

I. CLIMATE CHANGE ELEMENT DATA AND ANALYSIS

Climate change is one of the key challenges facing the world today. Greenhouse gas emissions resulting from the consumption of fossil fuels are widely considered to be the major contributing factor to climate change. Short term climate change impacts such as increased drought, flooding, and extreme weather events are already being felt in many areas. Long term impacts such as damage to buildings and infrastructure, agriculture, ecosystems, and human health, including increased asthma and allergies, are starting to be felt as well. While efforts to limit climate change are taking place at the national and international levels, local governments can make a significant contribution to both reducing the degree of climate change and to mitigating its effects. Ultimately climate adaptation must be planned for and implemented at the local level.

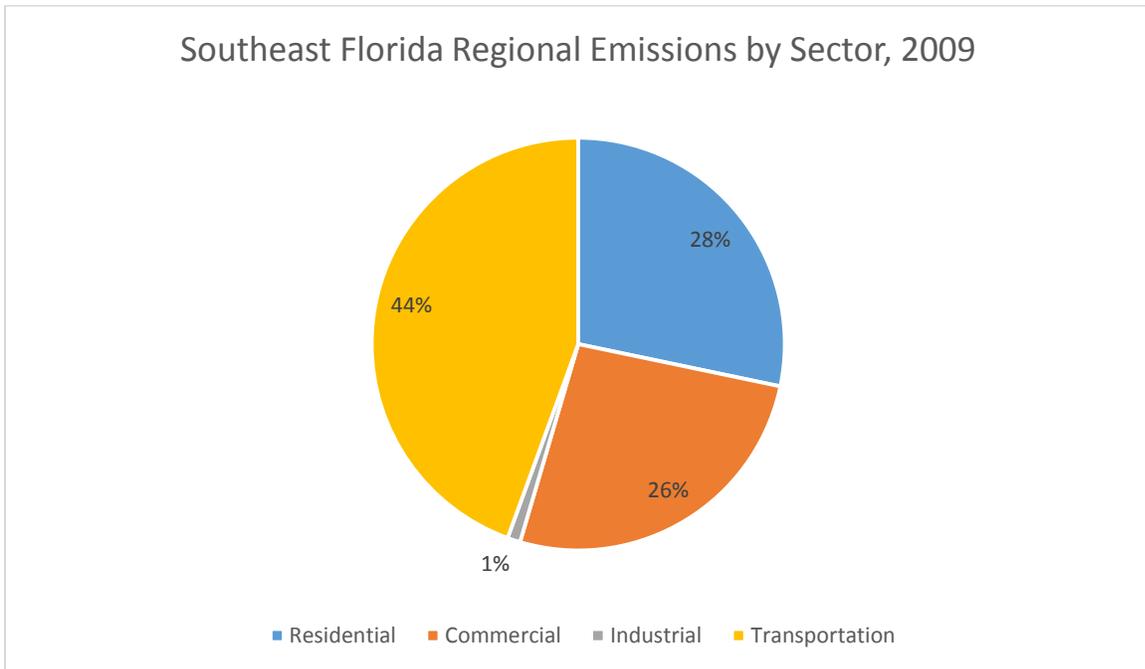
South Florida, with its low-lying coastal location and exposure to hurricanes, is particularly vulnerable to climate change and its effects, including sea level rise, stronger and more frequent storm events, and generally higher temperatures. In recognition of this vulnerability, in 2009 Miami-Dade, Monroe, Broward and Palm Beach counties formed the Southeast Florida Regional Climate Change Compact in order to coordinate a regional response to climate change. In October 2012 the Compact adopted the *Regional Climate Action Plan*, which presented data regarding climate change and its related impacts, and recommended mitigation and adaptation actions that can be taken at the regional, county, and municipal levels. According to the Plan, in 2009 64,917,785 metric tons of greenhouse gas were emitted by various sources in Southeast Florida. Table 1., and its associated pie chart, below indicates the source of these emissions by sector. As can be seen, the most significant source of these emissions was fuel consumption in the transportation sector (45%), followed by electric and energy use in the residential sector (28%), electric and energy use in the commercial sector (26%), and electric and energy use in the industrial sector (1%).¹

¹ *Climate Change Action Plan*, Southeast Florida Regional Climate Change Compact, October 2012

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Table 1. Regional Emissions by Sector

Sector	2009 metric tons emitted
Residential	18,237,990 (28%)
Commercial	17,083,809 (26%)
Industrial	811,016 (1%)
Transportation	28,784,969 (44%)
Total	64,917,785

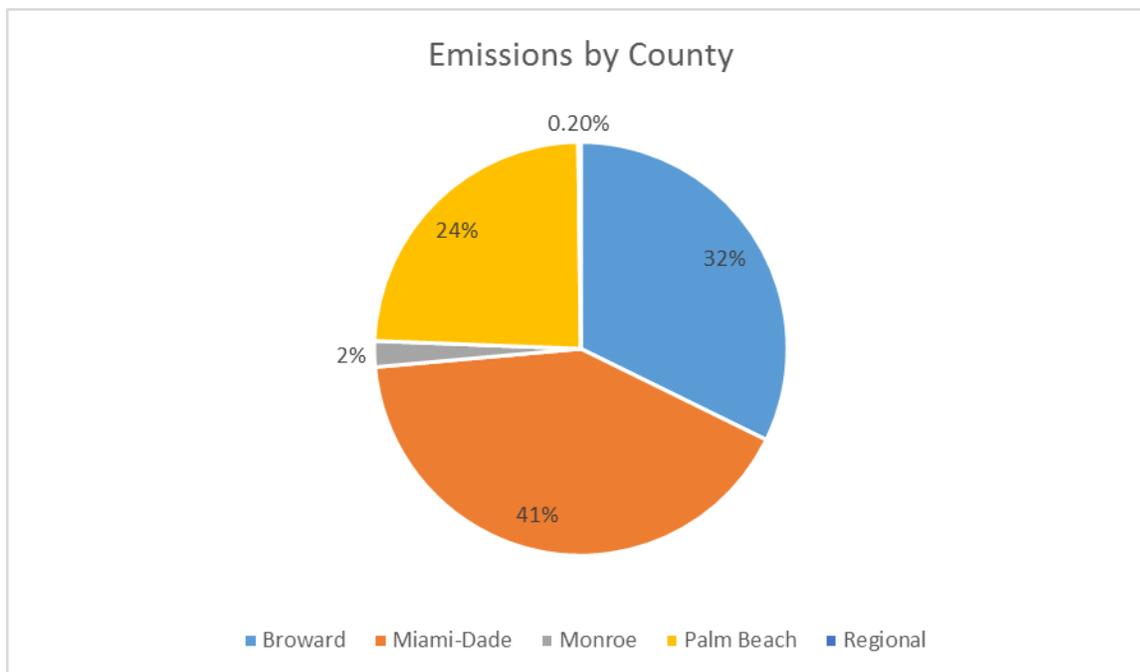


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Table 2., and its associated pie chart, below indicates total greenhouse emissions by County. In 2009, 26,859,326 metric tons of greenhouse gases were emitted by various sources in Miami-Dade County, comprising 41% of the emissions in the region. Although information was not provided at the municipal level, it is estimated that between 400,000 and 450,000 metric tons of greenhouse gases are emitted by various sources in the Town of Cutler Bay (the “Town”) based on its percentage of the total County population (1.6%).

