

Legal Considerations Surrounding the City of Coral Gables' Adaptation to the Threat of Sea Level Rise (2025 Update)¹



EXECUTIVE SUMMARY

Sea level rise is projected to be a growing threat to the future prosperity of South Florida, including the City of Coral Gables. The City's leadership is mindful of this reality, and in 2016, the City Commission requested that the City Attorney's Office, with the assistance of special counsel, draft a white paper outlining various sea level rise adaptation options available to the City, with a focus on some of the key legal implications surrounding those adaptation options. This present document is an update to that 2016 white paper, to take into account the numerous changes in best practices in climate change adaptation measures, to discuss the many new adaptation measures the City has taken in recent years, to update the relevant scientific projections of sea level rise in South Florida, and to update the relevant law.

As set out in Section I ("Introduction") of this paper, the City is actively seeking to develop and implement measures designed to help adapt to the rising seas. A critical step in sound adaptation planning, as set forth in Section II ("Gathering Actionable Data"), is to obtain reliable data upon which rational and legally-defensible planning and regulatory decisions can be made. Section II discusses the key data that is currently available, the scientific efforts underway in South Florida and across the world to measure the rising seas, the vulnerability assessments that are being utilized to predict the impact on specific communities (including ours), and what next steps the City should consider to improve the data that is available to assist in its planning and regulatory efforts.

Another critical step in making sound adaptation decisions is ensuring that stakeholders are informed and engaged in such efforts. This issue is discussed in Section III ("Informing and Engaging the Public"). Numerous specific suggestions relating to community engagement are presented, followed by a brief discussion of various benefits and risks associated with the notification and education efforts the City might consider.

Section IV ("City Infrastructure Adaptations") then considers important questions regarding the City's future infrastructure investments. The practical considerations surrounding the costs and benefits of these planning-level decisions are juxtaposed against liability-related considerations, such as inverse condemnation issues, sovereign immunity principles, and the obligation to act with due care. Section IV also discusses different types of financing options potentially at the City's disposal to pay for the costly infrastructure investment efforts that are necessitated by the effects of sea level rise. The options discussed are: ad valorem taxation; special assessments; user fees and utility fees; developmental impact fees; municipal bonds; state, federal, and non-profit grants and subsidies; and public-private partnerships. Section IV also provides some examples of how other local governments, such as the City of Miami Beach and Monroe County, have combined various funding options to implement extensive adaptation measures in their communities. Ex-ante municipal risk financing tools are also discussed in Section IV.

Part of the City's comprehensive sea level rise adaptation response in recent years has included revisions to the City's existing comprehensive plan. Section V ("Comprehensive Planning for Sea Level Rise") discusses those recent changes and contains additional suggestions regarding: how the City can rely on appropriate data and analyses to advance its adaptation policies; potential planning horizons for sea level rise-related policies to be added to the City's comprehensive plan; and when the City should periodically amend the comprehensive plan. Florida statutory provisions regarding planning for sea level rise are then explained. Section V also discusses some of the key comprehensive plan elements that the City might update to reflect

sea level rise adaptation policies. The text of specific Objectives and Policies are included as examples of how thought leaders across Florida are recommending that local governments could incorporate sea level rise concepts and policies into their comprehensive plans. Lastly, Section V discusses the topic of potentially assigning some regions of the City to Adaptation Action Areas (“AAAs”). AAAs are designated sections of a local jurisdiction that can be entitled to special infrastructure investments and/or that can be subjected to increased or different regulatory requirements, based on the vulnerability of the area. Section V outlines what inclusion criteria the City might consider when formulating AAAs, what type of subzones might be considered, examples of how other local governments have already begun implementing AAAs, and how municipalities’ liability risks can be weighed in the context of implementing AAAs (and in the context of comprehensive planning for sea level rise generally).

Next, Section VI (“Regulatory Tools for Adaptation”) deals with: (1) what regulatory tools are available to adapt to sea level rise, and (2) how consideration of liability risks can be incorporated into decisions about adopting each of those various regulatory tools – including constitutional takings issues, substantive due process principles, and Florida’s Bert J. Harris, Jr. Private Property Rights Protection Act. Zoning tools, such as the use of overlay zones and downzoning, are discussed, followed by a discussion of building code and resilient design adaptation options, such as elevation requirements, as well as historic preservation, accessibility, and aesthetic implications of new resilient design options. Regulations relating to setbacks and buffers are discussed next, followed by discussions of conditional development and exactions, rebuilding restrictions, and finally restrictions on coastline armoring.

Section VII (“Land Acquisitions and Conservation Easements”) discusses voluntary land acquisitions, eminent domain land acquisitions, and conservation easements – all of which will likely play important roles in the City’s sea level rise adaptation efforts.

Section VIII (“Market-Based Tools”) then discusses a number of market-based adaptation tools, such as the use of transferable development rights, tax incentives, other incentives such as payments for ecosystem services, and risk disclosures in real estate transactions. This section also discusses the importance of the City monitoring and working in concert with private sector forces, including anticipated changes to the real estate market, the mortgage industry, and the insurance industry, as well as an anticipated increase in private litigation.

Section IX (“Long-term Retreat”) considers community retreat and shut-down planning issues, which ideally will never need to be pursued but which current sea level rise projections indicate should at least be considered as part of a Florida community’s comprehensive long-term adaptation planning. This section touches on questions such as the legal options involved in reducing any municipal services that can no longer be maintained, taxation issues when services are reduced to an area, options for assisting with the relocation of residents, and the clean-up of abandoned and submerged lands to avoid environmental, health, and safety problems.

Finally, Section X (“Next Steps”) lists some key next steps the City can take to develop and implement legally-sound adaptation policies.

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I. Introduction

A. The Purpose and Scope of This White Paper

The City Commission of the City of Coral Gables and Coral Gables Mayor Vince Lago have made it a top priority to implement policies that will prepare the City for the substantial rise in sea level and other effects of climate change that are predicted to affect the City in the coming decades. This white paper discusses many policy options at the City's disposal to adapt to sea level rise, and provides a framework to begin understanding the various legal issues that are likely to arise as adaptive measures are implemented.

Because sea level rise adaptation is a rapidly changing and complex interdisciplinary issue, this white paper should be treated as a preliminary, living document that should be updated as the legal landscape evolves, as the available science improves, and as the facts on the ground change. In other words, each decision by the City and its residents in the years ahead will need to be based on carefully-calculated, long-term cost/benefit analyses that factor in changing circumstances.

To understand the scope of this white paper, it is also important to understand the distinction between sea level rise mitigation efforts and sea level rise adaptation efforts. Sea level rise mitigation involves "human interventions to reduce the human impact on the climate system, [and it] includes strategies to reduce greenhouse gas sources," while sea level rise adaptation involves "necessary changes to protect oneself, structures and communities from the effects of sea level rise."² The focus of this paper is on the latter – the legal implications of actions the City can take to *adapt* to rising sea levels.³

Accordingly, it is beyond the scope of this paper to address the heavily-politicized question of the extent to which human's addition of high levels of carbon dioxide and other greenhouse gases into the atmosphere will continue to cause warming and a corresponding melting of Earth's ice sheets and glaciers. While there is now nearly unanimous consensus among climate scientists on that important "why" question,⁴ it is not a debate that is necessary to engage in here. Rather, it is sufficient for the City's adaptation-planning purposes to recognize that sea levels are projected to rise substantially in the decades to come. Indeed, this increase has already begun. For the past several years, the daily high-water mark in our region has been increasing at an accelerating rate.⁵ A critical question facing the City is: At what rate will future sea level rise occur? Climatologists have been working to answer this complex question, and their current projections are included in Section II below.

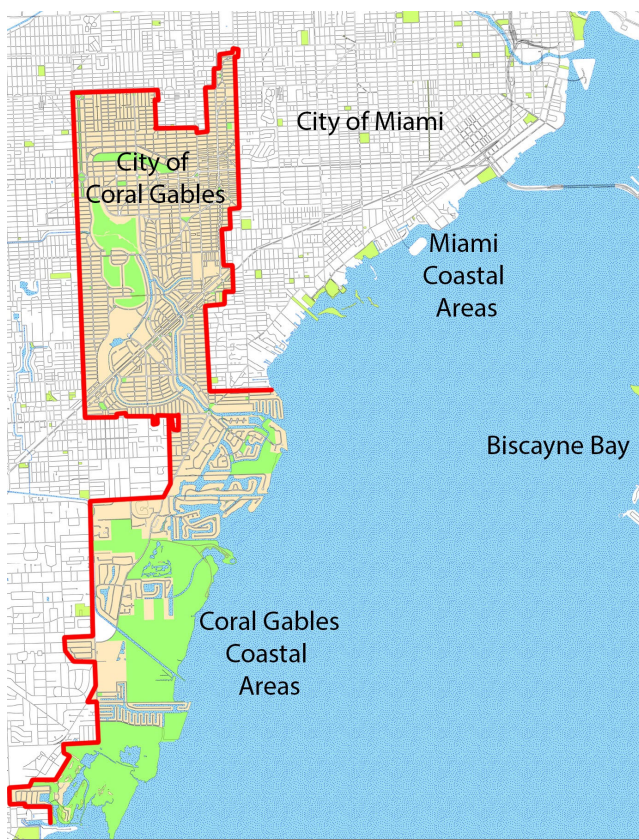
B. Sea Level Rise Generally

For millions of years, when global sea levels were substantially higher than they are today, the City of Coral Gables, like the rest of South Florida, lay underwater.⁶ Now, like the rest of South Florida, the City appears to be in danger of again being submerged due to an uptick in global temperature. As the temperature of the Earth changes, so does its sea level. Temperature and sea level are linked for two main reasons: (1) ice on land (namely, ice sheets and glaciers) melts, which increases the total volume of water in the ocean, and (2) as water molecules warm, they expand slightly – an effect that is cumulative and substantial across all of Earth's oceans.⁷

Rising sea levels can affect human activities in coastal areas like Coral Gables by, among other things: contributing to coastal flooding, eroding shorelines, increasing the intrusion of salt water into groundwater aquifers, and making the region more vulnerable to damage from storms by amplifying the effects of storm surge.⁸

C. Our Community's Exposure to the Seas

Some climatologists, academics, and political leaders around the world are referring to South Florida as “ground zero” for sea level rise and as “the poster child” for the impacts of climate change.⁹ Like much of the rest of South Florida, the majority of the City of Coral Gables – with its population of approximately 50,000 residents¹⁰ and nearly 8,000 businesses¹¹ – lies only between 0 and 10 feet above sea level, and the City has 42 miles of coastline and waterway exposure.¹²



Additionally, the bedrock foundation of our City is a porous limestone base – the remnants of ancient coral reefs. This fact has been described as South Florida's Achilles' heel when it comes to sea level rise vulnerability, because this porous limestone can act like a sponge, allowing water to flow up and through it, to bubble up through the ground, to flow up pipes and drains, to saturate infrastructure, and to encroach on fresh water supplies. For this reason, South Florida is not in a position like Venice, Italy or Amsterdam, Netherlands, where seawalls, dikes, and man-made canals provide an effective (albeit expensive) sea level rise adaptation solution. Building a seawall on top of porous limestone has been analogized to building a fence on top of an extensive network of tunnels – it may change the route of travel, but it is unlikely to significantly change the amount.¹³

Storm surge risk is also a part of life in South Florida’s coastal towns like the City of Coral Gables. When Hurricane Andrew struck in 1992, some coastal parts of the City saw storm-tide elevations of between 8.2 and 16.6 feet above sea level.¹⁴

D. The City’s Adaptation Efforts To Date

Although the exact impact of sea level rise on the future of the City is uncertain, the City has already begun sea level rise adaptation planning. First, in August 2015, the City signed on as an official partner of the Southeast Florida Regional Climate Compact (the “Compact”), which is a partnership, formed with bipartisan support, that shares knowledge and resources to plan for changes due to climate change.¹⁵ The Compact includes dozens of local governments from Palm Beach, Broward, Miami-Dade, and Monroe counties. The Compact, which was the first of its kind in the United States, “serves to create regional tools and standards, and transfer knowledge to build the local government capacity needed to implement regional climate solutions and avoid duplicative efforts.”¹⁶ By actively participating in the Compact, the City has a seat at the table to promote strategies that will help our community.

With the support of a variety of local, regional, state, and federal agencies, the Compact prepared the Southeast Florida Regional Climate Action Plan (the “RCAP”), which was recently updated in November 2022 and is now referred to as RCAP 3.0.¹⁷ The RCAP is a framework of recommendations to help guide climate change-related policies and projects at the county and municipal level.¹⁸ So far, and as discussed herein, the City has implemented many of the RCAP’s proposed action items, and is actively pursuing efforts to implement more.

The City was also one of five cities around the country – and the only Florida city – that participated in a White House pilot project called the Climate Resilience Dialogues.¹⁹ That project allowed City staff to get answers to specific adaptation-related questions from climate resiliency experts around the country.²⁰

Since the publication of the original version of this white paper in 2016, the City has been actively working to implement best practices to adapt to rising seas, and those efforts are discussed throughout this white paper. For example, as discussed in Section II. B. below, the City commissioned an infrastructure vulnerability assessment, completed in 2018, that is helping the City evaluate the relative risks to City-owned infrastructure due to sea level rise, and that recommends investments to address those vulnerabilities. As another example, and as discussed in Section V below, the City has updated its comprehensive plan to address the issue of sea level rise. Also, as discussed in Section VI. G., the City increased the bulkhead and seawall height requirements in the City’s Zoning Code in 2021. Finally, as another example, the City is currently working on a septic to sewer conversion assessment, as well as a stormwater master plan, as discussed in Section IV. A.

II. Gathering Actionable Data

A. The Need for Reliable Data

A critical first step in sound adaptation planning is to obtain (and frequently update) reliable, actionable data. Compared to the more limited time that we typically have to prepare for an incoming hurricane or tropical storm, South Florida has some time to prepare for sea level rise

and the other anticipated effects of climate change. This allows us time to gather accurate information and plan responsibly.

Working with the best available data is critical not only from a practical perspective but also from a legal perspective. As discussed throughout this white paper, important property rights will be affected by the decisions that the City and other governmental agencies make in the coming decades. As a matter of good governance and to defend against legal challenges, it is important to base those decisions on scientifically-sound data and analysis.

B. Critical Data Available/Gathered To Date

Fortunately, there is a substantial amount of research, data, and published literature on the issue of anticipated sea level rise in South Florida. Some of the key highlights of that information are set forth below.

1. Current Projections of Sea Level Rise

The Regional Climate Compact releases, and periodically updates, a Unified Sea Level Rise Projection chart, tailored to Southeast Florida, which is designed to assist local governments in planning.²¹ This projection was developed by regional and national scientists and experts and is based on up-to-date scientific literature.²² It draws from projections from the National Oceanic and Atmospheric Administration (“NOAA”), which publishes and updates the U.S. Government’s sea level rise projections as part of the National Climate Assessment,²³ and also from the Intergovernmental Panel on Climate Change (“IPCC”).²⁴

The Compact’s Unified Sea Level Rise Projection, which was most recently updated in 2019, forecasts an anticipated range of sea level rise for our region between 2000 to 2120, and it highlights three planning horizons:

- Short term: By 2040, 10 to 17 inches above the year 2000’s mean sea level,
- Medium term: By 2070, 21 to 54 inches above 2000 mean sea level, and
- Long term: By 2120, 40 to 136 inches above 2000 mean sea level.²⁵

These projections are illustrated in the following chart, which is referenced to the mean sea level at the tide gauge located in Key West, Florida:²⁶

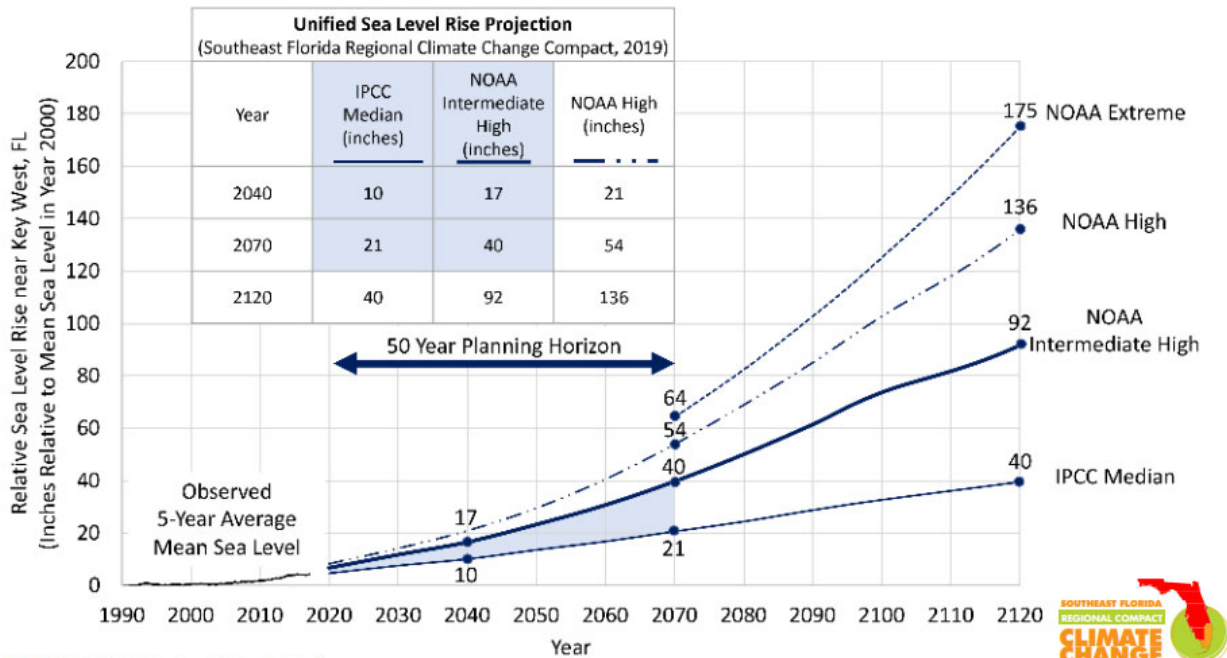


FIGURE 1: Unified Sea Level Rise Projection

These numbers represent an increase in the rate of projected sea level rise compared to the previous NOAA and IPCC projections that were reflected in the Compact’s 2015 Unified Sea Level Projections. Specifically, the IPCC Median projection increased by 2 to 3 inches in the 2019 projections, and the NOAA High curve increased 7 to 22 inches compared to the 2019 projections.²⁷

Some scientists have cautioned that even these updated NOAA and IPCC projections are likely too conservative.²⁸ And the Compact itself has noted that “[a]s scientists develop a better understanding of the factors and reinforcing feedback mechanisms impacting sea level rise, the Southeast Florida community will need to adjust the projections accordingly and adapt to the changing conditions.”²⁹ But despite such uncertainties about how Earth’s complex climate system will react in the future and whether human efforts might sufficiently reduce future greenhouse-gas emissions to slow future climate change, these projections still provide useful guidance for the City’s near-term decision making.

Notably, the Compact’s 2019 projections were recently re-reviewed to determine if they needed to be updated (based on a 2022 Sea Level Rise Technical Report from NOAA and based on observed trends in local relative sea level rise). But the Compact ultimately issued a statement in December 2024 stating that the 2019 Projections should continue to be utilized for now as the basis for resilience planning, design, and construction.³⁰ However, the Compact does intend to revisit this guidance again in the future as new science and modeling become available.

2. Regional and National Vulnerability Assessment Tools

Geographic Information System (“GIS”) practitioners from the four counties that are members of the Compact have worked in collaboration with NOAA and the South Florida Water Management District to develop a consistent methodology to generate a set of inundation maps,

which formed the basis for a 2012 South Florida regional vulnerability analysis.³¹ These tools were used to assess the region's vulnerability at one, two, and three feet of sea level rise. Physical features like hospitals, airports, evacuation routes, and airports, as well as property values, were tested under the three scenarios in order to evaluate the likely damage and help determine useful adaptation measures. These maps and GIS databases are available from each of the four Compact counties, including Miami-Dade.³²

In addition, a compendium of other sea level rise-related vulnerability assessments by various state, local, and national groups has been compiled by the Florida Department of Economic Opportunity ("FDEO") and is available on their website.³³ FDEO and the Florida Department of Environmental Protection have also published a document entitled Sea-Level Rise Vulnerability Assessment Tools and Resources: A Guide for Florida's Local Governments, which is designed to help local governments develop and complete sea level rise vulnerability analyses, and incorporate the results into local planning efforts.³⁴

Numerous other governmental and non-profit organizations have also created online tools that can help local governments and residents access and analyze sea level rise-related data, including:

- NOAA's Digital Sea Level Rise Viewer, which allows the user to test and visualize up to ten feet of sea level rise overlaid on maps of United States coastlines;³⁵
- NOAA's Coastal Flood Exposure Mapper, which provides a comprehensive view of assessing coastal hazard risks and vulnerabilities through a collection of maps that show people, places, and natural resources exposed to coastal flooding (included with the tool are tips for using the resultant maps in local communities);³⁶
- The Nature Conservancy's Coastal Resilience Mapping Portal for Southeast Florida, which identifies storm surge, sea level rise, natural resources, and social and economic assets;³⁷
- The "Eyes on the Rise" mapping toolkit, by Florida International University's GIS Center, which allows users to visualize sea level rise in their neighborhood;³⁸
- Miami-Dade County's flooding vulnerability viewer, which allows people to explore several flood risk layers including ground elevation, hurricane storm surge, sea level rise for various scenarios, flood zones, and more, alongside property-level data;³⁹
- Miami-Dade County's 3-D sea level rise building impact viewer, which allows planners and residents to view buildings that could be affected by one foot to six feet of sea level rise;⁴⁰
- The University of Florida Sea Level Scenario Sketch Planning Tool, funded by the Florida Department of Transportation ("FDOT"), which creates inundation and affected transportation infrastructure layers to identify potentially vulnerable transportation facilities and help plan transportation projects;⁴¹
- The U.S. Geological Survey, which provides information about groundwater wells impacted by sea level rise,⁴² including models created for Miami-Dade County;⁴³

- The U.S. Army Corps of Engineers Sea-Level Change Calculator, which creates site-specific details regarding projected flood elevations from 1992 to 2100;⁴⁴ and
- Climate Central’s Risk Zone Map, which is a global interactive map searchable by city or postal code, that shows areas vulnerable to permanent submergence from sea level rise, or to flooding from storm surge and tides. It is connected to databases that analyze financial, infrastructure, and sociopolitical impacts.⁴⁵

3. *City-Specific Vulnerability Assessments*

In 2018, engineering consultants Hazen and Sawyer⁴⁶ completed a detailed sea level rise vulnerability assessment of much of the City’s critical infrastructure.⁴⁷ That assessment covered wastewater pump stations (and their corresponding electrical panels and generators), fire and police stations, City Hall, the Youth Center, hospitals, and the Department of Public Works.⁴⁸ The assessment modeled sea level rise possible scenario and future ‘king tides’⁴⁹ and storm surges, including statistics and probabilities of their occurrence, and incorporated that data into models for flooding and storm surge.⁵⁰ It then recommended a preliminary adaptation plan for each critical asset.⁵¹ These recommendations also included cost estimates.⁵² The results of this vulnerability assessment have been helping to guide the City’s plans regarding infrastructure adaptation, which is discussed in Section IV below.

