis: Storm Surge (1,000yr) & 2070 Sea Level Rise – Intermediate High



APPENDIX C

STORMWATER POCKET PARKS: LOCATION EVALUATION

The map below displays the proposed locations for the Stormwater Pocket Parks as well as an overview of existing open space and parks. Agricultural parcels are also included on this map, as these areas have been identified by the Palmetto Bay Parks Master Plan as potential parcels to convert to pocket parks. It should be noted that several of these parcels are privately owned and vacant – no agricultural uses are implemented on these properties.

Each parcel has been assigned a number. The table below details occupancy information and ownership information for each parcel if available. This information is intended to support the Village in identifying potential locations for new parks, identify gaps in park locations, and explore opportunities for coordination, partnerships, or acquisition. It should be noted that not all of the identified parcels are available or suitable for new park locations. Some locations already have existing uses, such as school playgrounds or fields, or existing parks.

Table C-1: Parks and Open Space Parcel Type and Ownership Type

Number	Parcel Type	Ownership Type
1	Stormwater Pocket Park	Public Vacant (Village)
2	Stormwater Pocket Park	Public Vacant (County)
3	Stormwater Pocket Park	Public Vacant (Florida Power and Light; County)
4	Agricultural	Private Vacant: Residential
5	Agricultural	Private: Residential - Single Family : 1 Unit
6	Agricultural	Private Vacant: Residential w
7	Agricultural	Private Vacant: Residential
8	Agricultural	Private Vacant: Residential
9	Agricultural	Private Vacant: Residential
10	Agricultural	Private Vacant: Residential
11	Agricultural	Private Vacant: Residential
12	Agricultural	Private Vacant: Residential
13	Agricultural	Private Vacant: Residential
14	Agricultural	Private Vacant: Residential
15	Agricultural	Public Vacant (County)
16	Agricultural	Private: Residential - Single Family : 1 Unit
17	Agricultural	Private Vacant Residential
18	Agricultural	Private: Residential - Single Family : 1 Unit
19	Agricultural	Private Club or Hall
20	Agricultural	Private Religious
21	Agricultural	Private Educational/Scientific
22	Agricultural	Private Educational/Scientific
23	Agricultural	Private: Residential - Single Family: 1 Unit
24	Agricultural	Private: Residential - Single Family: 1 Unit
25	Agricultural	Private: Residential - Single Family: 1 Unit
26	Agricultural	Private: Residential - Single Family: 1 Unit
27	Agricultural	Private: Residential - Single Family: 1 Unit
28	Agricultural	Private: RELIGIOUS - EXEMPT
29	Agricultural	Private: Residential: Additional Living Quarters
30	Agricultural	Private: Residential - Single Family: 1 Unit
31	Agricultural	Private: Residential - Single Family: 1 Unit
32	Agricultural	Public Vacant (County)
33	Agricultural	Private: Residential - Single Family: 1 Unit

Number	Parcel Type	Ownership Type
34	Existing Parks	Bill Sadowski Preserve
35	Existing Parks	Coral Reef Park
36	Existing Parks	Palmetto Bay Park
37	Existing Parks	Perrine Wayside (Dog) Park
38	Existing Parks	Thalatta Estate Park
39	Existing Parks	Ludovici Park
40	Existing Parks	Charles Deering Estate
41	Existing Parks	Area 259
42	Open Space	N/A
43	Open Space	N/A
44	Open Space	Dr. Henry E. Perrine Academy of the Arts
45	Open Space	Southwood Middle School
46	Open Space	Howard Drive Elementary School

Figure C-1: Existing Parks and Open Space