Table 2. Regional Emissions by County

County	2009 metric tons emitted
Miami-Dade	26,859,326 (41%)
Broward	20,810,719 (32%)
Monroe	1,417,206 (2%)
Palm Beach	15,675,174 (24%)
Regional Sources	155,359 (.2%)
Total	64,917,785

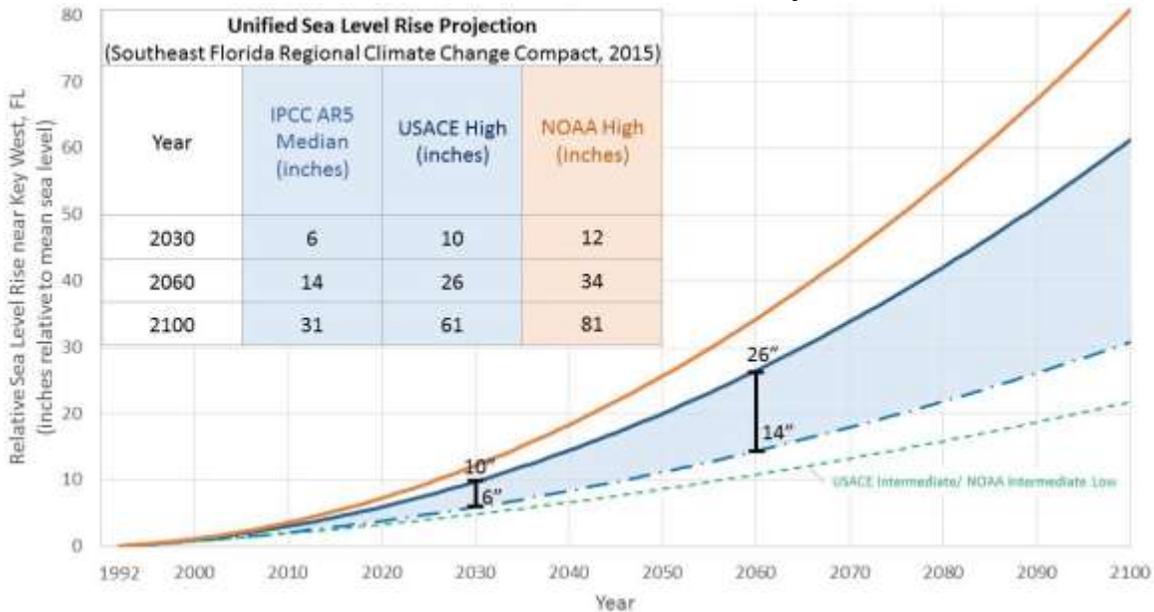


Elevation is the key factor in identifying areas most at risk for sea level rise and/or increased storm frequency impacts. Figure 1. on page 5 shows flood zones in the Town, while Figure 2. on page 6 shows the Coastal High Hazard Area, the areas of the Town most at risk from sea level flooding and storm impacts. According to the South Florida Regional Climate Change Compact’s unified sea level rise projections for South Florida as shown in Table 3, sea levels are

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projected to rise by six to 10 inches by 2030 and 14 to 34 inches by 2060², with potentially devastating circumstances.

Table 3. Unified Sea Level Rise Projection



In August 2012 the Southeast Florida Regional Climate Change Compact published the *Analysis of the Vulnerability of Southeast Florida to Sea Level Rise*. This report included maps showing areas that would be inundated in a one-, two-, three-, four-, or five-foot sea level rise. Figure 3. (Page 7) shows areas in the Town of Cutler Bay that would be inundated in a one-foot rise, which according to the projections is likely to occur after 2030. Figure 4. (Page 8) shows areas in the Town that would be inundated in a two-foot rise, Figure 5. (Page 9) shows areas that would be inundated in a three-foot rise (two inches higher than the maximum projection of a 34-inch rise by 2060), Figure 6. (Page 10) shows areas that would be inundated in a four-foot rise, and Figure 7. (Page 11) shows areas that would be inundated in a five-foot rise.

² *Unified Sea Level Rise Projection*, Southeast Florida Regional Climate Change Compact, Sea Level Rise Work Group, October 2015

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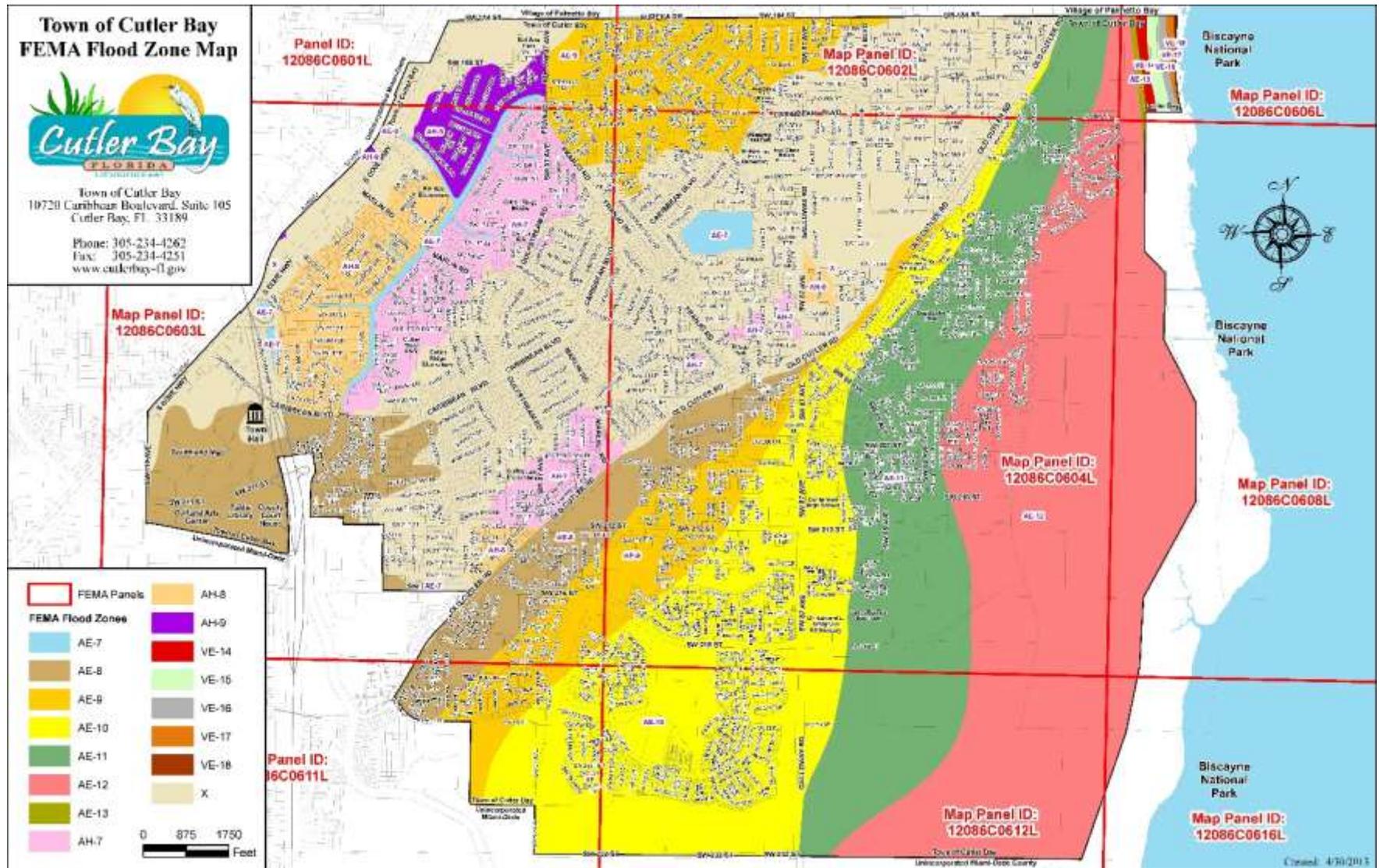