The City has obtained 100% funding from the State of Florida to update and expand that 2018 Hazen & Sawyer assessment.⁵³ That project is anticipated to be completed by late 2026. It is anticipated that the updated and expanded assessment will meet the requirements outlined in Florida Statutes § 380.093, such that future implementation projects made pursuant to the vulnerability assessment will be eligible for partial funding through the Florida Department of Environmental Protection’s Resilient Florida Grant Program.⁵⁴ The updated assessment is anticipated to include all critical infrastructure within the City’s boundaries, including transportation assets, critical community and emergency facilities, wastewater assets, and natural, cultural, and historical resources.

The City has also created Light Detection and Ranging (“LiDAR”) maps to evaluate the elevation of the entire City. One such map, which is available on the City’s website, shows basic elevation levels as well as key infrastructure such as roads, bridges, sanitary sewer lift stations, septic systems, Florida Power & Light substations, and schools.⁵⁵

In terms of other mapping assessments of flood vulnerabilities, local governments often rely heavily on the Federal Emergency Management Agency (“FEMA”) to designate the areas most at risk of flooding. FEMA updates and publishes Flood Insurance Rate Maps (“FIRMs”), which identify:

- Special Flood Hazard Areas (Zones A, AE, AH, AO, AR, A99, V, VE, and V1-V30), which are estimated to be subject to a 1% chance of flooding in a given year and which were previously called 100-year flood zones;
- Zone X areas, which are areas of moderate flood hazard, that are either between the boundaries of the Special Flood Hazard Areas and the 0.2%-annual-chance (or 500-

year) flood zone (i.e., Shaded Zone X), or are outside the 0.2% annual chance floodplain (i.e., Unshaded Zone X); and

- Zone D areas, where flood hazards are undetermined.⁵⁶

Numerous areas in the City of Coral Gables are within FEMA-designated flood zones. As displayed on GIS maps available on the City's Smart Hub website, areas in Coral Gables that are included within FEMA flood zones generally are near or border the Biscayne Bay coastline or the City's waterways.⁵⁷ These areas include some of the City's highest property values and are part of a tax base that is critical to the City's ability to maintain its current level of services to all of its residents. Indeed, there are currently 5,514 parcels in the City that are in Special Flood Hazard Areas under FEMA's preliminary 2021 FIRMs, and these parcels have an estimated assessed value of over \$9.3 billion and an estimated total value of over \$11 billion.⁵⁸

As discussed in Section VIII. E. below, the FIRMs are also often used by private mortgage and insurance companies to determine if flood insurance should be required in an area. And properties in a Special Flood Hazard Area must be covered by flood insurance to be eligible for federally funded loans.⁵⁹

Coral Gables property owners who wish to know how high their buildings were built in relation to their FEMA flood zone can view their flood elevation certificates through an outline tool called Forerunner, simply by searching the property's address.⁶⁰

C. Next Steps in Gathering Data

In the years ahead, vast amounts of data will need to be gathered and analyzed in order to assist the City's decision making, and high-resolution elevation, storm-surge, flood-risk, and infrastructure maps will be important for tracking and monitoring the success of the City's adaptation efforts. The following are some of next steps the City is planning for gathering data:

- Update and expand the scope of the 2018 Hazen & Sawyer vulnerability assessment;
- Continue to update and improve the City's LiDAR elevation maps (possibly to a 1-inch accuracy level, like the maps created by the City of Key West);
- Continue collecting data on the locations and the number per year of "nuisance" flooding events;
- Continue the City's on-going study using the four surface-elevation table-marker horizon (RSET-MH) monitoring stations in some of the City's coastal inlets, which obtain real-time data that is made available to the City and the public;⁶¹
- Utilize the results of the Coral Gables Waterways Assessment,⁶² as well as the City's planned Stormwater Master Plan and Septic to Sewer Conversion Assessment (discussed in Section IV.A. below), to create maps of the City that identify sources of potential toxic pollutants due to flooding, such as underground gas-storage tanks, septic fields, sewer lines, and even cemeteries.⁶³

The City may also want to consider commissioning a comprehensive community resiliency plan. While Hazen and Sawyer’s 2018 vulnerability assessment and the proposed update to it address vital data regarding critical infrastructure, a comprehensive community resiliency plan could also address private real estate investment vulnerabilities and even incorporate demographic and socio-economic information, and analyze the costs and benefits of proposed adaptation efforts beyond City infrastructure.⁶⁴ Such a resiliency plan could also help identify the most vulnerable areas of the City when creating “Adaptation Action Areas,” as discussed in Section V. C. below.

Notably, under Florida Statutes § 380.093, the Florida Department of Environmental Protection has been tasked with developing a *statewide* flood vulnerability and sea level rise data set, as well as a statewide flood vulnerability and sea level rise assessment.⁶⁵ So the City will also benefit indirectly from these additional efforts being made at the State level.

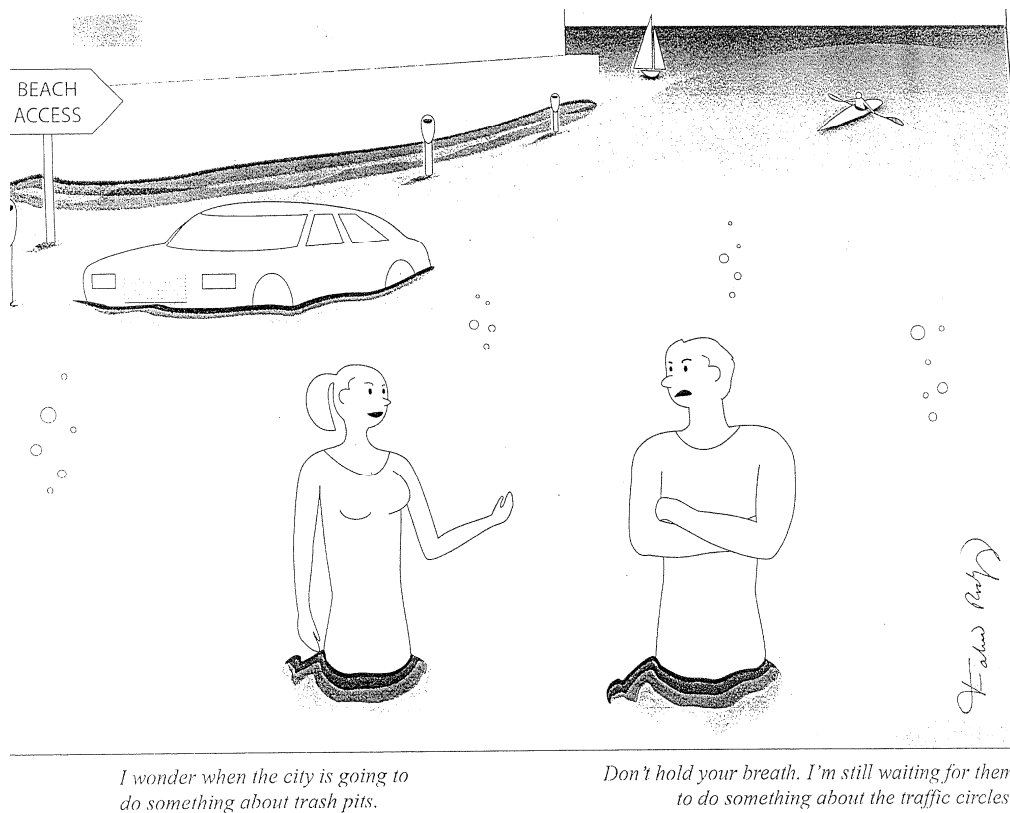
III. Informing and Engaging the Public

The next critical step in making legally-sound adaptation decisions is for the City to ensure that stakeholders, particularly its residents, business owners, and developers, are informed and engaged on this topic.

A. Community Engagement

Education is critical in preparing and obtaining the buy-in of residents and business owners for the work to be done to adapt to sea level rise. Informing and engaging stakeholders leads to better acceptance and support of the necessary adaptation measures, and more informed decisions by City leaders. Buy-in from the community is also necessary to obtain and maintain adequate financial support for the important but costly adaptation efforts and infrastructure investments that will need to be made in the short term to avoid greater costs in the future. Moreover, as discussed throughout this white paper, concepts of notice, knowledge, and foreseeability are also critical to managing the City’s risk of litigation regarding sea level rise adaptations.

One challenge when seeking to proactively address sea level rise is that future generations, who will likely bear the brunt of the effects from sea level rise, are not currently represented by decision makers. Compounding that challenge is the fact that it is often difficult for humans to recognize and fully appreciate slowly occurring phenomena – like the proverbial frog in boiling water that does not jump out of the pot if it was put in before the water starts boiling. Former Coral Gables Mayor Jim Cason had the following cartoon drawn to demonstrate this challenge:



Fortunately, the City has already begun the work of educating residents and other stakeholders about this issue and about the fact that if the City prepares appropriately, the long-term viability of our community can be extended. For example, the City has held a three-part lecture series on the challenges associated with sea level rise,⁶⁶ and former Mayor Cason has spoken out about the issue extensively in the national press.⁶⁷ The City also has an interactive flood map website,⁶⁸ and issues an annual Hurricane Preparedness Guide for residents.⁶⁹

In 2018, the City Commission also adopted a comprehensive Program for Public Information (“PPI”), which contains 21 specific outreach projects to be implemented by the City to help advise the public about the hazards and risks associated with flooding.⁷⁰ For example, one project involves sending FEMA’s “After a Flood: The First Steps” brochure to property owners before and after a flood event. Other projects include: giving presentations to homeowners associations about flood hazards; sending a 10-topic flood outreach brochure to realtors, lenders, and insurance agents; and giving presentations to the Coral Gables Chamber of Commerce.⁷¹

Five key target audiences were identified in the PPI: (1) *Homeowners Associations*, because “[e]ducating and partnering with this audience is an efficient way to reach large groups of residents at one time”; (2) *Landscapers and Contractors*, because “[e]levating HVAC and electrical equipment and mechanical systems is a simple and effective mitigation measure to protect property from flood damage” and “landscapers can play a role in ensuring that drainage inlets do not get blocked by yard debris”; (3) *Real Estate Agents, Lenders, and Insurance Agents*, because “[t]his group plays an essential role in delivering information about flood insurance and flood risk to property owners”; (4) *Spanish Speaking Population*, because “nearly 22% of [the City’s] Spanish-speakers have a low proficiency in English”; and (5) *Business Owners*, because of

the “importance of ensuring that business owners understand their flood risk and their options for flood insurance.”⁷²

The City has also provided a general notice regarding sea level rise risks, including reference to the Compact’s sea level rise projections, in the Coastal Management element of the City’s Comprehensive Plan. *See* Section V. B. 2, below.

But more can always be done to educate stakeholders. The South Florida Regional Planning Council recommends that local governments create and manage a formal “sea level rise outreach campaign” to “inform community residents and business owners of (1) the potential impacts of sea level rise, (2) the initiatives and programs the community will be or has implemented to address said impacts (such as an Adaptation Action Area designation), and (3) develop a relationship [with] and understanding of the community needs, including addressing vulnerable populations and health risks associated with sea level rise.”⁷³ The City of Pensacola, for example, appointed a “Climate Mitigation and Adaptation Task Force,” which issued a report outlining specific adaptation recommendations for the city.⁷⁴

Florida’s Department of Environmental Protection has also published an Adaptation Planning Guidebook that makes concrete suggestions for engaging the public and other stakeholders in climate change adaptation efforts (as well as offering insight into many other aspects of adaptation planning).⁷⁵

The Compact has issued a 3-page guide for citizens, which lists ways in which sea level rise is likely to affect individuals in Southeast Florida, how local governments are working to lessen the impacts, and what things citizens can do to help.⁷⁶ As another example, the Alaska Institute for Justice has encouraged the development of assessment tools that residents can use to measure erosion rates, among other things, on their property.⁷⁷ And the organization Climate Access has used an innovative program in California to help stakeholders literally visualize sea level rise by strategically placing, in public areas, digital viewfinders (modeled after classic coin-operated binoculars often found at scenic viewpoints) that simulate, in 360-degree 3D, various levels of projected sea level rise in the surrounding area. The viewer also shows what two different responses to sea level rise could look like, to help residents visualize a future community that has adapted to a changing climate.⁷⁸

Climate Access also has a helpful “Preparation Frame Guide,” which summarizes polling data on climate change issues, as well as social science research on effective risk communication, and gives examples of effective engagement efforts on this issue.⁷⁹ Similarly, the Union of Concerned Scientists and Viewpoint Learning teamed up to create a useful “Citizen Dialogues on Sea Level Rise” report, which addresses how local leaders can overcome polarization among residents on the issue of climate change.⁸⁰

And, finally, NOAA’s Office for Coastal Management has a publication (as well as a 90-minute interactive webinar), which discusses best practices, techniques, and examples for how to effectively communicate about climate change hazards.⁸¹ The following are a few interesting NOAA case studies where community members were educated about climate change risks:

- Undergraduate students enrolled in a Global Environmental Change course at Broward College were tasked with conducting a case study analysis of sea level rise impacts. They spent the semester working in teams to research projected sea level rise and identify adaptation strategies for communities in South Florida.⁸²
- Partners in the Great Lakes region condensed key findings from a 100-page vulnerability assessment document and made the information accessible to a diverse audience by creating storyboards using images, graphics, and concise messaging to tell a visual story of past flood events, anticipated future impacts, and options for addressing flooding problems.⁸³
- The City of Milwaukee provides tours of their sewerage district building, which includes innovative stormwater flood management tools such as a recreated buffer, pervious pavement, a green roof, and new drainage systems, so that property owners can learn the benefits of such tools, see what these options look like in practice, learn to implement them, and avoid the pitfalls that city has encountered with some of these techniques.⁸⁴
- The Sierra Club partnered with the Detroit branch of the NAACP and a local bike shop to sponsor a bike tour of the city of Detroit where cyclists explored projects such as rain gardens, cisterns, rain barrels, bioswales, constructed wetlands, and permeable pavers designed to help mitigate flooding and sewage pollution in the Great Lakes.⁸⁵
- The New Hampshire Coastal Adaptation Workgroup, a collaboration of 21 organizations working to help communities prepare for extreme weather events and climate change, shared hazards information with their local community through monthly conversations online and at restaurants and breweries, as well as through photo contests, field trips, and workshops.⁸⁶

B. Lobbying Other Levels of Government

Part of engaging stakeholders also means that the City can do its part to lobby for critical county, state, and federal action that the City cannot do alone. Such efforts might include: (1) coordinating with the U.S. Army Corps of Engineers on their ongoing project to fortify the Miami-Dade County coast from sea level rise and storm surge, including their updating of the regional flood control system;⁸⁷ (2) promoting follow-through on the Comprehensive Everglades Restoration Plan, which could help protect South Florida's fresh water source as sea level rise increases the likelihood of salt water intrusion into the Biscayne freshwater aquifer; (3) encouraging responsible management of the Turkey Point nuclear facilities, whose cooling canals are considered by many to be at risk from sea level rise;⁸⁸ and (4) ensuring that the Florida Department of Transportation continues to properly maintain low-lying State-controlled roads in the City, including South Dixie Highway, which may become vulnerable to flooding.

Although collaboration with federal, state, and other local governmental agencies is important, the resources of those agencies are likely to be strained in the decades and centuries

ahead. It is therefore important that the City as well as our residents and business owners do not rely on any assumptions of bailouts or assistance from other levels of government. Indeed, financial preparation for sea level rise must be every individual's responsibility.

C. Encouraging Local Investment of Resources

As with any challenge, there are opportunities that can be leveraged. There will be many job-creation opportunities in adapting to sea level rise,⁸⁹ and the City can encourage corporate, academic, and non-profit innovation in this area. Fortunately, we are surrounded by community partners eager to collaborate on this issue. This includes several universities. For example, the University of Miami, which is located in the City, has expressed a desire to help make UM a source of thought leaders on this issue;⁹⁰ Florida International University's interdisciplinary Sea Level Solutions Center⁹¹ has worked with the City on public education events;⁹² and Florida Atlantic University has hosted several sea level rise-related summits.⁹³ UM has also begun offering an undergraduate course dedicated specifically to the issue of sea level rise.⁹⁴

Many other potential collaborators that are already involved in adaptation innovation planning include: the Compact, Miami-Dade County, the South Florida Water Management District, the Florida Division of Emergency Management, the Florida Department of Economic Opportunity, the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, NOAA, the U.S. Geological Society, NASA, the Miami Foundation, the Nature Conservancy, the Climate Leadership Initiative, Florida Sea Grant, the Institute for Sustainable Communities, the Ocean Conservancy, the ICLEI Local Governments for Sustainability, 1000 Friends of Florida, and more.

D. Legal Considerations Relating to Sea Level Rise Notification

In addition to educating the public about sea level rise through general community outreach efforts as discussed above, the City could also work towards ensuring that residents are provided with specific, targeted notices about the risks of sea level rise in a particular area. This might be accomplished in a number of creative ways that the City can explore – for example, in applications for a development permit⁹⁵ or in contracts for the sale of real property. (See Section VIII. D. below, for a discussion about the potential for state or local legislation mandating such disclosures by sellers of real property.)

The practical reasons why property owners could benefit from receiving notifications about the specific risks of sea level rise to their property is self-evident; and as discussed below, there may also be some legal benefits to the City from providing such notices. But, first, we look at the question of whether a Florida municipality has an affirmative legal *duty* to notify its residents generally of risks related to sea level rise.

1. No Affirmative Legal Duty to Notify of Risk

Absent having affirmatively and voluntarily undertaken an obligation or being required to act by statute, it is unlikely that local governments in Florida will incur liability for failing to provide a natural disaster warning system or other notifications about natural disasters.⁹⁶ Accordingly, advance notification of rising sea levels and the anticipated ramifications thereof, should not, as a general rule, be required in a legal sense, because this type of advance notification

does not implicate any *special* legal relationship between the City and particular individual residents. In other words, the City likely owes no specific duty of care under civil tort law to provide such notices. Stated differently, providing advance warning of rising sea levels is the type of planning-level, policy decision that typically invoke sovereign immunity. (The importance of the distinction between a municipality’s planning and operational functions is discussed in Section IV.B. below.)

2. *Potential Benefits of Notice*

However, the City may nevertheless want to provide information regarding specific risks relating to sea level rise, for public policy reasons and/or in order to potentially reduce future exposure to regulatory takings claims brought under the Fifth Amendment to the U.S. Constitution (or under Article X, Section 6 of the Florida Constitution). The Fifth Amendment recognizes that property will sometimes be taken by the government for public use, but provides that no taking may be done “without just compensation.”⁹⁷ While typically associated with a government’s exercise of eminent domain,⁹⁸ a “taking” can be permanent or temporary and can occur by a physical occupation, by a regulation, or by the exaction of a real property interest.⁹⁹ A taking that occurs as the result of regulation is known as a “regulatory taking.” Generally speaking, a regulatory taking has occurred when a regulation, as applied to the very specific facts at issue, substantially deprives a property owner of his or her “reasonable investment-backed expectations” as to the use of the property, although there have been cases in which the government’s regulatory interest is so strong that no taking can be said to occur despite the owner’s loss of his or her reasonable investment-backed expectations.¹⁰⁰ These are important concepts here because advance notice of sea level rise – such as through disclosures in City-issued permits, in City ordinances, or in mandatory private sale disclosures, for example – would likely affect the *reasonableness* of a property owner’s future expected use of the property, thereby providing a potential benefit to the City in any future litigation alleged a taking (as well as in litigation brought under Florida’s Bert Harris Act, discussed in Section VI. A. below).¹⁰¹

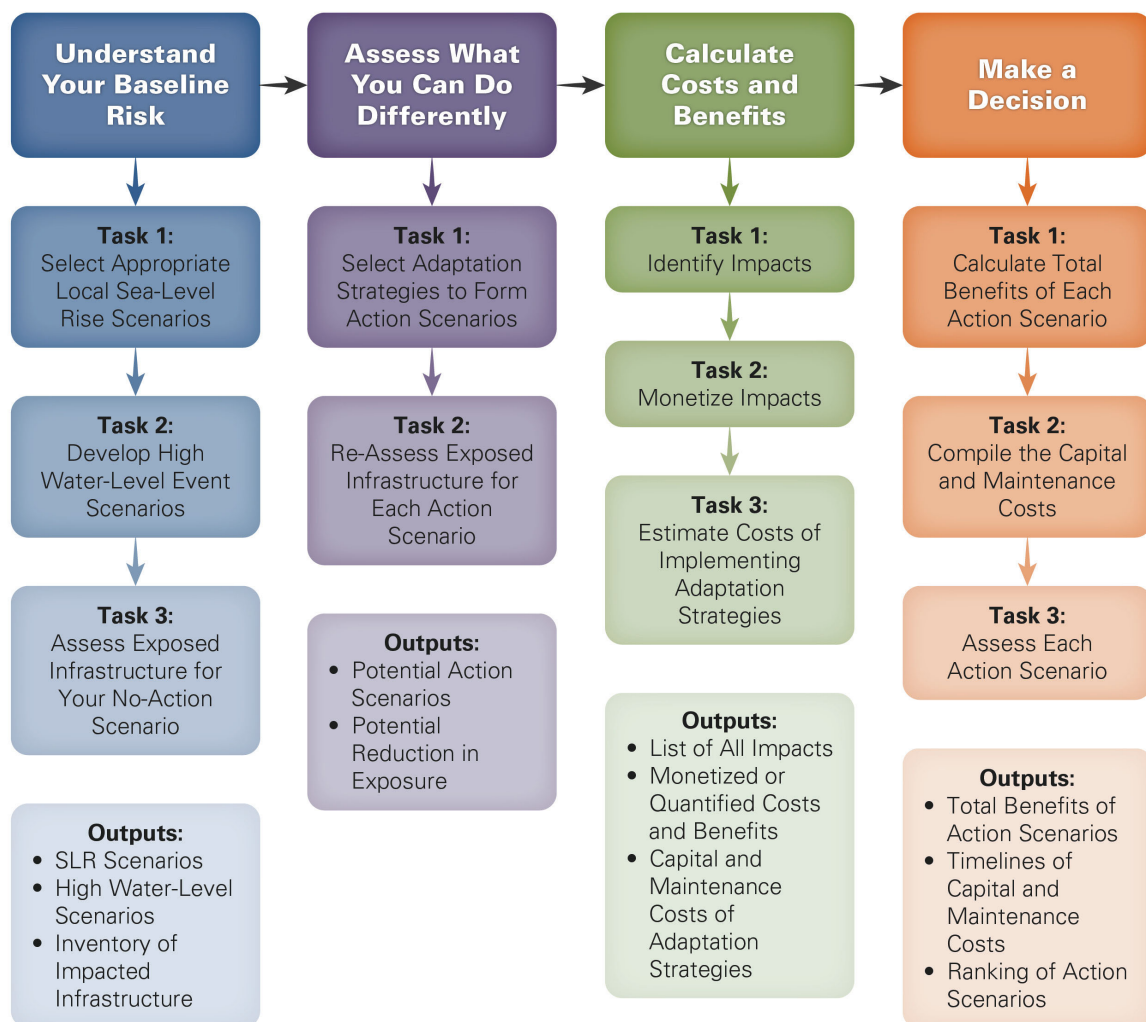
This potential benefit might be more substantial if the information explains not only the risk of sea level rise but also the likelihood of increased governmental regulation over the property and the reasonable scientific data and analysis on which the information is based. For a discussion of what might be included in a notice that is required for certain real property transactions, *see* Section VIII. D. below.

IV. **City Infrastructure Adaptations**

A. **Prioritizing Investments**

Adapting the City’s infrastructure to the effects of sea level rise will be a costly and complex issue, as different priorities compete for limited public funds. It is vital that the City continue investing now with a long-term perspective in mind and that the City consider the anticipated lifespan of any projects when evaluating the costs and benefits of different projects.

To that end, a report commissioned by NOAA provides a helpful framework – displayed in summary graphic form below – that can help local government leaders think about what investments to make, and when, in adapting to sea level rise.¹⁰²



The following are the key categories of City-owned infrastructure that will require substantial modifications to address sea level rise:

- Stormwater management system – Stormwater control structures, including the more than 5,000 catch basins and inlets in the City,¹⁰³ are the first line of defense for the City’s flood control system. Most of the major water control structures along the coastline in Miami-Dade County already maintain canal elevations very close to the upper end of the normal tidal elevation range.¹⁰⁴ The City is currently working to create a stormwater master plan that will be useful because part of the City’s stormwater system is aged with insufficient drainage for severe storm events. The master plan will be a guide to implement effective stormwater management measures to reduce flooding and mitigate for sea level rise and water quality impacts.¹⁰⁵
- Sewer and septic systems – When the water table rises, the City is likely to lose some functionality of sewer and septic systems. Difficult cost/benefit analyses will need to be made about the allocation of resources to address these issues in any perpetually flooding areas. The City estimates that over 7,400 properties currently

run on septic systems.¹⁰⁶ The City is currently working on a City-wide septic to sewer conversion assessment plan, which will also obtain public input from the community on the benefits and costs of converting properties in the City from septic to sewer.¹⁰⁷

- Roads – There are approximately 264 miles of roadway in the City – 233 miles of which are City roads, and only 31 of which are State or County roads.¹⁰⁸ The City owns and maintains a large percentage of that roadway, including in some of the areas of the City that are most vulnerable to sea level rise. The City will need to make strategic investment choices about how to maintain such roads as seas rise.
- Waterways and bridges – Although the South Florida Water Management District manages the gates that lead to the flow of water through our City’s waterways, the City (with the advice of its Waterways Advisory Board) manages the waterways and the bridges inside the City. There are, at last count, a total of 30 bridges in the City, including 19 vehicular bridges, 2 pedestrian bridges, and 9 golf cart bridges, all of which can potentially be affected by rising seas.¹⁰⁹
- City buildings, parks, etc. – As the manager of many acres of parks and other land, as well as numerous public buildings, the City, like any other responsible property owner, will want to invest in effective protective strategies to address sea level rise.

B. Litigation Risk Surrounding Infrastructure Expenditures

1. Legal Framework Generally

A Florida municipality’s litigation risk associated with infrastructure projects is generally framed by three overarching legal concepts: the public duty doctrine; sovereign immunity; and takings. A brief explanation of these principles is set forth below, followed by a discussion of how those principles are likely to apply in the context of infrastructure expenditures to adapt to sea level rise.

Public Duties. First, as noted above, absent having affirmatively undertaken an obligation or being required to act by statute, the City generally has no affirmative legal duty, from a civil tort perspective, to provide particular services to residents. Municipal powers are generally defined in terms of what the City *may* do, not what it must do.¹¹⁰ And under traditional principles of tort law, the absence of a duty of care between a defendant and a plaintiff generally results in a lack of liability – if the defendant owes no duty, it cannot be liable for “breaching” a duty.¹¹¹ The Florida Supreme Court in *Tranon Park Condominium Association, Inc. v. City of Hialeah*, provided a rough categorization for the types of activities, which may or may not support a governmental duty. These are the four categories followed by an explanation of whether each category creates a governmental duty: “(I) Legislative, Permitting, Licensing, and Executive Officer Functions; (II) Enforcement of Laws and the Protection of the Public Safety; (III) Capital Improvements and Property Control Operations; and (IV) ...Providing professional, educational, and general services for the health and welfare of citizens.”¹¹² According to the Florida Supreme Court, Category I activities pertain to the public at large and generally fail to support the recognition of a duty of care owed by a governmental actor to an individual plaintiff.¹¹³ Category II activities support liability only where the governmental actor owed the alleged tort victim a special duty of care –

where the government and the individual stand in a special relationship.¹¹⁴ And Category III and IV activities may subject a municipality to liability based on traditional tort principles; generally, it owes a duty commensurate with what a private entity conducting such activities would owe.¹¹⁵

Sovereign Immunity. Next, it should be understood that sovereign immunity may shield a governmental entity from suits alleging tortious conduct, *even if* the governmental entity may otherwise have been liable to an injured party.¹¹⁶ The so-called “discretionary-versus-operational function test” articulated by the Florida Supreme Court asks four questions to determine if the government action at issue involves “quasi-legislative policy-making” which is immune from suit: *First*, does the challenged act, omission, or decision necessarily involve a basic governmental policy, program, or objective? *Second*, is the questioned act, omission, or decision essential to the realization or accomplishment of that policy, program, or objective, as opposed to one which would not change the course or direction of the policy, program, or objective? *Third*, does the act, omission, or decision require the exercise of basic policy evaluation, judgment, and expertise on the part of the governmental agency involved? *Fourth*, and finally, does the governmental agency involved possess the requisite constitutional, statutory, or lawful authority and duty to do or make the challenged act, omission, or decision?¹¹⁷ ‘Yes’ answers to all four of those questions indicates that the activity is a discretionary one and generally mandates immunity. ‘No’ on any question indicates that the activity *may* be an operational one and requires further inquiry, but may still result in immunity.¹¹⁸

Takings. As noted in Section III. D. above, the U.S. Constitution recognizes that property will sometimes be taken by the government for public use, but provides that such takings should not be done “without just compensation.”¹¹⁹ While a “taking” can occur by a physical occupation, by a regulation, or by the exaction of a real property interest,¹²⁰ as discussed in subsection 5 below, *inverse* condemnation occurs when all or nearly all of the value of a property has been taken in fact by the governmental defendant, even though no formal exercise of the power of eminent domain has been attempted by the taking agency.¹²¹ Since takings suits arise under the Constitution, sovereign immunity does not shield governmental entities from liability for such claims.

2. *Deference to Infrastructure Investment Decisions*

Within this legal framework, courts are generally highly deferential to governmental planning-level decisions regarding the implementation of infrastructure projects. First, as discussed above, there is generally no default legal duty of a local government to, in the first place, *provide* many services, such as, for example, road access and water drainage. Second, the decision to implement long-term infrastructure projects falls within the categories of activities as to which governmental actors typically owe no specific legal duty of care to individuals. Third, and most important, long-term infrastructure planning is the kind of “planning” (as opposed to “operational”) activity that courts usually refuse to second guess. Overall, therefore, a legislature’s decisions about how to prioritize the use of limited public funds are generally given substantial deference.

3. *Obligation to Exercise Due Care*

While local governments have great legislative latitude in how they spend their capital improvement dollars, this discretion is not unbridled. If a local government takes on an affirmative duty, it generally must act with reasonable care to avoid harm to others.¹²²

Also, if a local government's actions *create* a dangerous condition known to the government but not readily apparent to those who could be injured by the condition, the governmental entity must generally take steps to avert the danger or properly warn people of the danger. For example, in *City of St. Petersburg v. Collom*, the Florida Supreme Court held that the plaintiffs had stated a valid cause of action against the City of St. Petersburg for its failure to either warn people of an open drainage ditch hazard or to correct the dangerous condition by adding barriers around the ditches.¹²³ According to the court, "a governmental entity may not create a known hazard or trap and then claim immunity from suit for injuries resulting from that hazard on the grounds that it arose from a judgmental, planning-level decision."¹²⁴ If however, the local government did not *cause* the condition, such a duty does not arise solely because the local government was *aware* of the condition.¹²⁵

4. *Maintenance Versus Upgrading Obligations*

Another important issue is what obligation, if any, a Florida municipality would have to maintain or upgrade stormwater systems, utilities, and roads that are inundated due to sea level rise. This could be a potential costly challenge for the City of Coral Gables in decades to come, particularly because so many City-maintained streets are in low-lying areas.¹²⁶

Related to the concept that a local government must generally act with due care is the critical distinction that Florida courts often make between "upgrading" or building out infrastructure – which is a "planning" level activity as to which a local government would generally be immune from suit – and "maintenance" of existing infrastructure – which is an "operational" activity that does not necessarily invoke sovereign immunity.¹²⁷

So, while a Florida municipality might potentially be legally required to properly maintain existing infrastructure – such as roads, drainage infrastructure, sewage systems, etc. – it would typically be immune from suit regarding decisions to upgrade, or not to upgrade, that same infrastructure, including if the infrastructure becomes obsolete in the face of rising sea levels. Unfortunately, the distinction between maintenance and upgrading is not always clear. This is an area of the law that Florida courts will need to develop and clarify in the future, and the City should carefully monitor case law developments in this area.

5. *Inverse Condemnation*

In addition to potential tort liability, potential takings liability might arise from infrastructure adaptation measures taken by a local government in response to sea level rise. This includes, for example, governmental actions that affirmatively cause flooding (such as by diverting flood water over private property) if the government's action constituted a substantial interference with the owner's private property rights for more than a momentary period, and it will be continuous or reasonably expected to continuously recur, resulting in a substantial deprivation of the beneficial use of the property.¹²⁸

A notable set of such cases has been making its way through the federal courts in recent years, stemming from the U.S. Army Corps of Engineer's implementation of the Missouri River Recovery Program ("MRRP"). In a case styled *Ideker Farms v. United States*, over 400 landowners from six states sued the United States, claiming a Fifth Amendment taking of their land for which just compensation was required, because the MRRP allegedly caused intermittent, substantial flooding of their properties.¹²⁹ As the trial court in that *Ideker Farms* case explained, to determine whether government action has caused intermittent flooding such that a taking has occurred, federal courts look at the following factors: "severity, duration, intent or foreseeability, character of the land, and reasonable investment-backed expectations."¹³⁰ That *Ideker Farms* court ultimately held that each of those factors was satisfied on the facts of that case and that a taking by flooding had indeed occurred as a result of the MRRP.¹³¹ However, as of this writing, that decision is currently on appeal, where the appellate court is grappling with various complex issues, including whether the trial court should have factored in what amount of flooding would have occurred *absent* the Corps' actions.¹³²

Such litigation against local governments in Florida can be expected in the future as local government work on infrastructure projects, and indeed some such litigation has already begun. For example, a group of property owners recently has sued the City of Miami Beach for raising the road in front of their houses which they say led to flooding of their property.¹³³ Those plaintiffs brought two lawsuits: one lawsuit asserts federal and state inverse condemnation claims as well as a negligence claim, and that case is pending in the U.S. District Court of the Southern District of Florida;¹³⁴ and the other lawsuit, which is pending in Miami-Dade County Circuit Court, asserts Bert Harris Act claims (the Bert Harris Act is discussed in Section VI.A.2 below).¹³⁵ How such lawsuits are ultimately resolved by the courts will be an important part of monitoring the legal landscape surrounding sea level rise adaptation measures.

While it is clear, as just discussed, that government *action* can sometimes lead to a finding of inverse condemnation,¹³⁶ another important question is could local government *inaction*, combined with the effects of substantial sea level rise, raise inverse condemnation issues? One Florida case, *Jordan v. St. Johns County*, is notable in this regard.¹³⁷ The case involved St. Johns County's decision to cease maintaining a portion of Old A1A. The County had been spending an average of \$250,000 per mile/per year to maintain that road due to rising sea levels and erosion. The court explained that, after establishing and undertaking to maintain roads dedicated to public use, which triggers an obligation to do so reasonably, a local government must provide a reasonable level of maintenance that affords meaningful access to adjacent property (unless or until formal abandonment of the road).¹³⁸ The court did not decide what precisely amounts to reasonable maintenance and did not dictate a particular manner or level of accessibility, but rather held that the County's discretion was not absolute and remanded the case for a determination of what would be reasonable maintenance.¹³⁹ The case then settled. But these developing concepts are an area of the law requiring consideration when determining the risk of inverse condemnation suits for property owners who may lose access entirely to their property due to perpetually flooded roads.

However, seemingly contrary to the holding in *Jordan*, a federal appellate court in 2018 held that affirmative acts by the government *are* required to state a taking claim, at least under the federal constitution, and that insufficient maintenance claims could only sound in tort law if at all. That decision, *St. Bernard Parish Gov't v. United States*, explains: "A property loss compensable

as a taking only results when the asserted invasion is the direct, natural, or probable result of authorized government action.”¹⁴⁰

Mindful of the fact that flooding of roads due to acts of nature will be a commonly discussed issue in years to come, the Florida Sea Grant program has developed a model ordinance to deal with environmentally compromised roads, with the goal to help limit inverse condemnation lawsuits and provide more predictability for property owners.¹⁴¹ The model ordinance proposes setting reasonable maintenance standards and levels of service to, in effect, gradually abandon any roads that are rendered unable to be maintained due to the effects of sea level rise.¹⁴² In brief, the model ordinance sets criteria under which a local government would designate certain roads in an environmentally challenged area (*i.e.*, a location where typical road construction, remediation, or repair criteria and standards are infeasible due to naturally occurring conditions such as sea level rise) as environmentally compromised where the maintenance costs for the road exceed, by some factor, the average cost to maintain similar roads.¹⁴³ The model ordinance also sets a maintenance standard for such roads limited to some fraction of the cost necessary to keep the road at its compromised state.¹⁴⁴ An ordinance such as this that sets reasonable levels of service might allow property owners a level of predictability, while also allowing a local government to budget its future expenditures.

Such decisions are, in any event, guided by the Florida Department of Transportation’s Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways, which is commonly called the “Florida Greenbook.”¹⁴⁵ Importantly, “benefit/cost analysis” is one of the criteria in the Greenbook that can justify an exception to a design standard.¹⁴⁶ A team of legal and planning experts in Florida took a deeper dive into those design standards and exceptions, and analyzed legal issues (including inverse condemnation issues) associated with maintaining roads affected by sea level rise, in a 2019 white paper entitled *Legal Issues When Managing Public Roads Affected By Sea Level Rise*.¹⁴⁷

It should also be noted that a municipality can sometimes have *statutory* obligations to provide a “reasonable level of maintenance” to certain existing infrastructure that it has taken operational control over – such as county roads or private roads.¹⁴⁸

6. Substantive Due Process Overlay

Any City decisions relating to infrastructure investments must also be consistent with substantive due process standards. Under well-settled case law, “a legislative act will withstand a substantive due process challenge ‘if the government identifies a legitimate state interest that the legislature could rationally conclude was served by the [legislative act].’”¹⁴⁹

Basing decisions on sound scientific research, keeping careful documentation, and making decisions in the public interest will help insulate adaptation measures from substantive due process scrutiny.¹⁵⁰ But a local government is “not limited to acting only where there is scientific certainty.”¹⁵¹ Furthermore, as the Florida Supreme Court has noted, “The police power of the state is not static. The courts are duty bound to recognize its expansion in proper cases to meet conditions which necessarily change as business progresses and civilization advances.”¹⁵²

7. *Takeaways*

Even in light of all of these legal principles, a Florida municipality has considerable leeway in planning and implementing long-term infrastructure projects. That said, the City would be wise to engage in a continuing evaluation of the risks associated with every project that it undertakes, as well as in a continuous evaluation of the litigation risks of action or inaction. Keeping residents informed and setting reasonable maintenance standards and levels of service might also provide more predictability to property owners and help inform their reasonable investment-backed expectations.

C. Financing Sea Level Rise Adaptation Costs

Sea level rise infrastructure adaptations in the decades ahead will be costly. The most attractive financing options available to the City for such measures are: ad valorem taxation, special assessments, user and utility fees, impact fees, municipal bond issuances, grants and subsidies, and public-private partnerships. Each of these is described below, followed by examples of how other governmental entities are using these tools in their adaptation efforts.¹⁵³ Additional funding options that can only be established by a Florida county – such as Municipal Service Taxing Units and Local Option Tourist Development Taxes – are not able to be implemented by the City and are therefore not discussed herein.

1. *Ad Valorem Taxation*

Ad valorem property taxes provide the City with the power to fund a broad variety of projects for “all municipal purposes,” for the benefit of the general public.¹⁵⁴ Ad valorem taxes are levied “for the general benefit of residents and property and are imposed under the theory that contributions must be made by the community at large to support the various functions of the government.”¹⁵⁵ Accordingly, ad valorem taxes may generally be imposed to fund projects that “support a particular government function” regardless of whether particular taxpayers receive a special or direct benefit from the project funded.¹⁵⁶

As of 2024, the City’s municipal millage rate was 5.5590 mills.¹⁵⁷ In the years ahead, if necessary, there could be a need for additional ad valorem taxes to be collected.¹⁵⁸ However, the use of ad valorem taxation to address sea level rise infrastructure improvements might face political push back if residents of some areas of the City feel as if they are subsidizing costly and potentially ultimately unsustainable adaptations in other areas of the City.

2. *Special Assessments*

The Florida Statutes provide broad authority to municipalities to levy special assessments to fund, among other things: (1) guttering and draining of streets, boulevards, and alleys; (2) construction, reconstruction, repair, renovation, and upgrading of sewer, canal, drains, and stormwater management systems; (3) construction and reconstruction of water supply systems, including aquifer storage and recovery, and desalination systems; (4) construction and reconstruction of seawalls; and (5) drainage and reclamation of wet, low, or overflowed lands.¹⁵⁹ Additionally, municipalities are empowered to levy and collect “special assessments to fund capital improvements and municipal services, including, but not limited to, fire protection,

emergency medical services, garbage disposal, sewer improvement, street improvement, and parking facilities.”¹⁶⁰

A special assessment is not subject to the ad valorem taxation limitations under Florida law.¹⁶¹ However, to be valid, a special assessment must pass a two-prong test: (1) the property burdened by the assessment must derive a “special benefit” from the project or service funded by the assessment, and (2) the assessment for the project or service must be properly apportioned.¹⁶² A special assessment “is imposed upon the theory that that portion of the community which is required to bear it receives some special or peculiar benefit in the enhancement of value of the property against which it is imposed as a result of the improvement made with the proceeds of the special assessment.”¹⁶³ Therefore, a special assessment cannot generally be used as a proxy for ad valorem taxation to fund projects that provide a general benefit to the public at large.¹⁶⁴

General law enforcement activities, the provision of courts, and indigent health care services are functions that have been found to be required for an organized society and that therefore cannot be funded through a special assessment.¹⁶⁵ Conversely, Florida courts have held that mosquito control services and fire protection services, which do provide a direct, special benefit to real property, may potentially be funded through a special assessment.¹⁶⁶

According to the South Florida Regional Planning Council, special assessments could be used to help fund specific improvements that provide direct and special benefits to identified Adaptation Action Areas (which are discussed in Section V. C. below).¹⁶⁷

Special assessments might also be used, for example, to raise the height of some of the City’s fixed bridges which provide access to Biscayne Bay from the City’s waterways, *provided* the two-prong test discussed above is satisfied.¹⁶⁸

3. *User Fees and Utility Fees*

The City could also finance some sea level rise adaptation projects through user fees or utility fees relating to the provision of stormwater utilities and other governmental services.