Figure 1. FEMA Flood Zones

Figure 2. Coastal High Hazard Areas

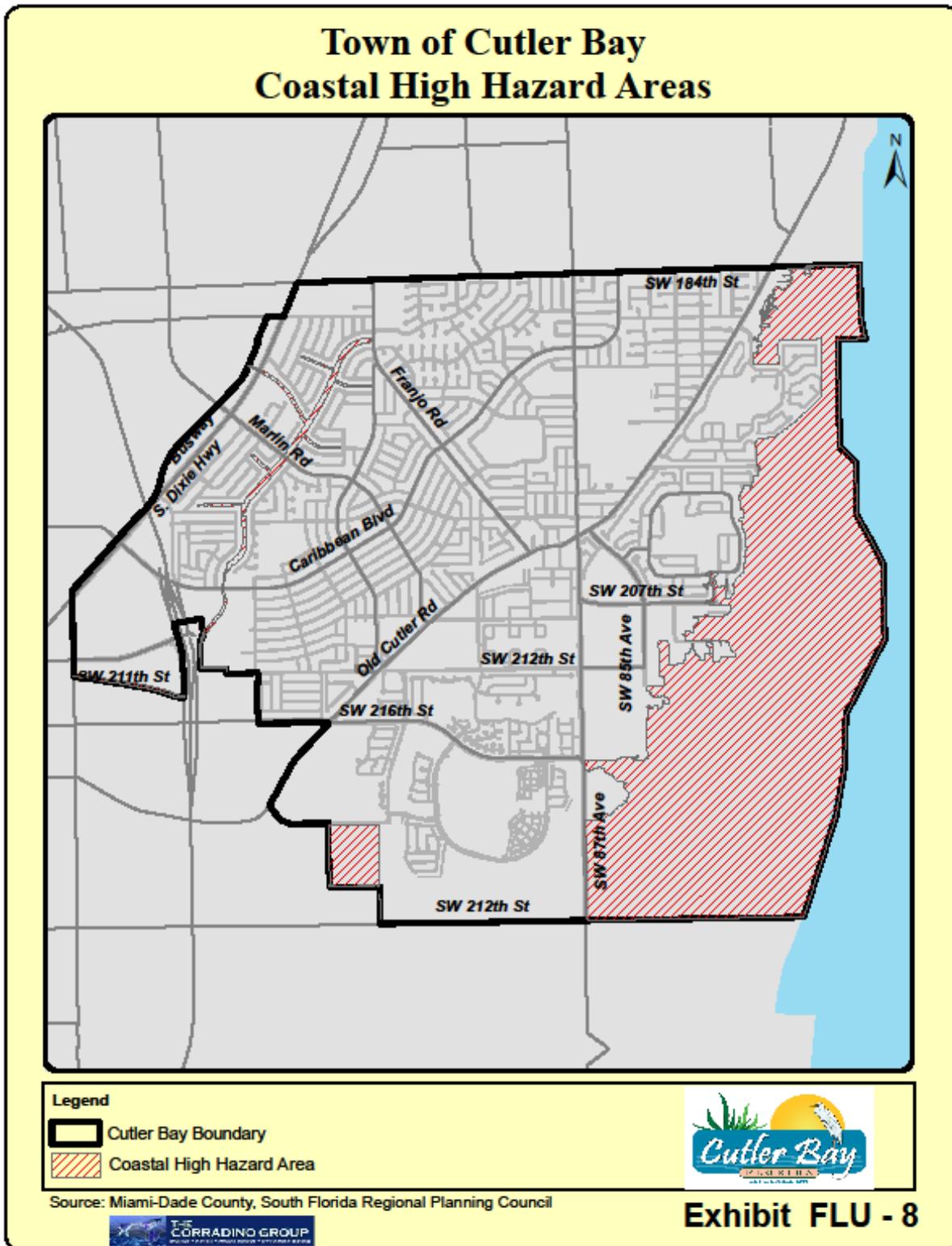


Figure 3. Areas Submerged, One-Foot Sea Level Rise

Figure 4.