User fees are charged in exchange for “a particular governmental service which benefits the party paying the fee in a manner not shared by other members of society” and are typically, but not always, “paid by choice, in that the party paying the fee has the option of not utilizing the governmental service and thereby avoiding the charge.”¹⁶⁹

The distinction between a user fee and a special assessment is not always clear.¹⁷⁰ But typically, a special assessment is a specific levy designed to recover the cost of an improvement that confers a particular benefit on a property, whereas a user fee, often created pursuant to state statute, is a charge to a person who uses a service for the cost of providing the service.¹⁷¹ User fees are not taxes and are not subject to the ad valorem taxation limitations applicable under Florida law.¹⁷²

A utility fee is a type of user fee.¹⁷³ In setting utility rates, municipalities “enjoy a significant degree of latitude,” and courts will typically uphold the rates set by local governments so long as they are “not arbitrary, unreasonable, or discriminatory.”¹⁷⁴

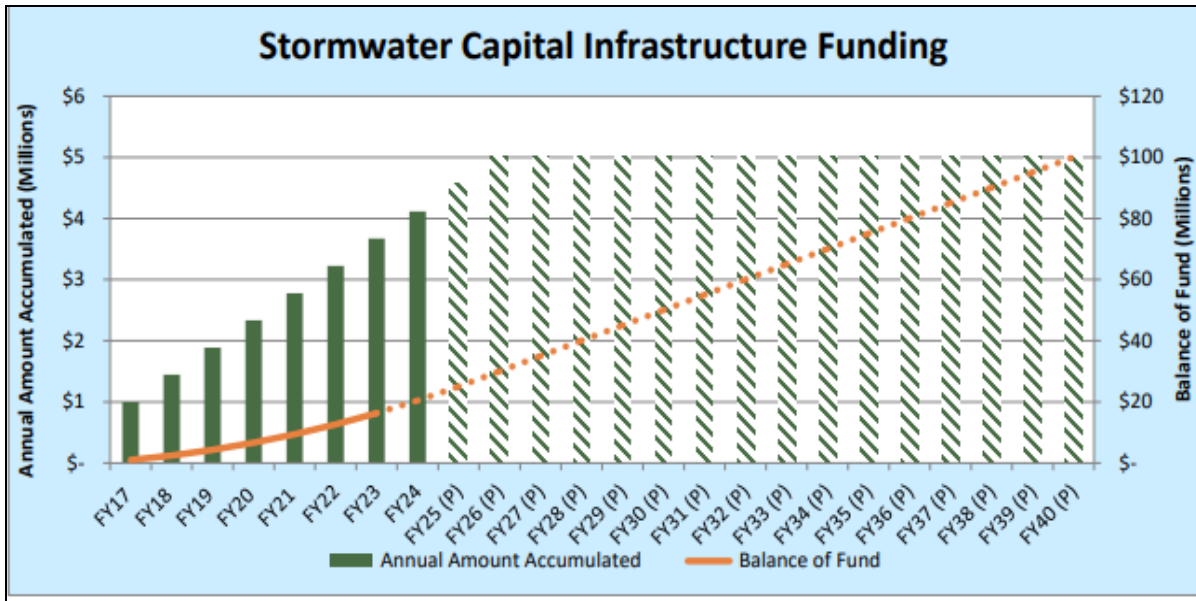
Most relevant to sea level rise adaptation financing, the Florida Statutes expressly empower municipal governments to create one or more stormwater utilities and to adopt stormwater utility fees to plan, construct, operate, and maintain stormwater management systems.¹⁷⁵ In terms of how stormwater fees are calculated, Florida Statutes § 403.031(17) provides that they should be assessed based on a beneficiary's "relative contribution" to the need for the stormwater services.¹⁷⁶

The City of Miami Beach is currently defending a lawsuit where condo associations, multifamily property owners, and commercial property owners are alleging that the method that city uses to calculate stormwater fees is "unreasonable, arbitrary and discriminatory" and violates Florida law.¹⁷⁷ No final ruling has been made in that case as of this writing, but such cases can be followed to understand how Florida courts would view such calculations.

The City of Coral Gables has a "Storm Water Utility Fund," which is "used to account for the operation, maintenance, financing and capital improvement costs of a storm water collection system providing services to all residents of the City, and all commercial properties," as well as a "Sanitary Sewer Fund," which is "used to account for the operation, maintenance and capital improvement costs of a sanitary sewer collection system providing services to certain residents of the City, the University of Miami and certain non-resident sewer connections in areas adjacent to the City."¹⁷⁸ These are both referred to in the City budget as "enterprise funds," and are funded primarily by service use charges.¹⁷⁹

And specific to sea level rise preparedness, the City is leading the way on sea level rise adaptation through its creation of a specific 24-year plan to generate \$100M for sea level rise capital improvements for its storm water utility system. This plan, which was first implemented during fiscal year 2016-2017, calls for modest annual storm water fee increases over a period of 10 years that will generate \$100M (present value dollars) by the year 2040, to help fund future storm water infrastructure hardening improvements.¹⁸⁰ As the 2024-2025 City budget explains, "[o]ne of the main objectives of this plan is to smooth out increases over time to ease the burden of funding this program while maintaining a steadfast commitment to combat rising seas. During each fiscal year, the funds generated by the fee increase will be accumulated and set aside as restricted funds until the \$100M is reached, or utilized sooner if an immediate sea level rise need occurs."¹⁸¹ Of course, it is expected that significantly more funding will be needed in the decades to come, but this fund is an important step.

The graph below illustrates the City's funding strategy for this plan:¹⁸²



As explained in a section of the City’s 2024-2025 budget devoted to the issue of planning for the financial impact of sea level rise: “By taking an aggressive and proactive approach to the threat of rising seas, the City hopes to get out in front of this issue. Conceivably by 2040 when most cities are searching for mitigation funding, Coral Gables will have \$100 million (present value) in reserve in the Stormwater Fund and have a fully funded Sanitary Sewer Capital Infrastructure Replacement Program to safeguard its residents.”¹⁸³

4. *Developmental Impact Fees*

Regulators often impose conditions when issuing permits for new development or substantial redevelopment (e.g., the renovation or expansion of an existing structure). Section VI below discussed various conditions on development from a regulatory perspective. But this section explores the potential use of one type of condition to fund infrastructure adaptation measures. Specifically, conditions that require a property owner to convey a property interest are called exactions. And exactions can include impact fees, which offset costs associated with the development (such as infrastructure needs). Such impact fees may theoretically be a potential source of funding for governmental infrastructure projects relating to sea level rise. For example, a local government might require a developer to pay a fee to cover the cost of flood-proofing infrastructure that services the new development.¹⁸⁴ However, special care must be taken to ensure that any such impact fees satisfy the relevant legal criteria for such conditions, and the imposition of impact fees related to sea level rise would likely be very challenging.

Specifically, due to their coercive potential, exactions and other development conditions must be carefully considered to ensure that they are legitimate (and not extortionate). To avoid such a finding, the *government* has the burden to prove an “essential nexus” between the purpose of the impact fee (or other exaction) and the impact that the fee or exaction seeks to mitigate,¹⁸⁵ as well as a “rough proportionality” between the exaction and the impact of the proposed development.¹⁸⁶ That two-party test would be challenging in the context of sea level rise adaptation.

Indeed, some Miami-Dade County Commissioners previously suggested the use of impact fees as a source of funding to pay for sea level rise-related costs to the County.¹⁸⁷ But, in a May 2021 memo, County Mayor Daniella Levine Cava explained that, after looking at the legal criteria for impact fees, including the nexus requirement, the County decided against the use of such fees to address sea level rise: “Because of this nexus requirement, it would be extremely difficult to create a new impact fee specifically tied to the impact of sea level rise. Increasing development in areas that are expected to be permanently inundated or in areas that will see more frequent flooding will likely drive up the costs to provide key public services. However, the direct relationship to the cost of public services is highly dependent upon the nature of the development and the project design. It is not easy to create generalizable rules about the anticipated scale of the impact.”¹⁸⁸

Another alternative that has been proposed by some is to create an endowment that would receive *voluntary* proffers from developers -- and other private donations as well -- and place the funds into an interest-bearing trust fund to be used for sea level rise adaptation efforts (and possibly helping residents in need of adaptation assistance), similar to a municipal workforce housing trust fund program.¹⁸⁹ Such a program, however, would need to include substantial safeguards to ensure that even voluntary proffers were analyzed against the two-prong exactions test.

5. *Municipal Bonds*

Issuing bonds can be another option to finance capital improvement projects that address sea level rise. Types of municipal bonds include: (1) general obligation bonds, which are secured by the full faith and credit and taxing power of the municipality; (2) ad valorem bonds, which are secured by the proceeds of ad valorem taxes levied on real and tangible personal property; (3) revenue bonds, which are payable from revenues derived from sources other than ad valorem taxes and which do not pledge the property, credit, or general tax revenue of the municipality; (4) improvement bonds, which are payable solely from the proceeds of special assessments levied for an assessable project; and (5) refunding bonds, which are issued to refinance outstanding bonds of any type (and the interest and redemption premium thereon).¹⁹⁰

Florida municipalities are empowered to issue bonds “to finance the undertaking of any capital or other project for the purposes permitted by the State Constitution and may pledge the funds, credit, property, and taxing power of the municipality for the payment of such debts and bonds.”¹⁹¹ Municipalities are vested with broad powers to issue bonds for the purpose of financing governmental undertakings approved by the municipality’s governing body “which the governing body of the municipality shall deem to be made for a public purpose.”¹⁹² Moreover, a bond issuance may provide “incidental” benefits to private parties, so long as the primary purpose of the bond is to serve “a paramount public purpose[.]”¹⁹³

Notably, general obligation bonds and ad valorem bonds (but not revenue bonds and improvement bonds) must typically be approved by a vote of the electorate, because these bonds carry with them the potential for raising taxes on citizens’ real and tangible personal property – perhaps even above the baseline millage limits – to satisfy the municipalities’ debt obligations.¹⁹⁴

Some investors are particularly eager to invest specifically in “green bonds,” which are fixed-income securities used to finance only environmentally-friendly projects, which could include climate change adaptation projects.¹⁹⁵ These are typically either general obligation bonds or revenue bonds.

Another related type of funding option that is sometimes discussed in resiliency planning is environmental impact bonds, which are a type of pay-for-success financing mechanism where investors are paid based on certain standards or metrics being met by the local government. Unlike green bonds, environmental impact bonds are not actually bonds in the traditional sense, but rather contracts between the governmental entity and third parties or intermediaries. For example, DC Water issued a \$25 million environmental impact bond in 2016 to finance the construction of green infrastructure to manage stormwater runoff.¹⁹⁶ The bond is structured to limit financial risk to DC Water if the performance of the green infrastructure is less than anticipated and financially reward investors if the performance exceeds expectations.¹⁹⁷ The federal government assisted in making this bond successful, by helping to connect DC Water with interested investors.¹⁹⁸

In recent years, many investors and ratings agencies have become increasingly interested in the effects that climate change may have on municipalities’ longer term finances. For example, Moody’s noted in a 2020 announcement that: “More frequent coastal flooding as a result of climate change poses risks for localities, states and the federal government due to large and growing populations and vulnerable infrastructure in coastal locations.”¹⁹⁹ And a 2022 DBRS Morningstar commentary report noted that “investors and underwriters no longer have the luxury of simply checking if a property is outside of FEMA’s 100-year flood zones and verifying there is some evidence of flood insurance. Because climate change is rapidly evolving, models based solely on historical data have become less accurate.”²⁰⁰

Eventually, rating agencies may take steps to force the political will of any governmental entities that are slow to incorporate sea level rise adaptation policies. For example, in 2015, Moody’s Investors Service called on coastal cities in Virginia’s Hampton Roads region “to continue investing and planning to mitigate negative credit effects from weather-related and tidal flooding.”²⁰¹ As Moody’s explained, “Annual planning and spending for stormwater management in the near term reduces the need for Hampton Roads municipalities to spend larger amounts later.”²⁰²

Fortunately, the City of Coral Gables currently enjoys very favorable municipal bond ratings. In fact, the issuer credit rating for the City from the Standard & Poor’s Ratings Services is AAA – the highest credit rating offered by S&P.²⁰³

6. *Federal, State, and Non-Profit Grants and Subsidies*

The City can also explore the possibility of state and federal grants and subsidies to help finance the costs of sea level rise adaptation projects, as well as possible grants from non-profit organizations.

Federal:

Grants through federal agencies can be significant (although they tend to be highly competitive). FEMA, for example, operates a Pre-Disaster Mitigation Program to help states and

local governments fund sustained pre-disaster natural hazard mitigation programs to reduce the overall risk to people and structures from future hazardous events.²⁰⁴ The federal Consolidated Appropriations Act of 2022 authorized funding for 100 such projects for states, tribes, territories, and local communities under the Pre-Disaster Mitigation Program, including two in Florida, for 2022 alone.²⁰⁵ These grants are distinct of course from FEMA’s *post*-disaster funding, such as the funding the City of Coral Gables received in the aftermath of Hurricane Irma in 2019.²⁰⁶

The U.S. Department of Housing and Urban Development (“HUD”) also provides grants relating to climate change preparedness at the state and local level. For example, HUD’s Community Development Block Grant program, which reaches over 1,200 local governments in all states and territories, requires jurisdictions to incorporate resilience to natural hazard risks into their plans and to discuss how climate change will increase those risks.²⁰⁷

Numerous other federal grant-funding opportunities can be found in NOAA’s U.S. Climate Resilience Toolkit, available on their website.²⁰⁸ The American Flood Coalition also has created a Flood Funding Finder, which is an interactive website that seeks to simplify the complex federal grants system and help small communities identify opportunities to fund flood resilience.²⁰⁹

State:

Other local governments in areas affected by sea level rise have been allocated funds through Florida Department of Environmental Protection (“FDEP”) programs designed to safeguard critical natural resources. Most notably, under FDEP’s Resilient Florida Grant Program, local communities can seek funding and technical assistance to assess their vulnerabilities and develop strategies to cope with sea level rise and associated flooding and erosion.²¹⁰ According to FDEP, the Resilient Florida Grant Program “will yield the largest investment in Florida’s history to prepare communities for the impacts of climate change – including sea level rise, intensified storms and flooding.”²¹¹ For 2023 alone, South Florida local governments obtained more than \$180 million for projects from the program to adapt to rising sea levels.²¹² And state leaders have stated at least \$1 billion will be spent through the Resilient Florida Grant Program to help address adaptation measures.²¹³

As another example of state funding for resiliency, FDEP’s Everglades Restoration Revenue Bonds program provides funding of up to \$100 million to finance the costs of acquisition and improvement of land, water areas, and related property interests and resources, as contemplated under the Comprehensive Everglades Restoration Plan and the Keys Wastewater Plan (among other plans).²¹⁴

Despite the potential for state and federal grants as a supplemental revenue source to address adaptation issues, uncertainty regarding the actions of other governmental entities may make planning difficult. If the current sea level rise projections come to fruition, resources will be strained in an unprecedented way. At the state level, it can be expected that the South Florida Water Management District (“SFWMD”), which controls the flow of water into and out of South Florida, could put a heavy strain on the State of Florida’s finances. SFWMD operates the “world’s largest water control system,” including 2,300 miles of canals, 61 pump stations, and more than 2,000 “water control structures.”²¹⁵ And a 2009 study estimated that almost two-thirds of the SFWMD’s 28 coastal control structures in Miami-Dade, Broward, and Palm Beach Counties would cease to operate due to even just 8 inches of additional sea level rise.²¹⁶ SFWMD is not

ignoring this issue, of course. SFWMD recently published a study on what short-term and long-term strategies can help make Miami-Dade County more resilient to sea level rise.²¹⁷ But the costs will be high.²¹⁸

And the City may not want to rely too heavily on the federal government either. The federal government could, at some point in the future, have different priorities, or could decide that it cannot or will not provide adequate funding to all of the communities that are addressing this issue.

Non-profit:

Many non-profit organizations are also providing grants for adaptation planning. For example, Miami-Dade County recently obtained a \$330,000 grant from the National Fish and Wildlife Foundation, to help cover restoration project costs around Biscayne Bay to, among other things, “enhance protection from hurricanes and sea level rise.”²¹⁹ Combined with a match from SFWMD, the Town of Cutler Bay, volunteers, and the County itself, grant funds will be used to accelerate the restoration of coastal wetlands, mangroves, and forests adjacent to Biscayne National Park.²²⁰

As another example, in 2016, the Miami Foundation coordinated an effort by Miami-Dade County, the City of Miami, and the City of Miami Beach to receive a 100 Resilient Cities grant from the Rockefeller Foundation,²²¹ ultimately resulting in the Resilient305 strategy program for how the region can address, among other things, the effects of climate change.²²²

An extensive list of potential non-profit grant opportunities relating to climate adaptation can be found in the NOAA’s U.S. Climate Resilience Toolkit.²²³

7. Public-Private Partnerships

Public-private partnerships (“P3s”) may provide another funding source. P3s are contractual arrangements between governmental and private entities under which the private entities assume greater involvement in the financing and delivery of capital improvement projects that benefit the public in exchange for revenue-sharing opportunities and/or completion bonuses.²²⁴

P3s have typically been used in Florida to finance transportation infrastructure projects; however, in 2013, the Florida Legislature expanded the potential uses for P3s to other public purposes.²²⁵ This statute now allows counties, municipalities, school boards, and other political subdivisions of the state, to utilize public-private partnerships to finance qualifying facilities or projects that “predominantly [serve] public purposes,”²²⁶ such as transportation facilities, water or wastewater management facilities and infrastructure, roads, highways, bridges, and other public infrastructure and government facilities.²²⁷

P3s allow governments to fund projects where public funds are otherwise lacking. Under P3 arrangements, a private entity typically pays for the design, construction, and/or operation of the project or facility for a period of time, and, in return, receives revenues generated from the operation of the project or facility in order to realize a return on its investment. In this regard, the statute expressly authorizes private entities to impose fees on the public for use of qualifying

projects or facilities funded in this manner.²²⁸ The statute contemplates a competitive process for the solicitation of bids from potential private partners as well as the approval of prospective projects under criteria designed to protect the public interest.²²⁹

Notable projects in South Florida that have been funded through the use of P3s include improvements to the Port of Miami Tunnel, I-95 express lanes, and I-595 – all between FDOT and private entities.²³⁰ The I-595 project in Broward County has been heralded as a particularly successful example of a P3.²³¹ It can be anticipated that many potential sea level rise infrastructure projects might be amenable to a P3 structure, including sewer infrastructure projects, bridges, roads, and more, provided the projects have a corresponding continuing revenue stream from which the private entity could recoup its investment.

8. *Examples of Other Local Governments' Funding Efforts*

Local governments in Florida are starting to use a number of various funding tools for sea level rise adaptation.

The City of Miami Beach has been implementing large-scale projects to address sea level rise, and they have utilized numerous funding sources. In 2014, the City commenced a two-step financing plan in excess of \$300 million to upgrade the City's storm drainage system. First, the City's stormwater utility raised the equivalent residential unit stormwater utility fee by 84%. Then, starting in 2015, the City Commission authorized issuance of hundreds of millions of dollars in revenue bonds to fund upgrades to the City's stormwater system, including the installation of new pump stations and the conversion of injection pumps. The City Commission authorized revenue from the increased stormwater utility fee to be pledged as security for the City's obligations under the bonds.²³²

The Town of Longboat Key has a beach renourishment program financed by two erosion-control special taxing districts vested with the authority to, among things, levy property taxes, assess special assessments, and issue bonds for this purpose. The districts fund the Town's beach renourishment program through a combination of ad valorem taxation and general obligation bond issuances. And recurring source of additional funding for the Town's beach renourishment projects has been provided through grants awarded under FDEP's Beach Management Funding Assistance Program.²³³

Monroe County has conducted a Regional Roads Adaptation and Capital Plan study, which analyzes which of the County's vulnerable roadways should be elevated or have drainage added in order to adapt to projected sea level rise and the other anticipated effects of climate change.²³⁴ The study outlines when and how roads will need to be elevated or otherwise improved, and provides cost estimates, conceptual designs, an implementation plan, and a proposed schedule.²³⁵ The study estimates that \$1.6 billion will be required to make the recommended changes to adapt the County's roadways.²³⁶ In September 2022, the County applied for 15 road adaptation projects under the Resilient Florida Grant Program, which would provide approximately \$384 million of the needed funds, and County officials are researching other available funding options as well.²³⁷ The federal government also appears ready to step up for the Florida Keys. In December 2022, then-President Joe Biden signed into law authorization of a \$2.6 billion coastal storm and sea-level rise infrastructure resiliency project in the Florida Keys to be conducted by the U.S. Army Corps

of Engineers. Appropriations for the project will require separate, annual approvals by Congress.²³⁸

9. *Municipal Risk Financing*

The City may want to also consider whether insurance or other ex-ante risk management tools could help in its planning to adapt to the effects of climate change. Including tools such as catastrophe bonds (“cat bonds”), insurance risk pools, or parametric insurance in a local government’s overall risk financing strategy could help manage financial exposure to major storm events, which may be exacerbated by the effects of sea level rise and climate change generally.²³⁹

In 2021, the Climate Policy Initiative, the Cities Climate Finance Leadership Alliance, and the Adrienne Arsht-Rockefeller Foundation Resilience Center worked together to publish a report on this topic, entitled “*Building Climate Resilience in Cities Through Insurance*,” and that report discusses cat bonds, insurance risk pools, and parametric insurance.²⁴⁰

Cat Bonds: Cat bonds are high-yield bonds that can sometimes be sponsored by municipal governments and issued by reinsurance companies. Such bonds can be triggered when specific parametric triggers are met by a disaster. Since cat bonds could theoretically “introduce a moral hazard into the ecosystem and disincentivize investment in resilience, to mitigate this risk firms like Swiss Re have begun to tie cat bonds with rebate programs that reward cities that invest in building resilience.”²⁴¹ For these cat bonds, Swiss Re “assesses the degree of risk reduction for a given protection measure and then reduces the rates that a municipality must pay its bondholders, reflecting the reduced likelihood that payout from these bonds will be triggered.”²⁴²

Risk Pools: As the *Building Climate Resilience in Cities Through Insurance* report explains, risk pooling is one of the most effective methods for local governments to hedge risk where participating communities have differing characteristics of vulnerability to climate-related hazards. For example, with leadership by the Philippines Department of Finance and the Asian Development Bank, ten cities around the world have been selected for an insurance pool based on factors including disaster risk and risk management governance, geographic location, and data availability. The pool is designed to provide post-disaster financing based on an insurance model and features payouts determined by the features of a natural hazard event.²⁴³

Parametric Insurance: Parametric insurance, a product that offers pre-specified payouts based on a trigger event, is increasingly being seen as an effective mechanism for cities to address climate risks. According to the *Building Climate Resilience in Cities Through Insurance* report, parametric insurance, which typically is used for immediate disaster response, tends to have a relatively simple structure, often provides for prompt payouts when risk thresholds are reached, and can be effective at focusing on specific hazards (i.e., floods or storms), which is helpful in light of the complexity of multi-hazard risk modeling.²⁴⁴

V. **Comprehensive Planning for Sea Level Rise**

Comprehensive plans (sometimes called “master plans”) are a long-range tool by which a local government guides development based on the community’s vision for its desired future. Under Florida law, a comprehensive plan designates areas for future development, for preservation, and for proposed public improvements, among other things.²⁴⁵ Considering sea level

rise in comprehensive plans is a key step by which local governments can begin to incorporate adaptation strategies into their decision-making framework.