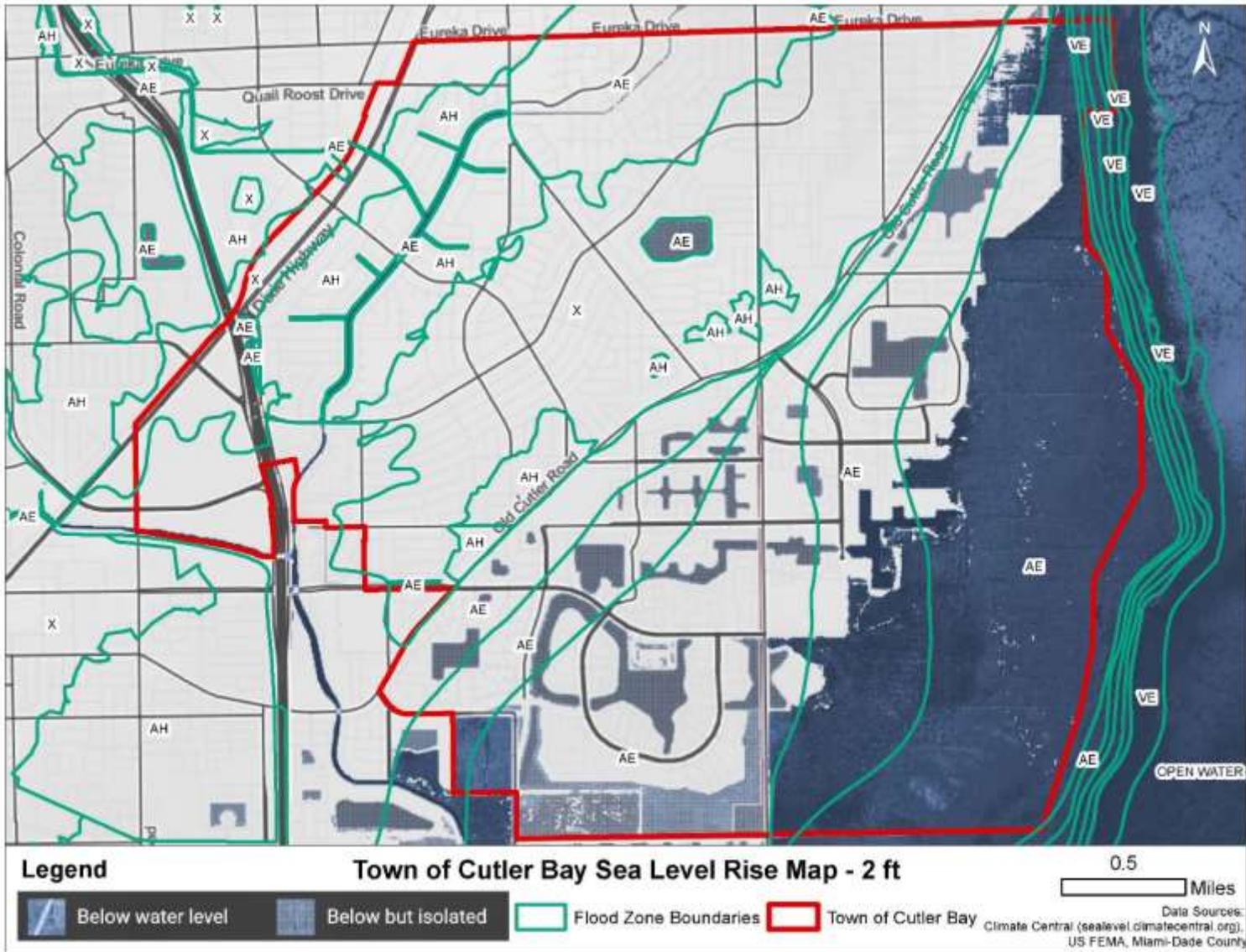


Figure 5. Areas Submerged, Three-Foot Sea Level Rise

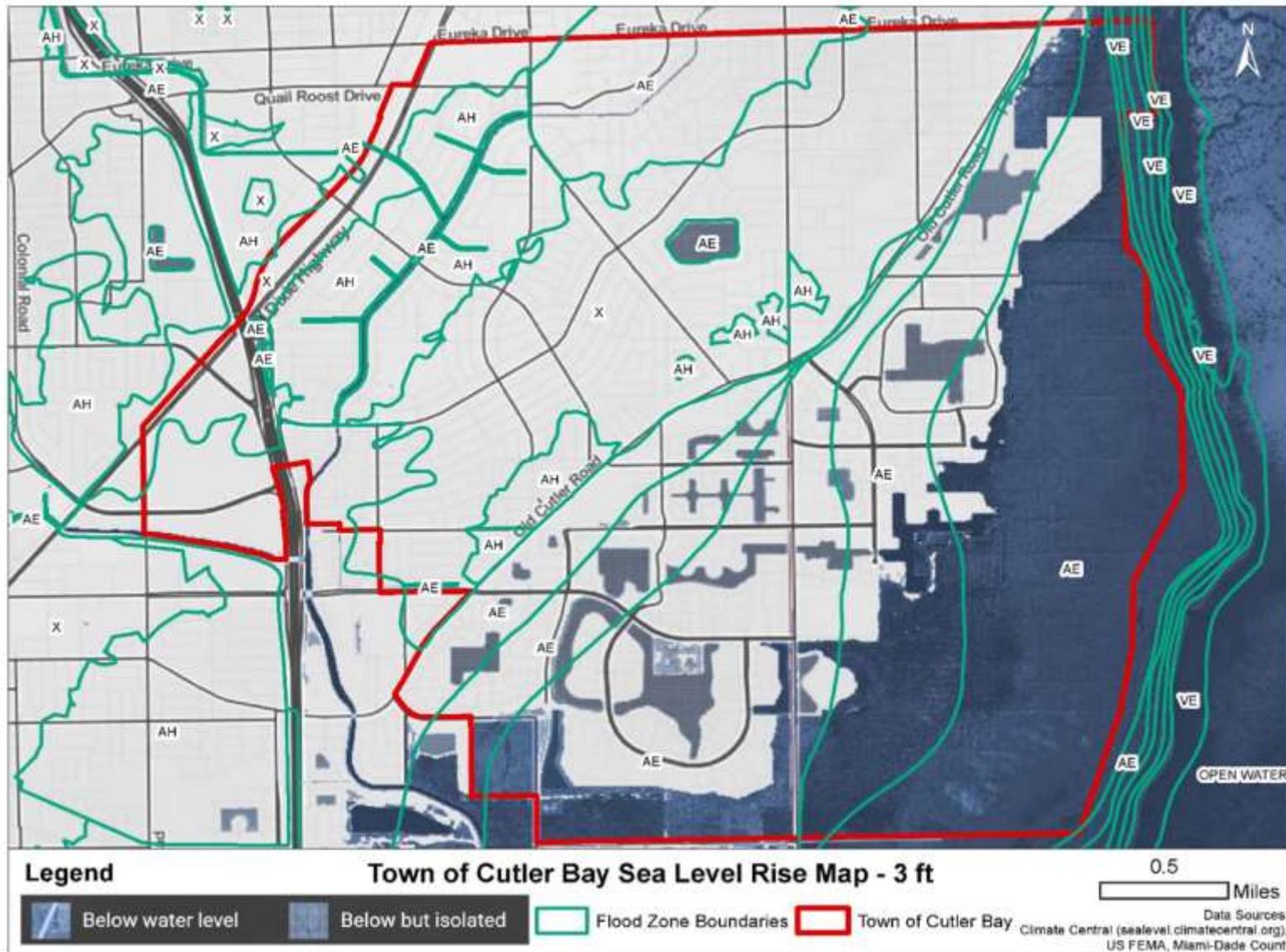


Figure 6. Areas Submerged, Four-Foot Sea Level Rise

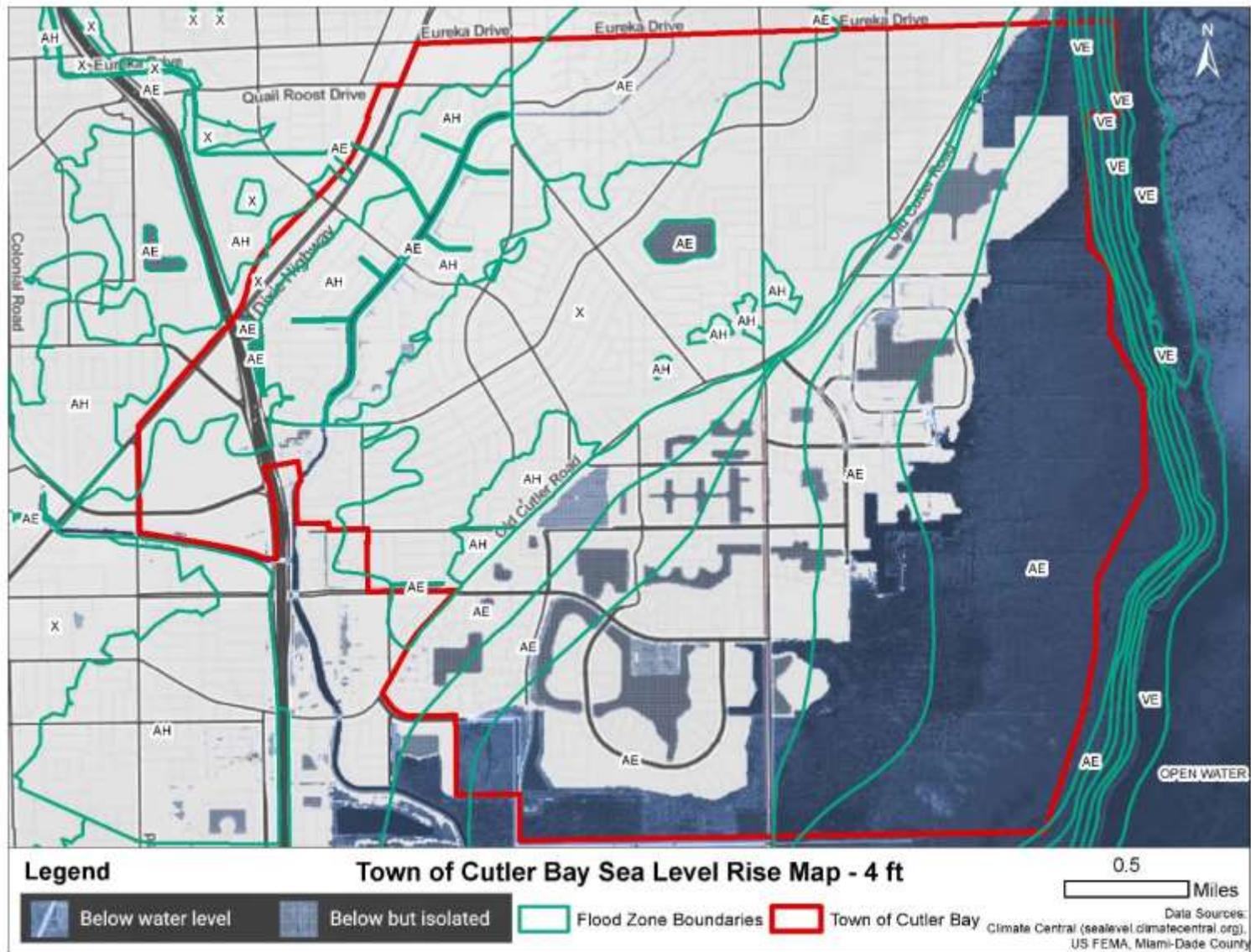
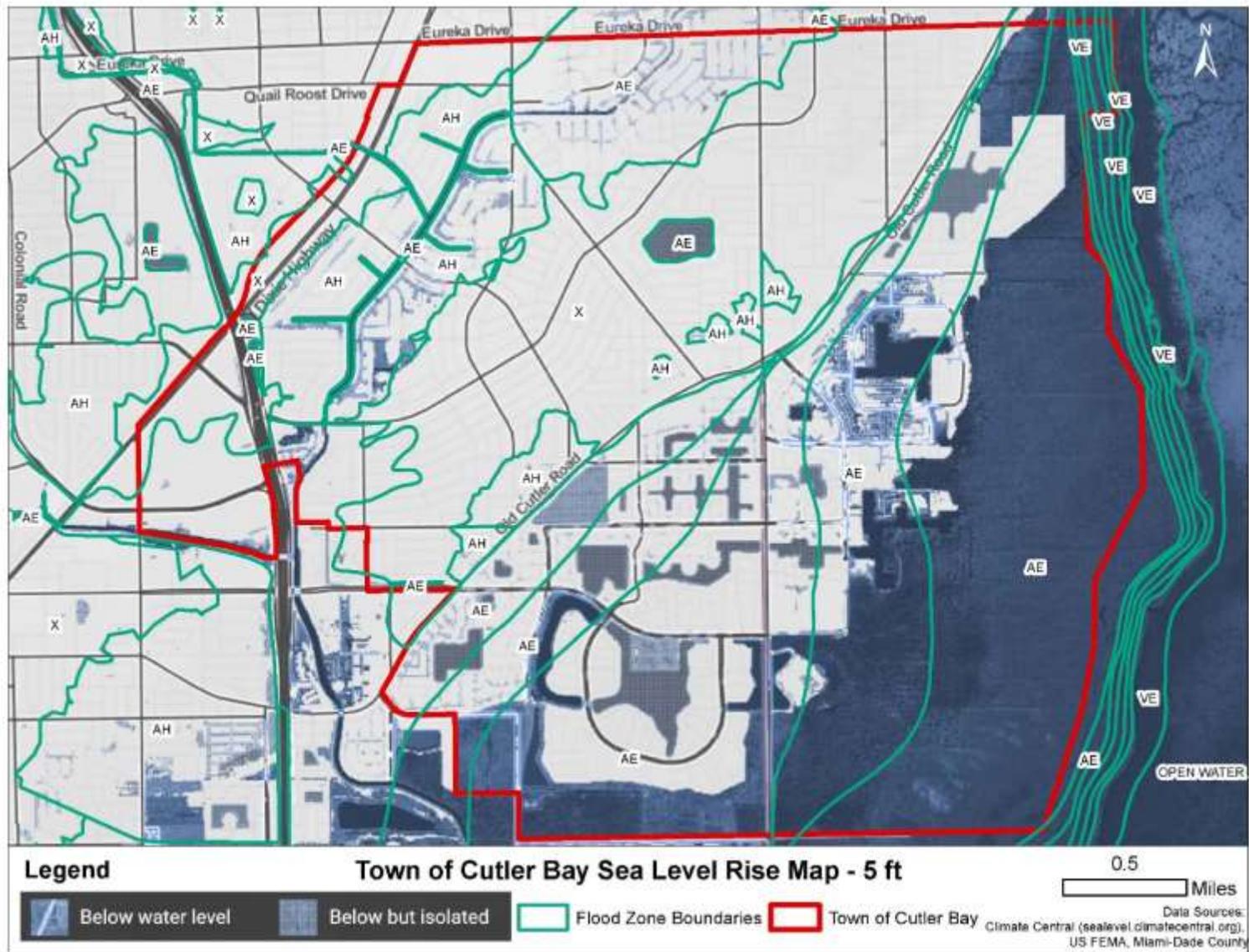


Figure 7. Areas Submerged, Five-Foot Sea Level Rise



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There are a number of actions that local governments can take to reduce greenhouse gas emissions. These actions include: reducing vehicle miles travelled through the provision of alternative transportation mechanisms; promoting land use patterns that reduce automobile dependence (i.e. compact mixed use development vs. urban sprawl), and; reducing energy consumption in all sectors (i.e. green building techniques, efficiency standards...).

The Town of Cutler Bay has already taken a number of steps to reduce greenhouse gas emissions and encourage environmental responsibility at the local level. The Town, along with neighboring communities, participates in the Property Assessed Clean Energy (PACE) Program, which provides loans to property owners for solar panels, wind generators, insulation and shutters. The Town also recently gained the legislative authority to allow residents of certain areas to receive loans, which can be paid off over time, to finance the initial costs of installing an alternate energy producing device (*Financing Initiative for Renewable and Solar Energy*). In addition, the Town is the only municipality in the County to have achieved the Florida Green Building Coalition's Silver Certification, and has adopted green building and development standards as part of its Land Development Regulations.

"Climate change resilience" means the ability of the built and natural environment (including infrastructure) to adjust to and absorb climate change impacts to the maximum extent feasible. Examples of management and development practices that can increase climate change resilience include: requiring increased minimum floor elevations for new development and redevelopment; retrofitting buildings for increased flood risk; designing infrastructure that can withstand higher water levels such as raising seawalls and installing tidal valves; implementing natural drainage features such as bioswales and stormwater buffers; reducing the heat island effect through increased landscaping, shading, and green building practices, and; adopting building practices that reduce vulnerability to increased storm events.

Resilience strategies specific to sea level rise and increased flooding are often categorized as Protection, Accommodation, and Retreat. Protection measures are structurally defensive measures designed to repel the impacts of rising seas. They include hard measures such as fortified seawalls or embankments and wave energy dissipation structures as well as soft measures like widened beaches and fortified sand dunes. Protection measures are most appropriate for concentrated areas of buildings and infrastructure the high value of which justifies the high cost of protection.

Accommodation measures are designed to allow for a degree of flooding without causing major damage. Raising building elevations and designing areas that can accept tidal or stormwater flooding without major damage are types of accommodation. There may be certain streets that can flood without property damage and water could be directed to these areas while other streets where flooding damages adjacent property could be raised. Accommodation is more difficult in heavily urbanized locations because there are fewer areas that can experience flooding without damage.

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Another aspect of accommodation is designing infrastructure that can withstand and adapt to sea level rise. For example, sea level rise poses a particular threat to stormwater infrastructure in that the outfalls of gravity-fed drainage systems are likely to be blocked by sea level rise well before any actual flooding from that rise occurs. This could lead to flooding during regular rainstorms, or during clear days in which extreme high tides are occurring, known as “sunny day flooding”. Sea water can also flow backwards into the pipes and onto the land at some elevations. One way valves, also known as tidal valves, installed on stormwater outlets can prevent the latter, but the only way to get stormwater from rain through the pipes and into the receiving canal would be pumps which are expensive and further contribute to greenhouse gas emissions. Diverting as much stormwater as possible away from the pipe based system into surface level bioswales and stormwater preserves is therefore key to reducing the high cost of pumping stormwater into canals.

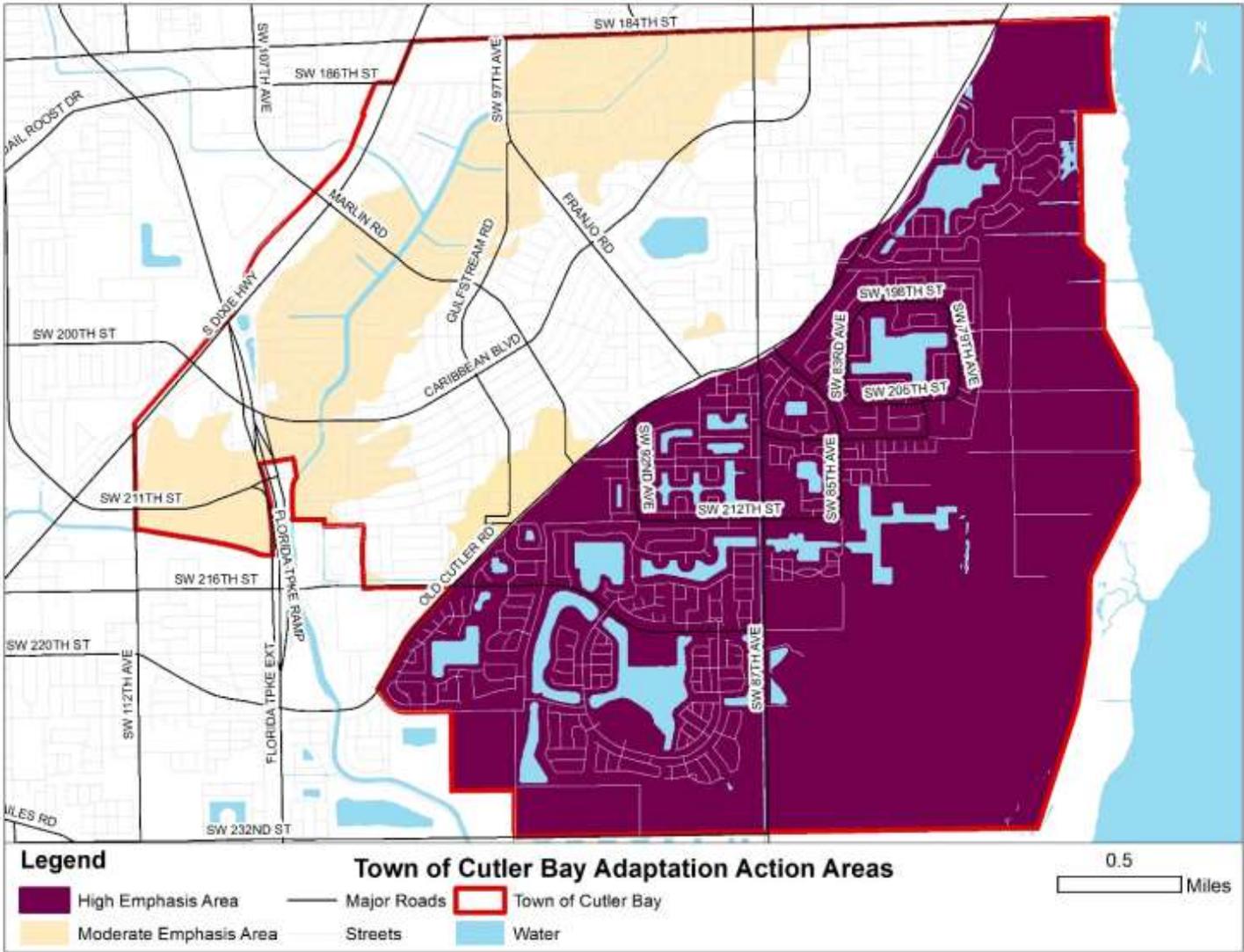
Retreat strategies involve the actual removal or relocation of existing development and the prevention of future development in the areas most at risk. Transfer of development rights is a means of achieving retreat as property owners can still realize their property value even if development rights on vulnerable properties are restricted. Retreat is the most invasive and expensive measure but may be required in certain situations.