A. General Considerations

1. Planning Horizon

Under Florida law, local governments must generally develop two planning horizons – a 5 year period after the comprehensive plan is adopted and then a longer period of at least 10 years for most planning purposes (some transportation and major infrastructure planning occurs on longer planning horizons).²⁴⁶ However, Florida law does not *preclude* a longer planning horizon should a local government choose to utilize a longer horizon. This is important in the context of sea level rise, because a 5 or 10-year planning timeframe may not be far enough out to model for the potential impact of climate change. In contrast, a 15 or 20 year timeframe might be far enough out to make some decisions related to such risks, and a 50 year or longer timeframe might be most appropriate for certain longer-term planning such as major infrastructure projects.²⁴⁷

As Florida attorneys Erin Deady and Thomas Ruppert have noted, a challenge with longer-term timeframes and with different planning timeframes for different types of actions will be to link major planning decisions (such as how areas should be developed, where infrastructure should be placed or retrofitted, and what land should be acquired) together by tying the “useful life” of zoning, infrastructure, or investment decisions with where the future flood impacts are expected to occur, and when.²⁴⁸

2. Appropriate Data for Planning

The Florida Statutes require that a comprehensive plan must be based on “relevant and appropriate data and an analysis by the local government that may include, but not be limited to, surveys, studies, community goals and vision, and other data available at the time of adoption of the comprehensive plan or plan amendment.”²⁴⁹ “To be based on data means to react to it in an appropriate way and to the extent necessary indicated by the data available on that particular subject at the time of adoption of the plan or plan amendment at issue.”²⁵⁰ That data must be taken from “professionally accepted sources.”²⁵¹ “Original data collection by local governments is not required,” but is permitted.²⁵²

Fortunately, the City has access to scientific data related to sea level rise and climate change (as set forth in Section II.B. above). And the City also has the Hazen & Sawyer vulnerability assessments which are adding further support for the City’s planning decisions by identifying particular vulnerabilities specific to our community. Such information can be taken into account in future comprehensive plan amendments.

It is important to note that Florida law is clear that a local government is “not limited to acting only where there is scientific certainty.”²⁵³ Courts will generally defer to local government planning if there is professionally accepted science to back up a decision.²⁵⁴

3. Statutory Provision Regarding Sea Level Rise

Local governments in coastal zones are required to incorporate into their comprehensive plan a number of coastal management-related provisions, including a “redevelopment component that outlines the principles that must be used to eliminate inappropriate and unsafe development in the coastal areas when opportunities arise...”²⁵⁵ In 2015, the Florida Legislature passed SB 1094, which, for the first time, requires that sea level rise considerations be part of the coastal management element of any local government required to have such an element. Under this provision, the coastal-management redevelopment component must contain: “... development and redevelopment principles, strategies, and engineering solutions that reduce the flood risk in coastal areas which results from high-tide events, storm surge, flash floods, stormwater runoff, *and the related impacts of sea-level rise.*”²⁵⁶

The City added a coastal management element to its comprehensive plan in 2018.²⁵⁷ As set out in Section V.B.2 below, that element contains such principles, strategies, and solutions associated with sea level rise.

4. *When to Amend?*

Municipalities must generally evaluate their plans every seven years to determine if amendments are needed to reflect changes in state law.²⁵⁸ Also, the City has the right, pursuant to Florida Statutes § 163.3191(2), to determine that amendments are necessary or appropriate at any time and amend the plan accordingly. Accordingly, additional considerations relating to sea level rise can be worked into the City’s comprehensive plan when the Commission and City staff deem appropriate. Not all changes need to be made at one time, of course. And the sea level rise aspects of the comprehensive plan could be reevaluated frequently (perhaps every five years), as the facts on the ground, the scientific projections, or the applicable legal principles change.

An important caveat is warranted here. Since Florida courts consider a comprehensive plan to be a local government’s “land use constitution” to which the City’s development decisions and land development regulations should conform,²⁵⁹ specific concepts should be added to a comprehensive plan cautiously and after careful consideration and consultations with legal counsel. This is particularly true since Florida law grants some affected third parties the right to challenge certain local government land development decisions that do not conform to the local government’s comprehensive plan.²⁶⁰

B. Key Elements of Comprehensive Plan Implicated

Under Florida law, a comprehensive plan is broken into elements – some mandatory, some optional, as set out in Florida Statutes § 163.3177. Some comprehensive plan elements that may be impacted by sea level rise are discussed below. The City could either add a separate “element” to the comprehensive plan related specifically to sea level rise, or could continue to weave sea level rise-related considerations into these (and other) relevant elements of the plan as appropriate. But in light of the systemic nature of the effects of sea level rise on City planning and operations, continuing to incorporate these considerations into the different elements is likely more appropriate than creating a single separate element.

1. *Infrastructure and Capital Improvements*

Under Florida law, local governments are instructed to refrain from extending or rebuilding roads, water and sewer lines, and other infrastructure in certain projected vulnerable areas. *See, e.g.,* Fla. Stat. §163.3177(6)(g)(6) (2022) (providing, among other things, that comprehensive plans in coastal cities and counties are required to “[l]imit public expenditures that subsidize development in coastal high-hazard areas”).

This general principle is included in Coral Gables’ current comprehensive plan as follows:

Objective SAF-2.1. Limit public expenditures in coastal areas to projects clearly in the public interest and which minimize the risk from storm damage. This objective shall be achieved through the implementation of the following policies.

Policy SAF-2.1.1. Public expenditures for infrastructure improvements shall be located outside flood prone areas, to the extent practicable, to keep floodways as unobstructed as possible.

Policy SAF-2.1.2. Limit public expenditures that subsidize development permitted in coastal areas as defined herein except for restoration or enhancement of natural resources.

Policy SAF-2.1.3. The City shall abide by the Coastal High Hazard Area (CHHA) defined as the area below the elevation of the category 1 storm surge line as established by a Sea, Lake, and Overland Surges from Hurricanes (SLOSH) computerized storm surge model...

Policy SAF-2.1.4. The Coastal Area within the City of Coral Gables shall be defined as the land south of the Coral Gables Waterway, east of Old Cutler Road, and north of the southern limit of the City.²⁶¹

Sea level rise will, of course, help inform which areas should be considered “high hazard” or “flood prone.” But the City could consider also more explicitly incorporating the concept of sea level rise into this element, and expanding these concepts beyond only coastal areas and into *any* area of the City that may become more flood-prone due to sea level rise.

Although counsel should be retained to draft carefully tailored language for the City’s comprehensive plan, the University of Florida’s Conservation Clinic has crafted a “Model Comprehensive Plan Goals, Objectives and Policies, to Address Sea-Level Rise Impacts in Florida,” which provides an annotated set of comprehensive plan language suggestions which could be used as a helpful starting point.²⁶² On the infrastructure element, the UF Model Comprehensive Plan includes the following model additions:

Policy 1.3.1: The City/County shall inventory all existing and planned infrastructure and land development within the vulnerable area for its capacity to accommodate projected sea-level rise over the life expectancy of the infrastructure and development.

Policy 1.3.2: No capital improvements within the vulnerable area shall be financed or constructed without having first been reviewed to determine the extent to which the proposed improvement is sea-level rise-ready, taking into

account the sea-level rise adaptation zone in which it is located, and whether it will contribute to additional development within the vulnerable area.

Policy 2.1.1: The City/County shall develop a comprehensive shoreline stabilization strategy to address protection of the built environment where it has been determined to be feasible and in the best interest of the City/County to protect economic investment and public and private infrastructure.

Policy 2.1.2: Based on projected rates of sea level rise within the sea-level rise planning horizon the City shall inventory all existing shoreline stabilization structures and determine their capacity to maintain functionality throughout the SLR [sea level rise] planning horizon.

Policy 2.1.3: The City/County shall inventory all public buildings and infrastructure that are vulnerable to sea level rise within the sea-level rise planning horizon and determine whether such buildings and structures should be protected through shoreline stabilization.

Policy 4.1.1: Within [the highest risk areas], the City/County shall eliminate new investment in public infrastructure likely to be subject to the impacts of sea level rise within the planning horizon.

Policy 4.3.2: Identify and establish a land bank for the purposes of relocating critically important infrastructure and municipal support facilities outside of the vulnerable area.²⁶³

2. *Coastal Management*

The Florida Statutes set out extensive requirements for comprehensive plans in certain coastal communities, to restrict development activities that would damage or destroy coastal resources.²⁶⁴ For example, local coastal management plans must “control proposed development and redevelopment in order to protect the coastal environment and give consideration to cumulative impacts.”²⁶⁵

As noted above, Coral Gables added a coastal management element to its comprehensive plan in 2018.²⁶⁶ The following Policies in that new element are directly related to the issues of sea level rise and the anticipated effects of climate change on storm vulnerability:

Policy CMT-1.4.3: Rise in sea level projected by the scientific community, and studied by the Southeast Florida Regional Climate Change Compact, shall be taken into consideration in future decisions regarding the feasibility, design, location, and development of infrastructure and public facilities in the City.

Policy CMT-1.4.4: Incorporate best practices from the City’s “Legal Considerations Surrounding Adaptation to the Threat of Sea Level Rise” in development standards.

Policy CMT-3.1.2: Participate in the preparation and adoption of a county-wide post disaster redevelopment plan that establishes an orderly process for reviewing the viability of private and public development proposals to restore the economic and social viability of the City in a timely fashion.

Policy CMT-3.1.3: During post-disaster redevelopment, structures that suffer repeated damage to pilings, foundations, or load bearing walls shall be evaluated for viability or required to rebuild landward of their present location or be structurally modified to meet current building codes.

Policy CM-4.2.2: Maintain the acreage, productivity, and viability of the shoreline and nearshore marine environments and preserves during future effects of sea level rise, storm surge, flooding, and redevelopment.²⁶⁷

In addition to comprehensive plan requirements for coastal areas, the State also has a set of Coastal Construction Control Line (“CCCL”) regulations, which seek “to preserve and protect [Florida’s beaches] from imprudent construction which can jeopardize the stability of the beach-dune system, accelerate erosion, provide inadequate protection to upland structures, endanger adjacent properties, or interfere with public beach access.”²⁶⁸ While the City of Coral Gables does not have land covered by the CCCL and its topography is not such that construction of sand dunes would materially protect development from the rising Bay or from storm surge, these natural resource protection concepts are still very important because some parts of the City’s Bay shoreline do have mangroves and sea grass beds, which help slow down the energy of waves and prevent erosion. Indeed, the City’s new Coastal Management Element includes the following objective: “Preserve and restore existing natural systems resources including wetlands and mangrove systems within Matheson Hammock Park, Chapman Field Park, R. Hardy Matheson Preserve, and the Cocoplum mangrove preserve, as well as those portions of Biscayne Bay that lie within the City’s boundaries.”²⁶⁹

Of course, in making any decisions affecting the coastal and wetland areas of the City, it must be remembered that Florida’s shorelines and wetlands are subject to a complex network of federal, state, and local regulations, all of which need to be carefully considered before the City adopts any proposed changes. By way of example, at the federal level, there is the Coastal Zone Management Act and the Endangered Species Act,²⁷⁰ and at the state level, there is the Florida Beach and Shore Preservation Act and the Oceans and Coastal Resources Act.²⁷¹

3. *Future Land Use*

The Florida Statutes require that the guidelines in a local government’s comprehensive plan about what can be built – including where and how – should be based on the character of the land (for example, its vulnerability to sea level rise) and on the availability of infrastructure and services to that land. Specifically, Florida Statutes § 163.3177(6)(a) states that a comprehensive plan must include the “distribution, location, and extent of” land uses and “population densities and building and structure intensities,” based upon, among other things “[t]he character of undeveloped land ... [and] the availability of water supplies, public facilities, and services.”²⁷² And land use amendments must be based on “the suitability ... for its proposed use considering the character of the undeveloped land, soils, topography, natural resources and historic resources on site.”²⁷³ Future sea level rise in Coral Gables could affect all of those issues. Accordingly, a number of specific land use-related regulation options are analyzed in Section VI below, and several are accompanied by corresponding model comprehensive plan language that might be considered for the Future Land Use Element of the City’s plan.

In the meantime the City's Future Land Use Element does already discuss flooding issues generally. For example, Policy FLU-1.10.2 states: "The City shall continue to maintain regulations consistent with the Comprehensive Plan which ... regulate development and use in areas subject to seasonal or periodic flooding..."²⁷⁴

4. *Natural Resources and Wetlands*

Comprehensive plans must also direct future land uses that are incompatible with the protection of important natural resources (including protected wetlands) away from such protected areas. And this concept is not necessarily limited to wetlands that currently exist – it can include future wetlands that might migrate or be created due to the effects of sea level rise.²⁷⁵ Appropriate data and analysis that supports the need to maintain specific lands for habitat migration, such as a professional vulnerability assessment of the City's wetland areas, would help bolster land use restrictions in those areas.

As noted above, the City's Bay shoreline contains important habitat, including mangroves. The City will likely want to work in tangent with federal and state laws to encourage and reward the planting and preserving of mangroves, in part to mitigate storm surge issues. *See* Section VI. G. below regarding regulations on Hard and Soft Armoring.

5. *Public Safety and Hurricane Evacuation*

Florida law also requires that the comprehensive plans of local governments in coastal zones meet certain state goals, including protection of human life against the effects of natural disasters, and limitation of public expenditures that subsidize development in high-hazard areas.²⁷⁶

Expected results of climate change in South Florida include not only increased flooding but also an increase in the intensity of storms, increased effects from storm surge, and increased extreme periods of high precipitation and drought.²⁷⁷ Fortunately, the City has broad home rule and police powers to plan ahead to protect the health, safety, and welfare of its residents from such hazards.²⁷⁸

In exercising its home rule powers, the City can develop, implement, and test evacuation policies and procedures. Notably, Miami-Dade County has a Local Mitigation Strategy ("LMS"), which is designed to reduce long-term risk to human life and property from disasters in the County.²⁷⁹ An LMS is a plan developed by a Florida county, in accordance with the federal Disaster Mitigation Act of 2000, to reduce and/or eliminate the risks associated with natural and man-made hazards.²⁸⁰

An additional proactive step that the City itself can take to plan for long-term redevelopment and recovery from disasters is establishing a post-disaster redevelopment plan ("PDRP"). PDRPs provide an opportunity to begin addressing sea level rise considerations in terms of both pre-disaster preparations and post-disaster redevelopment. Coastal municipalities are encouraged by FEMA to prepare PDRPs. Coral Gables' comprehensive plan contemplates developing a PDRP.²⁸¹ Panama City, Florida has a comprehensive PDRP, which might be used as an example for consideration.²⁸² Also, to encourage local governments to develop a PDRP and provide guidelines for those local governments to use, Florida's Department of Community Affairs and the Division of Emergency Management published the "Post-Disaster Redevelopment

Planning: A Guide for Florida Communities.”²⁸³ And a more recent addendum to that publication, entitled “Post-Disaster Redevelopment Planning, Addressing Adaptation During Long-term Recovery,” provides additional helpful information regarding PDRPs and recovery planning generally.²⁸⁴

Coral Gables has experience in responding to damaging storms, and the City has fully-accredited and exceptional police and fire departments, which will be vital in these efforts. The City’s Police Department is accredited with the Commission on Accreditation for Law Enforcement Agencies, which is the international gold standard in public safety, and the City’s Fire Department is one of only a handful of fire departments nationally to hold the distinction of Class 1 status for providing exemplary fire protection to the community.²⁸⁵ The City also has a police and fire headquarters that serves as a regional emergency operation center for several surrounding cities, and that headquarters was built in a relatively high elevation portion of the City. Coral Gables was also the first municipality ever to receive the National Emergency Management Award.²⁸⁶ Aside from harnessing and continue to invest in its own emergency resources, the City should also work closely with federal and state emergency responders and planners in the years to come.

Aside from acute disasters such as hurricanes and chronic problems such as frequent flooding, another potential risk to public safety caused by climate change is an increase in building damage and collapse, in part because salt water corrodes concrete and steel rebar over time. A recent study by FIU Associate Professor Randall Parkinson showed that sea level rise might have contributed to the 2021 collapse of the Surfside condominium building, Champlain Towers. Looking at NOAA data, Parkinson noted that the sea level was at or higher than the basement elevation of Champlain Towers from 244 times a year in 1994 to 636 times in more recent years.²⁸⁷ Indeed, a Miami-Dade grand jury investigating the collapse concluded, in a December 2021 report, that salt water intrusion had likely damaged the building’s foundation.²⁸⁸ The City can work to educate builders and residents of this risk, and of course take such considerations into account when evaluating its own infrastructure. Increased building inspection requirements have also been considered in recent years.²⁸⁹

Hurricane evacuation and public safety requirements are not only important as a matter of public policy; they are also an important part of the legal defensibility of cautious governmental limits on development. The need to mitigate the public hazard risks associated with severe weather, which can be an issue in South Florida even without the effects of sea level rise, might provide a strong defense to certain legal challenges against the City’s adaptation efforts in the future.

C. Adaptation Action Areas

1. What are Adaptation Action Areas?

The use of Adaptation Action Areas (“AAAs”) is one potentially powerful tool to address sea level rise adaptation in the City’s comprehensive plan. AAAs are designated sections of a local jurisdiction that can be entitled to special infrastructure investments and/or that might be subjected to increased or different regulatory requirements, based on the vulnerability of the area. The relevant Florida statute that contemplates AAAs, which was enacted in 2011, states as follows:

“At the option of the local government, develop an adaptation action area designation for those low-lying coastal zones that are experiencing coastal flooding due to extreme high tides and storm surge and are vulnerable to the impacts of rising sea level. Local governments that adopt an adaptation action area may consider policies within the coastal management element to improve resilience to coastal flooding resulting from high-tide events, storm surge, flash floods, stormwater runoff, and related *impacts of sea-level rise*.”²⁹⁰ The enabling statute contemplates that a local government might designate an AAA “for the purpose of prioritizing funding for infrastructure needs and adaption planning.”²⁹¹

2. *Inclusion Criteria for AAAs*

Criteria for establishing what the physical boundaries would be of different AAAs might feasibly include, but need not be limited to, “areas for which the land elevations are below, at, or near mean higher high water, which have a hydrologic connection to coastal waters, or which are designated as evacuation zones for storm surge.”²⁹²

As the Regional Climate Compact’s Built Environment Work Group recommends, the boundaries of an AAA should be based on vulnerability assessments that analyze the best available data to determine the areas most susceptible and vulnerable to rising sea levels, utilizing inundation mapping, modeling, and other similar tools.²⁹³

The infrastructure vulnerability assessment that Hazen and Sawyer has conducted for the City can be useful in identifying areas to include in AAAs. And a more comprehensive vulnerability assessment and resiliency plan that also covers all private property parcels in the City could be useful in determining AAAs as well. The professionals working on such assessments factor into their analyses numerous aspects of a particular neighborhoods’ vulnerability to climate change, such as elevation, the quality of the stormwater infrastructure in place, and the nature of the improvements on the land in that area.