Chapter 163, Section 163.3164 (1) of the Florida Statutes defines an “Adaptation Action Area” as an area or areas that “experience coastal flooding due to extreme high tides and storm surge and that are vulnerable to the related impacts of rising sea levels for the purpose of prioritizing funding for infrastructure needs and adaptation planning”. As per the Statute, areas that might be defined as Adaptation Action Areas may include, but are not limited to:

- a. areas that experience tidal flooding;
- b. areas that have a hydrological connection to coastal waters and are vulnerable to flooding;
- c. areas designated as evacuation zones for storm surge, and/or;
- d. other areas impacted by stormwater/flood control issues.

Figure 8 (Page 14) shows the recommended Adaptation Action Areas for the Town. These areas include: the Coastal High Hazard Area; areas subject to inundation in the event of sea level rise, and; areas expected to experience the greatest extent of flooding in a 100-year flood event.

Figure 8. Adaptation Action Areas



II. CLIMATE CHANGE ELEMENT GOALS, OBJECTIVES AND POLICIES

Goal 1: Achieve a sustainable, climate resilient community by: promoting energy efficiency and greenhouse gas reduction strategies; protecting and adapting public infrastructure, services, natural systems and resources from climate change impacts, and; continuing to coordinate with other agencies to address climate change at the local, County, Regional, State, Federal, and global levels.

Objective CC-1: Mitigate the causes of climate change while providing for cleaner energy solutions and a more energy efficient way of life for Town residents, visitors and businesses.

Monitoring Measures CC-1

1. Percent reduction in greenhouse gas emissions from government operations from baseline year 2017 and date of inventory, and/or since the date of the last inventory. (Target: at least 25% by 2030)
2. Percent reduction in overall greenhouse gas emissions, regionally and at the local level, between 2016 and date of inventory, and/or since date of the last inventory. (Target: at least 25% by 2030)

Policy CC-1A: The Town shall quantify greenhouse gas emissions resulting from its government operations by 2020, and develop a plan to reduce these emissions by 25 percent by 2030. The Town will continue to regularly monitor and track the progress of programs and initiatives that contribute to the ultimate reaching of this goal.

Policy CC-1B: The Town shall develop building standards that promote the increased use of solar electricity in the community, and shall monitor the initiatives of Miami-Dade County and other agencies in the development of renewable energy sources, including wind, geothermal and ocean energy technologies.

Policy CC-1C: The Town shall coordinate with legislative representatives to reduce regulatory barriers and develop incentives for renewable and alternative energy installations.

Policy CC-1D: The Town shall implement expedited permitting for the installation of alternative fuel and electric vehicle charging infrastructure.

Policy CC-1E: The Town shall coordinate with Miami-Dade County and the private sector to reduce greenhouse gas emissions and create “green” jobs by: promoting green economic growth and green-collar work training programs; expanding the market for energy efficient products and services; supporting renewable and alternative energy production, and; promoting and incentivizing energy conservation retrofits.

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Objective CC-2: Improve the climate resiliency and energy-efficiency of new and existing buildings and public infrastructure.

Monitoring Measures CC-2

1. Percent of new development or redevelopment in the Town between 2016 and 2030, or date of evaluation, that is LEED-certified, or awarded a comparable green certification. (Target: at least 50% by 2030)
2. Number of capital projects that increased infrastructure resiliency to climate change between 2016 and 2030, or date of evaluation.

Policy CC-2A: The Town shall encourage greener, more energy-efficient and climate resilient construction practices by:

- a) requiring that the construction or renovation of Town-owned facilities meets Florida Green Building Coalition, US Green Building Council Leadership in Energy and Environmental Design (LEED), or other acceptable commercial building standards;
- b) encouraging commercial builders to require that the construction or renovation of commercial facilities meets Florida Green Building Coalition (Silver), US Green Building Council Leadership in Energy and Environmental Design (LEED), or other acceptable commercial building standards;
- c) Encouraging licensed Town personnel to maintain LEED Green Associate certification;
- d) re-evaluating finish floor elevation standards with respect to projected sea level rise scenarios and flooding potential, and;
- e) incorporating building design specifications that increase resistance to more frequent and/or intense storm events.

Policy CC-2B: The Town shall evaluate risk from sea level rise or climate change related impacts in the location and design of new infrastructure, as well as the fortification or retrofitting of existing infrastructure.

Policy CC-2C: The Town shall make the practice of adapting the built environment to the impacts of climate change an integral part of its planning processes, including comprehensive planning, building codes, land development regulations, resource management, flood control and stormwater management, coastal management, community development and capital planning.

Policy CC-2D: The Town shall promote shoreline protection and erosion control by maintaining the buffer area between developed areas and the shoreline, and considering hard structures such as seawalls only when alternative options are unavailable.

Policy CC-2E: The Town shall implement strategies and practices to improve resilience to coastal and inland flooding, salt water intrusion, and other climate change impacts.

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Objective CC-3: The Town shall advance transportation and land use alternatives that: reduce fossil fuel use; improve the mobility of people, goods and services; provide a diverse, efficient, and equitable range of transportation options, and; increase the Town's resiliency to the impacts of climate change.

Monitoring Measures CC-3

1. Percent reduction in vehicle miles travelled between 2016 and 2030, or date of evaluation. (Target: at least 50% by 2030)

Policy CC-3A: New roadways in the Town shall be designed to: prevent and control soil erosion; minimize clearing and grubbing operations; minimize storm runoff; minimize exposure to and risk of climate change impacts such as increased flooding, and; avoid unnecessary changes in drainage patterns.

Policy CC-3B: The Town shall require new construction, redevelopment, additions, retrofits or modifications of property to: incorporate permeable driveways consisting of porous concrete, open cell unit pavers (turf block), flagstone, or brick pavers; reduce total impervious area, and; employ other techniques to reduce run-off, capture and reuse rain water, allow the infiltration of water into the underlying soil, and recharge the Biscayne Aquifer.

Policy CC-3C: The Town shall continue to support initiatives which seek to diversify fuel options for fleet vehicles, and expand infrastructure for charging electric and hybrid electric vehicles.

Policy CC-3D: The Town and its transportation partners shall continue to implement strategies to improve bicycle and pedestrian ways which safely and conveniently connect residential areas to recreational areas and major activity centers, and which safely connect bicycle and pedestrian ways along major thoroughfares throughout the Town.

Policy CC-3E: Development and redevelopment in the Town shall provide for pedestrian friendly street design, an interconnected street network and hierarchy to reduce congestion and improve traffic flow, design that promotes the use of non-motorized transportation modes, connectivity to transit, and a range of uses in a compact area to reduce the need for external trips.

Objective CC-4: Coordinate with Miami-Dade County in improving the resiliency of existing water resources and water and wastewater infrastructure to climate change impacts, while improving energy efficiency and reducing greenhouse gas emissions.

Monitoring Measures CC-4

1. Implementation status of policies CC-4A – CC-4E.

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Policy CC-4A: The Town shall coordinate with the Miami-Dade County to identify any existing septic tanks that may be currently at risk of malfunctioning due to high groundwater levels or flooding, and develop programs to abandon these systems and/or connect users to the public sewer system.

Policy CC-4B: The Town shall continue to participate in regional water conservation initiatives in coordination with the South Florida Water Management District, Miami-Dade County and other agencies.

Policy CC-4C: The Town shall coordinate with the appropriate agencies in the implementation of adaptive management strategies to improve the climate change resiliency of water and wastewater infrastructure and resources.

Policy CC-4D: The Town shall continue to develop regulations that require new construction, and redevelopment to: manage stormwater runoff; incorporate porous materials; reduce total impervious area, and; employ other techniques to reduce runoff, capture and reuse rainwater, and recharge the Biscayne Aquifer.

Policy CC-4E: The Town shall coordinate with the appropriate agencies to mitigate water supply losses resulting from saltwater intrusion, and to address climate change impacts on the coastal aquifer.

Objective CC-5: Protect, enhance and improve the climate change resiliency of the Town's natural environment and ecosystems.

Monitoring Measures CC-5

1. Number of new street trees planted, and the resulting increase in tree canopy. (Target: at least 20% increase between 2016 and 2030)
2. Implementation status of policies CC-5A – CC-5G.

Policy CC-5A: The Town shall continue to support local, County, Regional, State and national environmental restoration, mitigation and adaptive management efforts to improve the resiliency of natural lands and systems to climate change.

Policy CC-5B: The Town shall consider the climate adaptation needs of native plants and animal species, and strategies to assist in their natural migration.

Policy CC-5C: The Town shall promote species diversity, the planting of native landscapes, and sustainable landscaping practices in order to protect and enhance the resiliency of natural resources to climate change.

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Policy CC-5D: The Town shall encourage the planting of native trees that sequester and store high levels of carbon on public and private lands, including vacant and/or underutilized properties.

Policy CC-5E: The Town shall continue to maintain and enhance its tree canopy through such efforts as implementation and periodic update of its adopted Street Tree Master Plan, continue to seek urban forestry grants, and other actions.

Policy CC-5F: The Town shall evaluate Stormwater Management operations in the context of sea level rise in order to: lessen negative impacts to open spaces, wetlands, and other natural systems; improve the ability of these systems to adapt to climate changes, and; optimize the ability of these systems to create additional benefits to Town residents, businesses and visitors.

Policy CC-5G: The Town shall coordinate with the County and other agencies to protect ecosystems from contamination that might result from inundation, structural failure or abandonment resulting from sea level rise, storm events, and/or other climate change impacts.

Objective CC-6: Develop and implement adaptation strategies to address impacts associated with coastal flooding, tidal events, storm surge, flash floods, stormwater runoff, salt water intrusion and other impacts related to climate change, with the intent of increasing the Town's comprehensive adaptability and resiliency capacities. Adaptation strategy options may include but are not limited to: protection; accommodation; managed retreat; avoidance, and/or; other options.

Monitoring Measures CC-6

1. Implementation status of policies CC-6B – CC-6G.

Policy CC-6A: The Town shall identify and designate Adaptation Action Areas as provided by Section 163.3164(1), Florida Statutes, and develop policies for adaptation as required for the protection of areas and facilities in the Town that are vulnerable to the impacts of rising sea levels and climate change. Areas that might be designated as Adaptation Action Areas in the Town may include but are not be limited to:

- a) the Coastal High Hazard Area;
- b) areas subject to inundation due to sea level rise, and;
- c) areas expected to experience the greatest extent of flooding in a 100-year flood event.

Those areas identified in Exhibit CC-1 are hereby adopted and designated as Adaptation Action Areas. The highest priority for action shall be in the high emphasis areas most vulnerable to impacts and/or which are likely to be impacted first. Longer term action steps shall also be taken to address projected future sea level rise and climate change impacts in the moderate emphasis areas.

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Policy CC-6B: The Town shall collaborate with the South Florida Water Management District in order to review, develop and implement strategies to address impacts of rising sea levels on the operation of the flood and salinity control structures.

Policy CC-6C: The Town shall consider the installation of backflow preventers on drainage systems that discharge to Biscayne Bay or drainage canals in coordination with the appropriate agencies.

Policy CC-6D: The Town shall increase the minimum required base flood finished floor elevation of all new structures within designated Adaptation Action Areas by one (1) additional foot.

Policy CC-6E: The Town shall construct the additional stormwater drainage infrastructure necessary to accommodate projected increases in stormwater, including drainage wells, injection wells, swales, bioswales, French drains, and other related structures.

Policy CC-6F: The Town shall coordinate with the appropriate Local, Regional, and State agencies including Miami-Dade County, the South Florida Water Management District and the South Florida Regional Council in the implementation of Adaptation Action Area strategies.

Policy CC-6G: The Town shall coordinate with Miami-Dade County in the review of the Salt Barrier Line in an effort to determine whether the legislation needs to be amended due to increases in sea level and to help identify measures and improvements necessary to protect against salt water intrusion in the area of the established line.

Objective CC-7: Coordinate with Local, County, Regional, State and Federal agencies, and other non-governmental entities and academic institutions in the ongoing assessment of climate change and sea level rise, and continue to collaborate in the identification and implementation of appropriate mitigation, protection, accommodation and adaptation strategies.

Monitoring Measures CC-7

1. Implementation status of policies CC-7A – CC-7C.

Policy CC-7A: The Town shall coordinate with Miami-Dade County and other participating Counties in the Southeast Florida Regional Climate Change Compact in the identification of modeling resources and development of initiatives and goals to address climate change.

Policy CC-7B: The Town shall continue to coordinate regionally with southeast Florida counties and municipalities, academia, and local, regional, State and federal agencies in the analysis of sea level rise, drainage, storm surge and hurricane impacts and the planning of mitigation and adaptation measures.

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Policy CC-7C: The Town shall continue to actively monitor the Southeast Florida Regional Climate Change Compact, and shall coordinate with neighboring municipalities to make our community more climate change resilient by sharing technical expertise, assessing regional vulnerabilities, advancing agreed upon mitigation and adaptation strategies and developing policies and programs.

Objective CC-8: Increase opportunities for the community to learn about and participate in decision-making processes regarding climate change.

Monitoring Measures CC-8

1. Implementation status of policies CC-8A – CC-8C.

Policy CC-8A: The Town shall support community engagement in climate change adaptation and response planning.

Policy CC-8B: The Town shall provide information to the public and community stakeholders about the current and potential impacts of climate change and sea level rise, as well as mitigation, protection, accommodation and adaptation strategies.

Policy CC-8C: The Town shall continue to support public education and outreach programs addressing issues including but not limited to: energy efficiency; water conservation; solid waste reduction and recycling; urban forests; native landscaping; air quality, and; greenhouse gas reduction.

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Exhibit CC-1. Adaptation Action Areas