3. *Subzones*

As the Compact’s Built Environment Work Group suggests, a city that is establishing AAAs might also want to identify subarea overlay zones, such as the following:

- *Adaptation Areas* – areas within the AAA that include developed vulnerable land targeted for infrastructure improvements or modified land use and/or development practices in order to reduce risks and improve hazard mitigation. In these areas, the high cost of retrofitting, building, and maintaining infrastructure is outweighed by the return in investment.
- *Restoration Areas* – areas within the AAA that include vulnerable lands that may or may not be already developed and could include Coastal High Hazard Areas and high storm surge areas. Local governments should place priority on the acquisition of land in these areas for restoration, agriculture, or recreational open space.
- *Growth Areas* – areas *outside* of the AAA where growth is actually encouraged due to higher topographic elevations and the presence of existing resilient transportation infrastructure.²⁹⁴

Alternatively, the University of Florida’s Model Comprehensive Plan for sea level rise adaptation recommends the following AAA subareas:

- *Accommodation Zones* – Areas where local governments will allow new development but may limit the intensity and density of new development, limit hard shoreline armoring, and require that structures be designed or retrofitted to be more resilient to flood impacts.
- *Managed Relocation Zones* – Areas where the local government will prohibit coastal hard armoring, limit or prohibit rebuilding of damaged structures, and/or require the removal or relocation of structures that become inundated.
- *Protection Zones* – Areas with critical infrastructure and dense urban development, where coastal armoring will be allowed; local governments could require that soft-armoring techniques be employed where feasible.²⁹⁵

4. *Assistance with Implementing AAAs*

The Florida Department of Economic Opportunity partnered with the South Florida Regional Planning Council (“SFRPC”) to develop a comprehensive guide for local governments that are contemplating AAAs. The resulting document, entitled “Adaptation Action Areas: A Planning Guidebook For Florida’s Local Governments,” contains a significant amount of practical information and recommendations for policymakers implementing AAAs.²⁹⁶

By way of example, the SFRPC AAA Guidebook recommends that local governments align their AAAs with other comprehensive plan elements such as the Capital Improvements Element and the Coastal Management Element.²⁹⁷ And the Guidebook sets out a number of other local government documents into which AAAs can be integrated and “recommends that communities consider the completion of a checklist of regulatory documents and update times so that Adaptation Action Area strategies may be adopted on a schedule that conforms to the community’s existing or projected schedule of adoption and implementation activities.” The Guidebook then provides an example checklist as follows:²⁹⁸

EXAMPLE DOCUMENTS	ADOPTION YEAR	DO INTEGRATION OPPORTUNITIES EXIST?
Municipal Comprehensive Plan		
All-Hazards Mitigation Plan		
Floodplain Management Plan		
Evacuation Plan		
Emergency Response Plan		
Continuity of Operations Plan		
Disaster Recovery Plan		
Post-Disaster Redevelopment Plan		
Capital Improvements Plan		
Economic Development Plan/Strategy		
Coastal Plan or Element		
Shoreline Restoration Plan		
Open Space Plan		

Stormwater Management Plan		
Historic Preservation Plan		
Zoning Ordinance		
Flood Damage Prevention Ordinance		
Subdivision Ordinance		
Building Code		

D. Examples of Adaptation Incorporated into Comprehensive Plans

Many local governments in Florida have already begun to incorporate sea level rise issues, including AAAs, into their comprehensive plans. For example, the Village of Pinecrest (despite having almost no direct exposure to the Biscayne Bay coastline) has built a comprehensive approach to sea level rise adaptation into its comprehensive plan, including the use of AAAs.²⁹⁹ As another example, the City of Satellite Beach designates, as AAAs, existing Coastal High Hazard Areas, as well as other areas of the city that may be identified by their city council in the future as being subject to coastal erosion, flooding, sea level rise, or damage to environmental systems.³⁰⁰

An attorney at the Florida Sea Grant program, Thomas Ruppert, has compiled the language from many of those municipal and county sea level rise-related comprehensive plan provisions, which are available on Florida Sea Grant's website.³⁰¹ As that analysis indicates, some of the most detailed analyses and incorporation of sea level rise issues in the state have been implemented by Miami-Dade County, Broward County, and the City of Fort Lauderdale. Mr. Ruppert notes that the comprehensive plans of those three local governments contain the following similarities:

- They seek to ensure coordination of activities between the local government and other governmental units, and with educational or non-profit institutions;
- They are based on extensive supporting analyses of climate change and sea level rise impacts which allows them to understand current risk as well as potential future risk;
- They specifically address infrastructure, and the best ones ensure that any infrastructure decisions include sea level rise in the decision-making process (Fort Lauderdale and Miami-Dade County even indicate the need to analyze when infrastructure should be relocated due to sea level rise);
- Two of the three specifically indicate that future development and density increases should be focused in the least vulnerable areas; and
- Two of the three discuss criteria to identify AAAs.³⁰²

Also notable is the City of Fort Lauderdale's community investment plan, adopted under the State's Community Planning Act, which identifies 17 AAAs and lists 53 investment projects within those AAAs that have either been completed or are in the construction or design stage. Each AAA is prioritized for infrastructure improvements in order to reduce risks to assets that are vulnerable to sea level rise, including areas experiencing or expected to experience coastal flooding or tidal flooding and areas with hydrological connections to coastal waters.³⁰³

Similar efforts exist outside Florida as well. For example, the State of Maryland has established “The Chesapeake Bay Critical Area Protection Program,” which creates overlay zones that regulate development adjacent to Chesapeake Bay based on the status of development in three types of areas: (1) intensely developed areas with little habitat, which are the preferred location for new development, (2) limited development areas where any new development must protect habitat, and (3) resources conservation areas, predominantly wetlands, where only limited residential development is allowed.³⁰⁴

E. General Litigation Risk Considerations

As discussed in Section IV.B. above (in the context of City infrastructure planning), pure planning decisions are generally considered to be legislative in nature and therefore subject to the most deferential standards of judicial review. Accordingly, local governments will often be given substantial discretion to restrict land uses that are inconsistent with projected sea level rise and storm-surge risk. And, as discussed in Section VI.A. below, there is generally no vested property right against reasonable increased land use planning restrictions, allowable uses, and development standards, and such restrictions will typically not amount to a regulatory taking unless there is no remaining economically viable use or unless there has been substantial good faith reliance on investments and expenditures to the point of creating a vested right.³⁰⁵ This is important to remember, because it is far more efficient and effective to plan properly in the first instance – particularly when discussing long-term infrastructure and development – rather than trying to undo or modify existing development at a later time.

The risk of liability to the City surrounding placing a property within an AAA depends on what particular restrictions or other features are placed on properties in that AAA. As the SFRPC Guidebook notes, the designation of AAAs is flexibly written in the Florida Statutes, so that the benefits the AAAs may confer “relate to numerous ... growth management tools already in existence to protect the welfare of community residents,” including, for example, transferable development rights, zoning and overlay zones, setbacks and buffers, building codes and design, impact fees, conservation easements, real estate disclosures, coastal land acquisition programs, and land trusts.³⁰⁶ Such tools, which could be applied to AAAs (or otherwise), are explained and discussed in the following sections.

VI. Regulatory Tools for Adaptation

Traditional regulatory tools are a critical part of any local government’s adaptation efforts. A number of those options, and legal considerations surrounding each, are discussed below. But we begin with an explanation of some general legal principles that often come into play when imposing new regulations that potentially interfere with property rights.

A. General Legal Considerations When Utilizing Regulatory Tools

The primary legal concerns that are most likely to be implicated by regulatory adaptation efforts are: constitutional takings issues, Florida’s Bert Harris Act, and constitutional substantive due process considerations.

1. Takings Law

Sea level rise-related regulations that are subjected to a takings analysis would likely be evaluated under one of two rubrics. First, under state and federal law, if a regulation deprives a property owner of all economically beneficial use, it could be deemed a taking *per se*, which requires compensation, unless the governmental agency can show that the applicable use would have otherwise been prohibited at common law, such as a public nuisance.³⁰⁷ Second, if a regulation does not constitute a *per se* taking, a court then weighs three considerations, under a balancing analysis that the U.S. Supreme Court has set forth, to determine if the regulation nonetheless amounts to a taking.³⁰⁸ Those considerations are: (i) the character of the governmental action, (ii) the economic impact of the regulation, and (iii) the reasonable investment-backed expectations of the property owner.³⁰⁹

The reasonable investment-backed expectations of a property owner are determined in part by what laws were in place at the time the owner acquired the property.³¹⁰ In other words, laws (include land use regulations) make up the background principles that affect owners' reasonable expectations for how they can use their property and, therefore, the potential outcomes of takings lawsuits.³¹¹ Other factors that can affect one's reasonable investment-backed expectations include: the use of similarly-situated properties, nuisance law background principles, and the appropriateness of the property for the proposed use.³¹²

In short, if the City bases its adaptation regulatory decisions on sound scientific data, including predictive data of sea level rise, such decisions are likely to be upheld even against a takings claim, provided that some economically viable use remains in the property. As the Florida Supreme Court has explained, the "degree of [constitutional property] guaranties must be determined in the light of social and economic conditions which prevail at a given time."³¹³

2. *Florida's Bert Harris Act*

Florida's Bert J. Harris, Jr. Private Property Rights Protection Act is another law for the City to consider when enacting and applying sea level rise adaptation regulations. The Act provides, in relevant part, that "[w]hen a specific action of a governmental entity has inordinately burdened an existing use of real property or a vested right to a specific use of real property, the property owner of that real property is entitled to relief, which may include compensation for the actual loss to the fair market value of the real property caused by the action of government...."³¹⁴

Many of the terms in this statutory language are the same as the key terms in U.S. constitutional takings jurisprudence. However, the Act provides additional substantive rights to property owners beyond constitutional takings and substantive due process principles.³¹⁵ Unfortunately, the Act's "inordinate burden" standard has not been defined clearly or well developed by Florida courts.³¹⁶ Accordingly, the application of the Act to actions stemming from local governments' efforts to redirect development away from areas that are likely to be affected by flooding, sea level rise, and storm surge is an issue for the City to watch carefully in Florida jurisprudence in the years to come.³¹⁷ But typically, courts often narrowly construe the Act where a municipality is simply enforcing federal regulations (such as, for example, FEMA flood elevation regulations) that the municipality was delegated power to enforce.³¹⁸ And, as with takings claims, "[t]here is no cause of action based on nuisance or a request to abate activities which constitute a nuisance" under the Bert Harris Act.³¹⁹

However, Florida's Fourth District Court of Appeals has recently clarified that the meaning of the phrase "reasonable, investment-backed expectations" is not the same under takings jurisprudence as it is under the Bert Harris Act. In *Ocean Concrete, Inc. v. Indian River County*, the Fourth District held that "reliance on federal takings cases as opposed to Florida law interpreting the Harris Act [is] misplaced" when interpreting that phrase.³²⁰ Instead of relying on federal takings law, the *Ocean Concrete* court looked to two Florida cases³²¹ that had interpreted that phrase, both of which established that whether a landowners' expectations for development are "reasonable" and "investment-backed" depends on "the physical and regulatory aspects of the property."³²² In *Ocean Concrete*, this meant that the property owner plaintiff, who owned a parcel that had been zoned Light Industrial, had a reasonable investment-back expectation that he could use his land to build a concrete batch plant, which was a permissible use under that zoning district.³²³ With this case in mind, local governments may face liability if a developer proposes a project that is permissible under the zoning restrictions but then the zoning code is changed to stop the project.

It is also notable that the City of Coral Gables' Zoning Code has a "mini" Bert Harris Act ordinance, which provides, in part, that the City may grant a wide variety of forms of relief "when it is demonstrated that [an] applicant .. has been unfairly, disproportionately or inordinately burdened by a final order of the City that either denied development approval to the applicant or imposed one (1) or more conditions of approval on the applicant."³²⁴ "The process may also be initiated by the City to settle litigation in order to avoid unfairly, disproportionately, or inordinately burdening a party to that litigation..."³²⁵ Dispute resolution agreements entered into under this process run with the land and are recorded in the public records.³²⁶

3. *Substantive Due Process*

Of course, regulations imposed by the City must also not be arbitrary. Substantive due process requirements of the U.S. Constitution prohibit irrational and unreasonable regulations.³²⁷ However, courts in substantive due process suits have typically given regulating agencies substantial leeway to use their police powers, as long as the government action in dispute addresses a legitimate government concern and is supported by substantial competent evidence.³²⁸

Preventing flooding and protecting environmentally-sensitive areas have both been considered legitimate governmental concerns under Florida law.³²⁹ And, as previously noted, the use of vulnerability assessments will aid the City in demonstrating how the regulations are rationally related to such legitimate public purposes.

The more tailored a regulation is to the governmental concern, the stronger the argument will typically be that a rational basis exists to survive a substantive due process challenge. Courts will not, however, substitute their own judgment in place of legislators' judgments when choosing among different rational options. As the Florida Supreme Court has explained: "The test to be used in determining whether an act is violative of the due process clause is whether the statute bears a reasonable relation to a permissible legislative objective and is not discriminatory, arbitrary or oppressive. It therefore becomes necessary for us to examine the objectives of the Legislature in enacting this statute in order to determine whether the provisions of the act bear a reasonable relation to them. In doing so, we do not concern ourselves with the wisdom of the Legislature in choosing the means to be used, or even with whether the means chosen will in fact

accomplish the intended goals; our only concern is with the constitutionality of the means chosen.”³³⁰

4. *The Effect of Granting Permits and Other Approvals*

Litigation risk surrounding land use decisions and regulations is often associated with a government’s decision to *prohibit* a property owner from taking some action. And it is true that a governmental entity is less likely to be held liable for *granting* a permit or otherwise approving a request. Indeed, courts have consistently held that granting a permit or otherwise approving a project falls within the public duty doctrine and is a discretionary rather than operational function, and that immunity therefore typically attaches to such decisions (with exceptions, as discussed above).³³¹ However, it might be contemplated whether sea level rise will increase the likelihood of takings and inverse condemnation suits against local governments where, for example, permits or other approvals are given to develop in flood-prone areas and those areas are then later abandoned by the government in terms of certain governmental services or infrastructure (such as road access).

The court in the *Jordan v. St. Johns County* case, discussed in Section IV.B.5 above, noted that that County had previously issued permits allowing development along the stretch of road that the County later stopped maintaining due to recurrent flooding.³³² Although that fact was not necessarily a deciding factor in that case, it may be argued as being one relevant fact in future litigation, if a litigant can demonstrate that the granting of a permit affected his or her reasonable investment-backed expectations. For this reason, the City might explore the possibility of including notice provisions in certain permits, which provide notice that the new development (or redevelopment), although being allowed, is in a high-risk area and that City services may be reduced to the area in the future due to the effects of climate change. Case law is sparse on how much weight would be given to such notices by the courts, but it is an issue to be seriously considered, and is another area of Florida jurisprudence to keep an eye on in future years. In the meantime, simply from a public policy perspective, such notices could help inform property owners of potential risks.

B. Zoning Tools

Zoning laws, which provide the regulatory framework that governs a community’s use and development of land, are arguably the most powerful tool that local governments have to manage and prevent hazards stemming from sea level rise. That is because avoiding the construction of unsustainable development in the first place is often the most efficient way to deal with it.

1. *Overlay Zones*

Overlay zones allow local governments to superimpose additional regulatory requirements on top of existing zones to add supplemental regulations in areas that have special characteristics. Overlay zones allow greater flexibility because they do not require the locality to disrupt existing zoning classifications.³³³ The City of Coral Gables already uses overlay zones, including, for example, “preservation districts” which are designed to protect “natural and cultural resources and environmentally sensitive lands such as wetlands, tideland, mangroves, natural forest communities, marine and wildlife habitats and such other areas or terrain which have qualities of scenic, natural and aesthetic value in its present state as a natural area.”³³⁴

As discussed in Section V above, AAAs are one type of overlay district that could be very useful in implementing a wide variety of sea level rise adaptation tools, including the regulatory tools and initiatives set forth herein.³³⁵

2. *Downzoning*

Downzoning is a regulatory tool used to reduce the density and intensity of development.³³⁶ The University of Florida's Model Comprehensive Plan recommends the following down-zoning policies, to be used in conjunction with AAA zones that have been identified as being at high risk due to sea level rise:

Policy 3.2.1: [Down-planning/Down-zoning] The City shall limit the residential density within the accommodation zone to no more than () units per acre.

Policy 3.2.2: [Limitation on Building Footprint] The City/County shall limit the building footprint for all new residential structures within the accommodation zone to () square feet and commercial structures to () square feet.

*Policy 4.1.1: Within a Managed Relocation Zone, the City/County shall reduce residential land use densities to no more than () units per acre and commercial structures to () square feet per acre.*³³⁷

One example of a comprehensive downzoning of a large area due to flooding occurred in St. Tammany Parish, Louisiana, after Hurricane Katrina. Flood-prone areas in St. Tammany that were previously zoned for residential or commercial development were down-zoned to lesser densities or rezoned for conservation and for land uses more compatible with periodic flooding.³³⁸

One option when considering downzoning is for the City to actually increase allowable density in less vulnerable areas of the City, while decreasing density in more vulnerable areas (taking into account vested rights). This could be done through zoning updates or as part of a transfer of development rights program (discussed in Section VIII. A. below).³³⁹

For any changes to the Zoning Code, it should be noted that many areas in the City are subject to Site Specific Zoning Regulations, which would also need to be updated.³⁴⁰

It is also important to distinguish here between down-*planning* densities and intensities (which would occur in a comprehensive plan amendment) vs. down-*zoning*. Rezoning or zoning text amendments that would reduce density or intensity must be consistent with the Comprehensive Plan. Maximum zoning densities and intensities can sometimes be lower than the Comprehensive Plan's maximum allowable densities and intensities on a temporary basis, but downzoning should not *permanently* preclude the ability to achieve the maximum density and intensity allowed by the Future Land Use category in the Comprehensive Plan. For example, downzoning could temporarily reduce density due to infrastructure constraints, with the expectation of restoring higher zoning in conjunction with retrofitting or other infrastructure improvements. However, if the downzoning is intended to be long term, then the Comprehensive Plan density and intensity in the corresponding Future Land Use category should generally also be

reduced. Indeed, under the Bert Harris Act, the term inordinate burden does not include “temporary impacts to real property... However, a temporary impact on development ... that is in effect for longer than 1 year may, depending upon the circumstances, constitute an inordinate burden.”³⁴¹

Additionally, if widespread density reductions are proposed in a Comprehensive Plan, the local government should still ensure that sufficient land use allocations are provided to accommodate the medium-series population projections produced by Florida’s Office of Economic and Demographic Research. *See* Fla. Stat. §§ 163.3177(1)(f)(3) and (6)(a)(4).

Specific Litigation Risk Considerations:

Although downzoning often results in litigation, a governmental action which downzones land is not necessarily invalid simply because it denies the owner the best and highest economic use of the property, so long as: the increased regulation still permits some use that can be economically carried out, the principles codified in Florida’s Bert Harris Act (discussed above) are not violated including the Act’s distinct definition of “investment backed expectations,” vested rights are not inappropriately denied, and a rational basis exists for the change.³⁴² Stated differently, there is no inherently vested property right to the continuation of one’s existing zoning.³⁴³ However, even though many legal challenges to governmental downzoning efforts might ultimately fail on the merits, the City would still face legal challenges to any downzoning, and cases challenging downzoning are often very fact-intensive and can create considerable expenses to litigate, even if the City ultimately prevails.

Reductions in allowable densities by local governments have specifically been addressed as potential takings by Florida courts. For example, in the case *Glisson v. Alachua County*, comprehensive plan amendments that reduced density from 1 unit/1 acre to 1 unit/5 acres were held not to be takings on their face, in part because economically viable uses remained.³⁴⁴ Another case that evidences these principles is *Lee County v. Morales*, where the Second District Court of Appeals rejected a takings claim relating to a downzoning, because the resulting densities were still economically viable and the reductions were not made arbitrarily by the County, but rather were based on valid planning reasons and a reasonable study.³⁴⁵

Of course, any downzoning action must also have a rational basis, under substantive due process principles. As noted previously, a governmental act will withstand a substantive due process challenge if the government identifies a legitimate state interest that it could rationally conclude would be served by the legislation or other governmental action.³⁴⁶

C. Building Codes and Resilient Design

Building codes and design standards establish minimum requirements for construction, many of which can continue to be leveraged to prepare for sea level rise, including standards for elevation, placement, size, foundations, floor assemblies, roof structures, mechanical, electrical, plumbing, site drainage and storage, permissible usages, fixture standards, fire code, and other specific requirements for resistance to weather events like hurricanes and flood events.³⁴⁷

When making decisions about building and design approvals, the City will want to consider factors such as those, while also taking into account the likely life span of the structure(s)

at issue juxtaposed against projected sea level rise for that particular location. For example, a building with an estimated useful life of 90 years but that is in a high-risk area of the City that has been identified to likely be below the mean high water line in only 60 years can and should be restricted much differently than a building or other structure with a 30-year estimated useful life in a less-vulnerable area of the City.

1. *Elevation and Related Options*

Just as when Hurricane Andrew struck South Florida in 1992, state and local building codes will likely be tightened and upgraded after major storms and other flooding events that are caused or exacerbated by climate change. The more steps the City can take before such disasters occur, the greater the reduction in long-term private and public losses.

For example, the City has the option to create some local amendments to the Florida Building Code to extend building code requirements in areas that may become vulnerable to flooding, provided there is no inconsistency with certain minimum standards.³⁴⁸ The Compact's Built Environment Work Group recommends that local governments work to revise building codes and require increased resiliency for new development and redevelopment.³⁴⁹ And the SFRPC recommends that local governments might do the following within a designated AAA:

- Require two or more feet of “freeboard” – i.e., elevation above FEMA’s base flood elevation level (“BFE”) – for structures located in tidally-influenced floodplains, foundations that are more resilient to erosion and wave impacts, and/or flood-resilient construction materials;
- Encourage the use of strategies in new development and redevelopment projects to maintain the form and function of natural resources, such as incorporating vegetative buffers; and/or
- Delineate the minimum technical and safety requirements for the design and construction of structures that are vulnerable to sea level rise impacts.³⁵⁰

Freeboard initiatives, and elevation requirements generally, are likely to be a critical part of a community’s efforts to adapt to sea level rise and to the increased storm surge effects due to climate change. Elevation may occur either by elevating particular buildings where feasible, or by elevating, through the use of fill, the ground level of entire areas, while also raising roads and other infrastructure.

Elevation-related regulations may also save some residents money on their insurance premiums. Private insurance companies often look favorably on resilient design features (and will likely focus even more on these issues in the future). Additionally, for those property owners covered by FEMA’s National Flood Insurance Program (“NFIP”), their premiums could be adjusted downward based on an improvement in the City’s Community Rating System (“CRS”) score due to such changes. (See Section VIII. E. 3 below for more on the City’s CRS score.)

In order to participate in the NFIP, local governments must impose minimum regulations in floodplains, wherein structures must be constructed in a way to minimize flood damage, including elevation requirements. By way of example, currently, single-family home and small

townhomes in Coastal A Zones must generally have the lowest floor elevated to or above 1 foot above the FEMA-determined base flood elevation level.³⁵¹

Section 5-701(D) of the City's Zoning Code provides that for areas not subjected to the FEMA base flood elevation level and other requirements, the minimum floor elevations of residential, duplex, or multiple-family structures shall generally be not less than sixteen (16) inches above the established grade, but in no case shall be less than eight (8) feet above M. L. W. USED Bay Data.³⁵² And under Section 5-701(E) of the Zoning Code, commercial, industrial structures, private or public garages, cabanas, utility rooms, storage rooms and similar structures shall be not less than six (6) inches above the established grade, and in no case shall be less than six and one-half (6½) feet above M. L. W. USED Bay Datum.³⁵³

And the City's flood damage prevention ordinance, which is codified at Chapter 113 of the City Code's Land Development Regulations, provides other criterion, such as a provision that "Critical facilities shall be elevated or dry floodproofed to or above the 500-year (0.2 percent) flood elevation plus one foot."³⁵⁴ Chapter 113 also contains the following important disclaimer:

The degree of flood protection required by this chapter and the Florida Building Code, is considered the minimum reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur. Flood heights may be increased by man-made or natural causes. This chapter does not imply and should not be interpreted to mean that land outside of mapped special flood hazard areas, or that uses permitted within such flood hazard areas, will be free from flooding or flood damage. The flood hazard areas and base flood elevations contained in the flood insurance study and shown on flood insurance rate maps and the requirements of Title 44 Code of Federal Regulations, Sections 59 and 60, may be revised by the Federal Emergency Management Agency, requiring this community to revise these regulations to remain eligible for participation in the National Flood Insurance Program. No guaranty of vested use, existing use, or future use is implied or expressed by compliance with this chapter.³⁵⁵

Additional regulations above the City's current standards could further improve the City's CRS score. Examples of such additional regulations include increased elevation requirements for new or redeveloped structures above FEMA's base flood elevation level and restrictions on the use or size of structures in high risk areas. These increased regulations could be, but need not be, limited to just FEMA Special Flood Hazard Areas or to designated AAAs (assuming that the AAAs differ from the Special Flood Hazard Areas). Such efforts might improve the City's already-impressive CRS score further and therefore save residents additional money on their insurance premiums if they are covered under the NFIP.

Notably, elevation requirements need not be in the form of mandatory regulations. Rather, the City could, instead (or also), provide market-based incentives to property owners who develop or redevelop structures above the minimum requirements of the NFIP. *See* the discussion of market-based tools in Section VIII below.

One example of a local government in South Florida making big adjustments to elevation requirements, in the City of Key West, most new residential buildings must now be built 1.5 feet above the floodplain (and must also be green-certified).³⁵⁶

In recent years, more builders and architects in South Florida have begun voluntarily planning for the future. For example, the Perez Art Museum in Miami, which sits just 75 feet from Biscayne Bay, is elevated 10 feet above flood surge levels and has a porous-floored garage as well as rain gardens that are designed to capture and filter stormwater.³⁵⁷ And, in Miami Beach, architect Jean Nouvel elevated the Monad Terrace condominiums 11.5 feet, raising even the parking garage above grade.³⁵⁸ And architect Reinaldo Borges designed a senior citizens' center in Fort Lauderdale that incorporates a "split lobby" between the first and second floors so that, if the waters eventually rise as predicted, the first floor can be sacrificed without causing operational problems.³⁵⁹

Specific Litigation Risk Considerations:

Zoning or building code requirements that simply require that new or substantially redeveloped properties be elevated a reasonable amount higher than previously required are unlikely to create a substantial risk of liability from a constitutional takings perspective, as elevation requirements have long been common in flood-prone areas.

However, increased private litigation among property owners can be anticipated if stricter elevation requirements are put in place. If property owners are only required to elevate when seeking a development or redevelopment permit, an entire neighborhood would be elevated slowly, parcel-by-parcel. This can present a problem if private parcels that elevate their land cause flooding on adjacent parcels. Neighboring property owners might sue their neighbors (in addition potentially to the local government itself) under negligence or nuisance law principles, even if elevation of the property was required by law.³⁶⁰ One way to possibly mitigate such logistical problems and legal wrangling would be to elevate entire neighborhood blocks at once. This was once done in Galveston Island, Texas after a massive storm in 1900.³⁶¹ Of course, massive projects like that would be incredibly costly and would implicate many of the legal concerns addressed throughout this white paper.

Another tool to help prevent the issue of neighbors flooding neighboring land is to develop and enforce stringent Code criteria to be followed by property owners or developers who are engaged in any construction that might affect the flow of water onto a neighboring property.

2. Accessibility, Historical Preservation, Aesthetic, and Environmental Considerations

Any substantial changes to building codes and design requirements are likely to have ripple effects on several other issues.

As one example, changes in elevation must be coordinated with the applicable accessibility design standards for businesses, transportation providers, multi-family housing facilities, and local governments under federal and state laws, such as the Americans with Disabilities Act,³⁶² the Fair Housing Act,³⁶³ and the Florida Accessibility Code.³⁶⁴ These standards apply to existing buildings and to new construction, and to pedestrian routes in the public right of way. For private entities,

property owners generally pay for any accessibility compliance issues, but if an entire street is raised, the City could consider assisting property owners with these compliance efforts – for example by building ramps as part of a street elevation project. This has been an issue in Miami Beach’s Sunset Harbor neighborhood, where that city raised the elevation of an entire stretch of road by 2.5 feet.³⁶⁵

Historic preservation requirements may also come into conflict with the City’s adaptation efforts. This is of particular concern in Coral Gables, which has a large number of treasured historic landmarks. The City may need to carefully balance these concerns in the years to come, and potentially modify the historic preservation portions of the Zoning Code, while still taking into account the strong local goals of preserving our history and cultural heritage.³⁶⁶ The City of St. Augustine has published a document called *Resilient Heritage in the Nation’s Oldest City*, which tackles some of these issues and provides many suggestions for balancing these interests.³⁶⁷

The tension between historic preservation and restrictions on development in coastal areas has been on display recently in the Florida Legislature. In the 2024 session, the Legislature passed a controversial “Resiliency and Safe Structures Act,” which prohibits local officials from blocking the demolition of certain older buildings in coastal areas if the structure is seaward of Florida’s coastal construction control line (“CCCL”), is within certain high-risk FEMA flood zones, and does not meet FEMA’s standards for new construction.³⁶⁸ The new law has a number of exceptions including for single family homes and for buildings on the National Register of Historic Places.³⁶⁹ Although the primary effects of this law do not directly affect Coral Gables since no portion of the City is seaward of the CCCL, this new law is reflective of the type of conflicting interests that are likely to continue to arise between those seeking to protect historic buildings and efforts to make buildings more resilient.

The City should also prepare for increasingly frequent conflicts between architectural aesthetic concerns – which Coral Gables has been masterful at maintaining – and the benefits of resilient building design. For example, drastic increases in base flood elevations can have significant aesthetic effects, especially in dense areas where grandfathered-in existing buildings would have a much lower elevation than newly constructed or renovated buildings. And currently accepted, aesthetically desirable building practices (such as underground parking garages) may be unsustainable in the long term, depending on factors such as the elevation of the property and the likely life span of the project juxtaposed against projected sea levels and storm surge impacts.

Finally, environmental concerns may also arise. By way of example, if building code regulations call for raising the elevation of land, developers or other property owners may seek to raise the land by dredging from the environmentally sensitive Biscayne Bay or by bringing in fill from other unsustainable sources.³⁷⁰ Difficult policy decisions will have to be made, while balancing such considerations.

3. *Innovative Building Design Issues*

In the future, the City (and other regulating authorities at the state and local level) may want to consider innovative and unprecedented building design options for adapting to sea level rise. Such options might include, for example: mechanisms to capture, reclaim, and harvest stormwater; the use of permeable pavement surfaces; or even the use of floating buildings or

buildings on stilts in open water (and the accompanying issues of providing utilities and other services to such structures). Less permanent solutions that sometimes work for occasional flooding incidents include: flood wraps (fabricated from a synthetic water-proof sheeting material, such as plastic, anchored to the base of a structure with sandbags or other anchoring tools); temporary flood gates (which are stored and installed when floodwaters are predicted, such as before a major storm event, and are then slid into rails on a permanent flood wall), and quick deployable flood barriers (such as plastic self-rising barriers or “dams,” or rigid flood “fencing”).³⁷¹

Engineering methods to address sea level rise will no doubt improve over time as monetary incentives increase and sheer necessity factors in. For example, some have suggested that human engineering may eventually find a way to resolve the permeability of South Florida’s limestone base through either a resin or clay that could be injected into the limestone to fill the holes and set to form a seal, or perhaps by requiring builders, before constructing a new building, to lay a waterproof shield underneath.³⁷² As such ideas are being worked on by private researchers and evaluated by environmental experts and engineers, the City may want to provide special assistance and work alongside those making such efforts to develop effective engineering and design ideas, and then make appropriate modifications to City laws to accommodate the new efforts.

In other parts of the world, areas besieged by flooding have started implementing large scale, creative projects for dealing with the onslaught of water. For example, in northern Amsterdam, architects designed a community of houses directly on the water that rise and fall with the flow of the water. Rows of jetties connect the houses with each other and to land. Approximately 150 residents, including 40 children, live in the floating neighborhood, which was completed in 2021.³⁷³ And in Bangkok, an 11-acre park was completed in 2017 that is able to funnel water through gardens and artificial wetlands, and into water retention ponds and underground tanks. And if needed, the retention ponds can nearly double in size by expanding onto the park’s main lawn. Altogether, the park can hold up to one million gallons of water.³⁷⁴

Closer to home, Miami architect Reinaldo Borges has been working on a conceptual design for a “platform city,” which would be a prototype community for 6,000 - 10,000 residents living on a massive platform raised 75 feet above current sea levels. He envisions a solar-powered community that utilizes ocean farming and controlled indoor urban agriculture.³⁷⁵ And the City of Miami Beach has been considering converting a City-owned golf course into a park that will hold stormwater.³⁷⁶ That would not be the first Florida golf course to be converted in such a way. In 2010, a private conservancy group bought a golf course on Florida’s Gulf Coast and converted it to an 80-acre wetland and wildlife preserve.³⁷⁷

D. Setbacks and Buffers

Setbacks require that development be set back a certain distance from a baseline, such as from a property line or from a shoreline feature (high water mark, vegetative line, etc.). And buffers require landowners to leave portions of property (such as existing wetlands) undeveloped. Buffers can provide protection from flooding and can also promote effective stormwater management, help preserve views, help maintain existing ecosystems, or even serve as alternatives to coastal hard armoring.³⁷⁸

The City might consider establishing setbacks and/or buffer areas based on the projected shoreline locations by using the best available evidence of sea level increase and erosion rates over the life of a proposed structure.

The South Florida Regional Planning Council's AAA Policy Options handbook recommends that municipalities take the following actions with respect to setbacks and buffers, within designated Adaptation Action Areas:

- Establish mandatory construction setbacks to a specified distance from a seawall or mean high water line.
- Establish erosion-based setbacks requiring that the structure be set back by the projected shoreline position over a specific time frame -- could either be based on a sea level rise projection (such as two feet by 2060) or be determined by the life expectancy of the structure.
- Establish a tiered setback system that would allow for varying setbacks based on the size and risk of a structure and determined by the annual average rate of erosion over a specified number of years.
- Limit the development on a property if sufficient setback requirements cannot be met.
- Designate coastal buffer zones in areas that have existing important natural resources and/or that could be part of a mitigation corridor as shorelines erode or tidal habitats shift.
- Expand existing green buffer areas that are experiencing significant erosion or increased inundation.
- Reduce property exposure to erosion and storm damage through shoreline vegetative buffers. For example, a minimum of 25 feet of a vegetated buffer for all new beachfront development in the coastal zone, or a buffer of 100 feet from existing natural resource assets like protected wetlands, shores, or streams.³⁷⁹

The University of Florida's Model Comprehensive Plan recommends the following comprehensive plan Policy with regard to buffers and setbacks for tidal waterways:

Policy 3.3.1: [Riparian Buffers] The City/County shall establish riparian buffers that reflect projected rates of sea level rise within the planning horizon for all tidally influenced water bodies. Such buffers shall be designed to allow the conversion of adjacent uplands to wetlands while retaining transitional ecotones³⁸⁰ where ecologically feasible.³⁸¹

Specific Litigation Risk Considerations: Because setbacks and buffers can limit the amount of property that can be developed, they may limit a property's development value. The City of course already has some regulations requiring setbacks or buffers,³⁸² and is, therefore, familiar with the burdens required to administer such regulations. Erosion-based or sea level rise-based setbacks are potentially even more challenging because the City may need to obtain scientific data or other support on projected increased sea level and erosion rates, and then map the areas with

natural features where buffers will be required, and update those maps periodically to account for changes in sea level and storm surge risk.³⁸³ Furthermore, setbacks could potentially present taking challenges, particularly if they were to prohibit all economically viable use of a given property. (See Section VI. A. above.)

E. Conditional Development and Exactions

Regulators often impose conditions when issuing permits for new development or substantial redevelopment (*i.e.*, renovation or expansion of existing structures). Conditions that require a property owner to convey a property interest are called exactions. Exactions can include impact fees, which seek to offset the infrastructure or other public costs associated with the development, but exactions can also include, for example, dedications of land for public uses or conditions on future land use. Exactions are typically negotiated between the property owners and the local government, and they often arise when zoning conditions are imposed.³⁸⁴

Local governments in Florida have general authority to impose exactions and other conditions based on the power they possess under the Florida Constitution's home rule principles, assuming of course that the conditions do not violate constitutional or other legal principles (some of which are discussed below).

The Georgetown Climate Center has recommended that local governments consider the legality and feasibility of the following potential types of conditions on development in areas that are vulnerable to climate change effects:

- Require developers to pay a fee to cover the costs of potential emergency response and future armoring, to mitigate impacts to natural resources from future armoring, or to flood-proof infrastructure that services the new development;
- Require landowners to remove certain structures as they become inundated due to land loss;
- Require that development and its supporting infrastructure (including, for example, its sewer lines) be more resilient to flood impacts, such as by requiring that it be built above the minimum requirements of flood protection;
- Require the dedication of easements to preserve natural buffers or floodways; and
- Restrict coastal hard-armoring as a form of flood protection, and instead authorize in the permit conditions the use of soft-armoring alternatives to protect the development.³⁸⁵

Specific Litigation Risk Considerations: Due to their coercive potential, exactions and other development conditions need to be carefully reviewed as potential regulatory takings and under Florida's Bert Harris Act. Importantly, for an exaction to be valid, the government – not the property owner – has the burden to prove an “essential nexus” between the purpose of the exaction and the impact that the exaction seeks to mitigate,³⁸⁶ as well as a “rough proportionality” between the exaction and the impact of the proposed development.³⁸⁷

Georgetown University Law Center professor J. Peter Byrne has written an article entitled “Climate Exactions” in which he analyzes, among other things, the rough proportionality test as applied to climate change adaptation-related impact fees.³⁸⁸ As Professor Byrne explains, “rough proportionality for adaptation, (which is inherently forward-looking), may require more of a risk-mitigation analysis, which may be harder to calculate and monetize. There is work to be done to improve current tools and methodologies but the science in these areas is constantly progressing, and unfortunately, we learn more about the value of avoiding risk each time we see more damage from storms and sea-level rise. In any event, the amount of an adaptation fee probably should be discounted to reflect that it addresses climate harms that will occur at an uncertain time in the future.”³⁸⁹

Notably, Chapter 70 of the Florida Statutes also provide a cause of action for relief from improper government exactions. Under this law, a property owner can recover damages in addition to remedies otherwise available in law or equity, but the owner must send the government entity that imposed the exaction a written notice of claim at least 90 days before commencing litigation, but no later than 180 days after the exaction was imposed.³⁹⁰ These procedural requirements can help prevent some exactions disputes from resulting in costly litigation.

Any lawsuit alleging that an exaction or other development condition amounts to a taking would be highly fact-dependent. And to ensure that the conditions are tailored to address specific public interests (such as protection of natural resources or promoting safety from flood risks) in a proportional way, zoning ordinances might specify the facts and conditions to be weighed when the permit is issued in an order, lay out the analysis that the regulators should perform before requesting an exaction or condition, and limit the discretion of regulators to condition permits.³⁹¹

F. Rebuilding Restrictions

In the context of sea level rise adaptation, local governments might limit, or even prohibit, the rebuilding of structures that have been damaged by recurrent flooding or storm surge effects. For example, if a high-risk area is downzoned, existing structures could remain but become “nonconforming,” such that if a building is destroyed or damaged, reconstruction has to conform to the new, more stringent zoning and building requirements.³⁹² Similarly, as discussed below, retrofitting requirements up to NFIP standards can sometimes be imposed on existing structures when a property owner applies for a permit to renovate or expand a structure.³⁹³

The Georgetown Climate Center has recommended that local governments consider the following types of rebuilding restrictions in vulnerable areas:

- Limit or prohibit rebuilding of structures damaged by flooding and sea level rise in vulnerable areas;
- Target sites that repeatedly are damaged from flooding for future public acquisition;
- Allow rebuilding but with the condition that the owners will not build erosion-causing hard armoring structures or that they will remove such structures when threatened by erosion or inundation;

- Establish a post-disaster building moratorium to evaluate and plan redevelopment in vulnerable areas; and
- Establish post-disaster reconstruction criteria for size (compared to the original structure prior to the storm event), base floor elevation, and/or other design standards.³⁹⁴

The University of Florida's Model Comprehensive Plan even recommends that the following "relocation covenant" be added to local governments' comprehensive plans, to be applied in the most highly vulnerable zones of the community:

Policy 4.2.2: All permits for new development within a Managed Relocation Zone shall include, as a condition of development approval, a covenant or other real property instrument that runs with the land, that requires the abandonment and removal of structures and fixtures once they are inundated for at least () months per year, or are no longer habitable as determined by the building official, whichever comes first.³⁹⁵

Of course, some rebuilding restrictions already exist, as part of FEMA's "50 Percent Rule." That rule states, in general terms, that a structure in a Special Flood Hazard Area will typically be deemed to have suffered "substantial damage" if the total cost of repairs is 50% or more of the structure's market value before the disaster occurred.³⁹⁶ Such substantially damaged homes must be rebuilt to conform to local floodplain-management regulations, including minimum elevation standards.³⁹⁷

Specific Litigation Risk Considerations: Although some landowners may challenge rebuilding restrictions under the takings clause, courts often uphold rebuilding restrictions if the restrictions are well-crafted and provide property owners with time to adjust their reasonable economic expectations for the continued use of the property.³⁹⁸

G. Hard and Soft Armoring

The protection of property and structures from flooding and erosion is typically referred to as "armoring." Armoring can be either hard-engineered structures like bulkheads, seawalls, revetments, dikes, and tide gates (referred to as "hard-armoring") or techniques that mimic natural buffers like wetland habitat restoration, beach renourishment, or the creation of living shorelines (referred to as "soft-armoring").³⁹⁹

When it comes to the protection of sandy coastlines, hard armoring is typically disfavored by resiliency experts, because hard armoring often causes or exacerbates erosion as well as flooding on neighboring properties, and because hard armoring can prevent natural resources such as wetlands and beaches from migrating naturally.⁴⁰⁰ Hard armoring can also encourage unsustainable development in vulnerable areas and can increase risks to people and property in the event that the armoring fails.⁴⁰¹

Conditions to development might also be considered to require landowners to mitigate the impacts of any allowed coastal hard armoring. For example, developers might be required to pay impact fees to mitigate damage to natural resources such as the loss of wetlands or beaches.⁴⁰² In

Wald Corp. v. Metropolitan Dade County, a Florida appellate court upheld a county ordinance imposing an impact fee on a subdivision development to cover the costs of protecting the development from flooding and to offset the impact on downstream owners of the effects of the development's runoff.⁴⁰³ Impact fees for armoring have also been addressed by courts outside Florida. For example, in *Ocean Harbor House Homeowners Ass'n v. Cal. Coastal Comm'n*, a California court upheld a \$5.3 million mitigation fee imposed by the California Coastal Commission as a condition to a permit to build a seawall. The court found that the mitigation fee was roughly proportional to the impacts based upon "projected economic losses to local businesses and the tourist industry."⁴⁰⁴

Wherever hard armoring *is* allowed, the City – working in the context of all applicable state and federal regulations – can continue taking into account future sea level rise when reviewing the design and construction of armoring structures, rather than basing the design criteria only on historic flood measures (like FEMA's 100-year flood event levels).

For example, one step that several Florida municipalities have taken is to require new minimum heights for seawalls on both public and private properties. The City's own Zoning Code was recently amended to make such a change. Specifically, in 2021, the City increased the minimum elevation of bulkheads and seawalls from 5 feet to 6 feet. This change had been recommended by Hazen & Sawyer in the 2018 vulnerability assessment. The Zoning Code's bulkhead and seawall provision now reads as follows:

No bulkhead, retaining wall or similar installation along a water body shall be built or constructed unless such bulkhead, retaining wall or similar installation be constructed of reinforced concrete, pre-stressed concrete or gravity mass non-reinforced concrete, providing, however, that in those water bodies west of LeJeune Road and north of Sunset Road, bulkheads and retaining walls may be constructed of concrete block or native stone. All bulkheads and retaining walls shall be subject to the following conditions:

- A. All plans for such bulkheads and walls shall be designed by a registered engineer, qualified under the laws of the State of Florida, to prepare such plans.
- B. All such bulkheads and walls and components shall be designed to meet loads imposed by saturated backfill.
- C. The minimum elevation of such bulkheads and walls shall be six (6) feet NGVD (National Geodetic Vertical Datum 1929), and shall structurally support seven and a half (7.5) feet.⁴⁰⁵

The City of Fort Lauderdale, which (like the City of Coral Gables) has a number of neighborhoods along tidal waterways and canals, also passed an ordinance in 2016 that strengthens the seawall requirements.⁴⁰⁶ And Miami Beach passed a similar ordinance in 2021.⁴⁰⁷ Although such rules are far from a cure-all in light of South Florida's porous limestone base, well-constructed and maintained seawalls and bulkheads are likely to be one important part of Coral Gables' adaptation to sea level rise, especially for the properties along the City's inland waterways.

The University of Florida's Model Comprehensive Plan recommends the following additions to local governments' comprehensive plans on the issue of hard and soft armoring:

Policy 2.2.1: The City/County shall require adequate mitigation for shoreline stabilization through the construction of living shorelines in front of hard shoreline stabilization structures where it is feasible to do so.

Policy 4.2.1: The City/County shall prohibit hard shoreline stabilization techniques within a Managed Relocation Zone.⁴⁰⁸

The City might also evaluate the feasibility of requiring or incentivizing the use of alternative soft armoring in particular locations, and set out guidance for the long-term maintenance of such soft armoring features.⁴⁰⁹ For example, the City of Satellite Beach has a Living Shorelines Homeowner Incentive Pilot Program, has been created to incentivize Satellite Beach homeowners who live along the Indian River Lagoon to build living shorelines and stormwater retention areas on their properties.⁴¹⁰

Sarasota County has restricted shoreline hardening or the construction of shore protection structures unless it is found to be in the public interest. Under their code, shoreline hardening or shore protection structures "must minimize adverse impacts to coastal processes and resources, neighboring properties, and the values and functions of the beaches and dune systems, and provide mitigation where determined ... to be appropriate."⁴¹¹

Additionally, the Florida Department of Environmental Protection, working alongside the consulting and engineering firm Cummins Cederberg, created a catalog of the various living shoreline efforts throughout Florida. The product of this collaboration produced a publicly-available Living Shoreline Database that includes permit information on public living shoreline projects throughout Florida.⁴¹²

Specific Litigation Risk Considerations: Hard armoring regulations could result in litigation against a local government under various scenarios. For example, claims might potentially be brought if property damage (due to flooding or erosion) is exacerbated due to a prohibition on hard armoring.⁴¹³ Additionally, litigation might ensue for *allowing* armoring including where the armoring is done by the City itself and causes flooding to neighboring property or where the City's own armoring construction efforts were allegedly not done with due care and damage results.⁴¹⁴

VII. Land Acquisitions and Conservation Easements

A. Land Acquisitions (Voluntary)

Another attractive sea level rise adaptation tool is the use of public funds to acquire private property for conservation purposes and/or to promote public health and safety. This might be done by the City acting on its own or in conjunction with the County, State, or other local governments, or with third parties such as private land trusts or non-profit organizations.⁴¹⁵

The City might acquire property that is at increased risk from sea level rise in order to provide flood buffers for other properties, to preserve coastal habitats and upland migration

corridors, to preemptively remove at-risk structures, or to provide open spaces and corridors to “welcome” and make space for water to help manage inundation.⁴¹⁶ When identifying properties to acquire, the City might consider not only the current state of the property but also the future natural resource value of the property. For example, some currently dry land could provide room for wetlands to migrate inland in the future.⁴¹⁷

The University of Florida’s Model Comprehensive Plan recommends the following addition to local government comprehensive plan regarding land acquisition:

*Policy 3.3.2: The City/County shall develop priority areas for land acquisition based on their strategic capacity to absorb floodwaters and support coastal ecosystem migration.*⁴¹⁸

The City can proactively begin now to identify areas or parcels where such land acquisitions should be encouraged. For example, a designated Adaptation Action Area (“AAA”) might be a logical property base in which the City could focus its acquisition efforts. The City can also consider developing criteria for the prioritization of lands to be purchased, such as those lands that have been severely damaged by recent storms, that are at highest risk of being damaged in the future, and/or that are currently undeveloped.⁴¹⁹

The City is fortunate to have a ridge of relatively higher elevation land in the northern and central portion of the City.⁴²⁰ With an eye towards maximizing the use of that land, the City could identify and establish a “land bank” where critically important infrastructure and municipal support facilities might be located outside of the most vulnerable areas.⁴²¹

Fair market property values in Coral Gables are generally quite high, so voluntary land acquisition can be a costly option. But the City can investigate possible funding sources for a land acquisition program or trust, such as applying for federal and state funding programs, providing tax or cash incentives for donated properties or land trades, and/or selling government bonds.⁴²² See Section IV. C. above regarding other funding options for adaptation measures.

Lease-backs are another option that may be easier to fund and that can be explored as a possibility so that the City can exercise responsible land management over vulnerable parcels while still giving them a useful life in the hands of the public. In a lease-back acquisition, the City (or other acquiring entity) would purchase vulnerable land from an interested property owner and immediately lease the property back to the former owner for a long period, such as 90 years. The property owner would be paid the value of a fee simple title to the property minus the value of the lease.⁴²³

The City can also encourage land acquisitions by the State of Florida in our City. Through the Florida Forever program, the State has acquired over 897,785 acres of land across Florida since 2001, at a cost of approximately \$3.3 billion.⁴²⁴

The federal government also has conservation and buyout programs such as the following:

- NOAA’s Coastal and Estuarine Land Conservation Program provides federal matching funds to state and local governments to fund acquisitions of coastal properties.

Properties that receive funding must be identified in a state coastal and estuarine land conservation plan, and states must nominate the projects.⁴²⁵

- The U.S. Fish and Wildlife Service’s National Coastal Wetlands Conservation Grant Program provides matching grants to states for acquisition, restoration, management or enhancement of coastal wetlands.⁴²⁶
- FEMA’s Hazard Mitigation Assistance programs fund buyouts of properties at risk of flooding, including repetitive loss properties, through competitive grants to state and local governments. Buyouts must be voluntary. The grants can be used to acquire, demolish, or relocate threatened properties.⁴²⁷

One example of a voluntary land conservation program by a Florida local government is the Alachua County Forever Conservation Program.⁴²⁸ As of May 2022, that program has protected over 33,000 acres of land. Of the approximately \$118 million in cost for those acres, the County has paid a majority – approximately \$75 million – and partners and sponsors have paid the remaining approximately \$43 million.⁴²⁹ Alachua County currently has a 1-cent infrastructure surtax added to its sales tax, and a half-cent of that is dedicated to acquire and improve conservation lands and create and improve and maintain parks and recreational facilities.⁴³⁰ The second half-cent is dedicated for public infrastructure.⁴³¹

And in March 2019, the voters in the Town of Jupiter approved a \$20 million bond referendum to fund the Land Acquisition Program. Any properties acquired with the funds will fall into at least one of the following categories or uses: (1) environmentally sensitive, waterfront and recreational lands; (2) lands for open spaces; (3) archaeological or historic preservation; or (4) traffic mitigation. The funds may also be used for incidental costs related to the lands acquired through the program, such as clearing exotic vegetation and creating public access.⁴³² The Town of Jupiter approved a similar Open Space bond program in 2004 for \$17 million which resulted in the acquisition of seven parcels totaling 59.9 acres of land.⁴³³

B. Land Acquisitions (Eminent Domain)

Although voluntary land acquisitions could be an excellent way for the City to acquire property, if a property owner refuses to sell land that there is a valid public need for, eminent domain is sometimes a viable (albeit costly) tool.⁴³⁴

“Just compensation,” which must be paid in an eminent domain scenario, could still be determined even in a community with rising seas by evaluating comparable sales going on at that time; however, a local government utilizing eminent domain can nevertheless anticipate costly and time-consuming disputes with property owners over what just compensation should be for property that is severely compromised by acts of nature.⁴³⁵

This issue arose in the wake of 2012’s Superstorm Sandy where the State of New York sought to buy out homeowners in particularly vulnerable locations, turn those areas into parks or rehabilitated ecosystems, and allow the shoreline to migrate inland. The State initially proposed using \$400 million for a buyout.⁴³⁶ But even with the unprecedented destruction caused by Superstorm Sandy, many residents did not want to move and threatened litigation.⁴³⁷ So, to avoid lengthy and costly eminent domain litigation, Governor Cuomo proposed the “New York Rising

Community Reconstruction Program.” In Staten Island, the program offered “pre-storm” value to owners of damaged houses as an inducement to re-locate. Those in even more vulnerable areas were offered a bonus to sell; and in a small number of highly flood-prone areas, the State would double the bonus if an entire block of homeowners agreed to leave.⁴³⁸ The program was partially successful, and some areas did de-populate.⁴³⁹

C. Conservation Easements

Conservation easements can be another powerful tool in sea level rise adaptation. Conservation easements place restrictions on the use and/or allowable amount of development on a property but still allow the owner to retain the property with limitations based on the terms of the easement.⁴⁴⁰ For this reason, conservation easements are a potential ‘win-win’ option for local governments and property owners.

Pursuant to Florida Statutes § 704.06, conservation easements can be used to preserve property for habitat, open space, and recreation, among other things.⁴⁴¹ Because the statute broadly allows for creation of easements that impose both affirmative and negative obligations, the types of restrictions imposed can vary greatly. Covenants could certainly be incorporated into a conservation easement that protect property from sea level rise, such as prohibiting the removal of protective mangroves, prohibiting certain shoreline hard armoring, or restricting land uses that would put public resources at risk. The easement is then recorded and binds future owners of the property.⁴⁴²

Interestingly, the Florida Statutes also provide that such easements can typically survive property tax lien foreclosures, which could be a key issue for perpetually flooded lands in years to come.⁴⁴³ Other important aspects of the conservation easement statute include:

- The creation of a conservation easement cannot be done through eminent domain powers;⁴⁴⁴
- The easements must be perpetual;⁴⁴⁵
- The holder of the easement (i.e., the City) is entitled to enter the land in a reasonable manner and at reasonable times to assure compliance;⁴⁴⁶
- The property might be eligible for reduced property tax valuation;⁴⁴⁷
- Liability protection may be available for the easement holder;⁴⁴⁸ and
- The owner of the property encumbered by the easement must abide by Florida’s Marketable Record Titles to Real Property statute or any other similar law or rule.⁴⁴⁹

Similar to land acquisition programs discussed above, the City could prioritize highly vulnerable properties and purchase conservation easements across parcels that have particular utility as habitat or natural buffers or for water management.

And as with land acquisitions, there may be some available sources of matching funding for conservation easements. For example, NOAA’s Coastal and Estuarine Land Conservation Program provides matching federal funds for the purchase of conservation easements from coastal property owners.⁴⁵⁰

D. Rolling Conservation Easements

One form of conservation easement, which has been getting attention among lawyers and planners who are considering sea level rise adaptation efforts with respect to coastal properties, is the rolling conservation easement.⁴⁵¹ The idea behind a rolling conservation easement is that as the sea advances on a property over time, the easement would automatically “roll” landward, allowing coastal habitat to migrate naturally. Property owners can still build upland on the property. And if the high water mark (or other indicator of the current sea level) migrates inland and destroys a structure, the structure can only be rebuilt landward of the rolling line.⁴⁵²

Under this concept, private landowners would receive up-front compensation for voluntarily agreeing to limit development in specified ways in the future. Meanwhile, they could continue to develop and use their property until the seas threaten their development (impacts that may be decades in the future).⁴⁵³ In exchange, the City would be assured that development will not be maintained in those areas in a manner that will compromise public resources. Rolling easements also provide property owners with advance notice of what will happen when the sea reaches their property, so that the owners can develop realistic investment-backed expectations about the long-term available uses of their property.⁴⁵⁴

The easement terms would need to be drafted to ensure that public funds are not used to acquire easements that may someday be unenforceable or that were simply unnecessary. For example, under the public trust doctrine set forth in the Florida Constitution, the State of Florida already holds all lands on the Atlantic and Gulf coasts below mean high water in trust for the use and enjoyment of the public.⁴⁵⁵

The University of Florida’s Model Comprehensive Plan recommends the following addition to a local government’s comprehensive plan:

*Policy 4.3.3: The City/County shall promote the acquisition of rolling conservation easements within a Managed Relocation Zone.*⁴⁵⁶

The Elizabeth River Project (“ERP”), a nonprofit organization in Norfolk, Virginia that is working to restore the Elizabeth River, is reportedly the first *private* entity to voluntarily employ a rolling conservation easement for the riverfront property where they are building a resilience lab.⁴⁵⁷ The lab will feature a living shoreline, solar power, a green roof, a learning park, and a floating entry pavilion that is designed to be a refuge for the community during extreme flooding.⁴⁵⁸ The easement, which will be enforced by a Virginia-based land conservation group, prohibits ERP or future owners of the property from hardening the shoreline, and requires the building to be demolished and the land surrendered once a certain threshold of sea level rise has occurred.⁴⁵⁹ As a representative of ERP has explained: “In this area, and in so many areas that are faced with sea level rise right now, ‘retreat’ is almost a dirty word... But this is a planned retreat, so you see it on the horizon. You know that it’s coming, and you can make calculated plans for it. It isn’t something that’s impending doom.”⁴⁶⁰

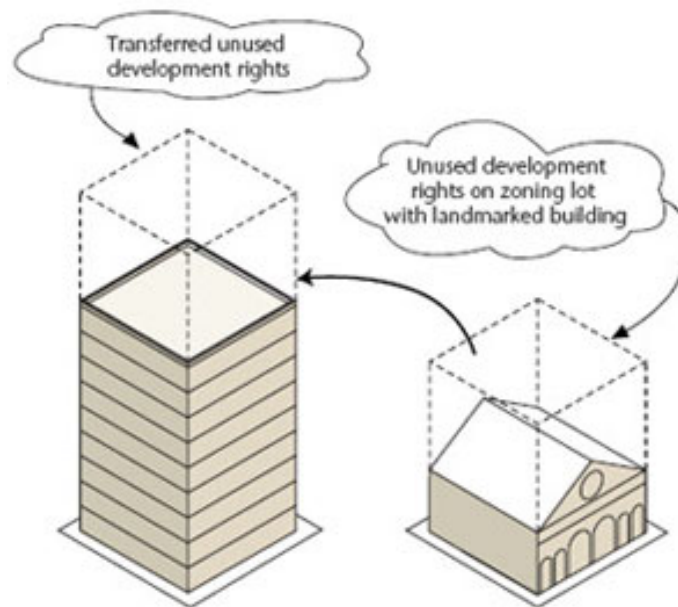
VIII. Market-Based Tools

The City may also want to consider the following adaptation tools that rely on incentives and market-based forces.

A. Transferable Development Rights

One tool with significant potential for use in sea level rise adaptation is a transferable development rights (“TDR”) program. A TDR program is designed to achieve land preservation or promote less intensive use of property by allowing a landowner to sever development rights over ecologically valuable or sensitive land (the “sending area”) and to sell them to an area where the local government wants to encourage development (the “receiving area”).⁴⁶¹ The development rights are monetized based on the level of development that the local government’s base zoning code would allow, such as a certain number of units per acre, and the buyer can then use the credits to exceed the default density standards or building height requirements in the receiving area.⁴⁶² To ensure that property in the sending area is conserved, a permanent conservation easement is typically recorded against the sending property in conjunction with the sale of the development credit.⁴⁶³

The following is a drawing reflecting a classic TDR scenario where unused density rights on a lot that has a smaller historic structure are transferred to a parcel where the developer wishes to increase the allowable density to build a high-rise building:



The City of Coral Gables Zoning Code already contains a TDR provision for the transferring or sending of unused development rights in connection with either: “local historic landmarks” or “parcels designated for open space conveyed to the City to encourage more open space in the city.”⁴⁶⁴

The City could consider expanding this concept even further, and in new ways, in the future, to decrease intensity and density standards on parcels in areas that are most vulnerable to sea level rise, while factoring in all of the various precautions discussed above. As one implementation option, the City might consider establishing a voluntary TDR program in designated AAAs to provide incentives to landowners to develop at higher densities in lower-risk areas outside the designated AAAs.⁴⁶⁵

In Miami-Dade County, properties adjacent to the Everglades National Park generally cannot be developed, so to provide some financial compensation to owners, the County allocated

owners Severable Use Rights (another name for TDRs) that can be sold to increase the intensity or density on upland parcels.⁴⁶⁶ As another example, Sarasota County's comprehensive plan recognizes the potential use of TDRs to promote resettlement from high-risk coastal areas like barrier islands to inland areas that are less vulnerable to nature and natural disasters.⁴⁶⁷

The University of Florida's Model Comprehensive Plan recommends the following policy statement:

*Policy 4.1.3: The City/County shall create a transferable development rights program within a Managed Relocation Zone that transfers densities and intensities outside of the Managed Relocation Zone.*⁴⁶⁸

Importantly, TDR programs have successfully been used to help insulate otherwise onerous land use regulations from takings challenges in Florida courts.⁴⁶⁹ The development credit is viewed as part of the retained property rights of the landowner, and courts will therefore typically consider the development credit when assessing the potential economic use or value of the property.⁴⁷⁰

B. Tax Incentives

Tax incentives are another tool that governments can use to discourage development in areas likely to be threatened by sea level rise. Such programs could take many different forms, some of which would have to be implemented by, or with the assistance of, other levels of government rather than by the City alone, depending on which level of government is imposing or administering the relevant tax.

With that caveat in mind, the following are some specific types of tax incentives that might be considered:⁴⁷¹

- Provide tax rebates to landowners who retrofit structures to be more resilient to flooding or storms;
- Provide business tax credits to developers who site new development in lower-risk areas;
- Provide a one-time tax credit to property owners who move structures out of at-risk areas (either relocating on the same or a different parcel);
- Provide a landowner with tax deferment if they legally restrict the use of the entire property for conservational uses;
- Provide tax credits when a landowner exceeds minimum resiliency standards required by existing ordinances such as the minimum required setbacks or building elevations; and
- Provide tax deductions to landowners who donate an easement on a portion of their land for conservation purposes, such as wildlife corridors and vegetative buffers. Notably, the federal government already provides a federal income tax deduction to landowners who donate an easement on their land "exclusively for conservation

purposes.”⁴⁷² In addition, under Florida law, properties subject to conservation easements might be eligible for reduced property tax valuation based upon the diminution in the property’s value caused by the restrictions imposed by the easement.⁴⁷³

C. Other Incentives

The City might also consider offering other types of non-tax incentives, such as permitting incentives and density incentives to property owners and developers who prioritize sea level rise adaptation in their plans. By offering fast-track review or reducing permit application fees, the City can encourage development of such projects.

The City could also look into the possibility of creating a Payment for Ecosystem Services (“PES”) program for land management, restoration, conservation, and sustainable use activities. PES programs have been implemented on the state level – including by the South Florida Water Management District (“SFWMD”), through its Dispersed Water Management Program, which facilitates collaboration among governmental agencies, environmental organizations, ranchers, and researchers to address excess surface water in the Lake Okeechobee area.⁴⁷⁴ The Florida Fish and Wildlife Conservation Commission has also implemented PES pilot programs designed to protect threatened species.⁴⁷⁵ The City would likely need to coordinate with relevant state and federal agencies – like SFWMD and the EPA – if it is interested in creating a local PES program that provides payment incentives for private sea level rise adaption efforts.

Another innovative incentive program is the City of Miami Beach’s Private Property Adaptation program. The program provides grants of up to \$20,000 for property owners who are making certain efforts to address current or anticipated flooding issues on their property.⁴⁷⁶ The program covers projects such as: elevating homes; raising mechanical appliances adjacent to homes; raising sea walls; and adding absorbent, green landscaping.⁴⁷⁷ As part of the program, applicants may also qualify for a subsidized application to FEMA for home elevation and apply for federal funding to cover 75% of home-raising costs.⁴⁷⁸

Yet another example of an incentive program is the State of Florida’s graywater statute. Under Florida Statutes § 403.892, developers or homebuilders who install graywater reuse technology under certain conditions are provided density or intensity bonuses. If at least 75% of the development will have a graywater system, then the density or intensity bonus is 25%.⁴⁷⁹ Similar bonuses could be contemplated in areas that are less vulnerable to sea level rise where developers or homebuilders take other desired action to make their property more resilient.

D. Mandating Risk Disclosures in Real Estate Transactions

Numerous state and federal laws already require sellers of residential real estate to disclose certain information to potential buyers – for example, the property’s location in a flood zone area, the presence of lead-based paints, special property taxes, or information about radon gas risks – and in some instances, failure to disclose can lead to a lawsuit against the seller and/or the real estate licensee.⁴⁸⁰ The purpose of these disclosure laws is to ensure that buyers are fully informed about the conditions of the property prior to its purchase, which allows them to make decisions based on informed risks.

Similarly, potential buyers, especially of residential properties, in sea level rise-threatened zones might benefit from informed notice about these risks. Accordingly, and as noted in Section III.D.2. above, local governments in Florida – or the State legislature – could consider enacting laws requiring sellers of properties in particularly vulnerable areas to alert potential buyers of the nature of the property’s vulnerability to the future impacts from sea level rise. Such notice requirements might be applied, for example, to properties covered under a designated AAA or in a FEMA-designated high risk flood zone.

Thomas Ruppert, an attorney with the Florida Sea Grant program, has written an article about this issue, in which he explains that a well-drafted notice might identify the following: the property’s inclusion in the high-risk area; the area’s projected rate of sea level rise-based flooding (with a reference to the scientific source of that projection); any special regulatory restrictions on the area such as special setback or buffer restrictions; the possibility of future additional regulation in the area; and the long-term possibility of discontinuation of certain governmental services in the event of substantial sea level rise.⁴⁸¹ The disclosure might be required, for example, to be provided at or before the signing of the contract for purchase, and/or at or before the closing.⁴⁸² Possible results of non-compliance that might be considered are a monetary penalty or allowing the purchaser to rescind the transaction prior to the time of recording.⁴⁸³

One somewhat analogous disclosure law already on the books is Florida’s coastal hazards disclosure law, Florida Statutes § 161.57, which could be used as a rough model for a sea level rise disclosure law. That coastal hazards disclosure law, which applies to property seaward of the Coastal Construction Control Line (“CCCL”), requires that certain sellers or sellers’ agents notify purchasers that the “property being purchased may be subject to coastal erosion and to federal, state, or local regulations that govern coastal property, including the delineation of the CCCL, rigid coastal protection structures, beach nourishment, and the protection of marine turtles.”⁴⁸⁴ The statute currently requires that notice be given “[a]t or prior to the time a seller and a purchaser both execute a contract for sale and purchase” of the coastal property.⁴⁸⁵ A CCCL affidavit or survey must then be given to the buyer “at or prior to the closing” on the property.⁴⁸⁶

Leon County, Florida has adopted another notable model. Its ordinance requires disclosure to buyers of residential properties of any known flooding in the past or any knowledge that property is flood prone if not otherwise readily observable. Failure to provide the disclosure creates a rebuttable presumption that the failure to disclose materially affected the value of the property.⁴⁸⁷

In terms of litigation risk, requiring disclosure of certain property hazards and attributes is a long-accepted practice in the real estate industry. Even if the required notice had an effect on one’s property value (which would depend on the circumstances), it is not clear that such a disclosure would be found to be a basis for a taking under the analysis that the U.S. Supreme Court has set forth for regulatory takings.⁴⁸⁸ Furthermore, such notices would typically inform a new buyer’s reasonable investment-backed expectations regarding the future of the property – a fact that might help insulate local governments from future regulatory takings or inverse condemnation lawsuits.

However, rather than any one local government acting alone, it would arguably be more helpful and effective if a uniform, statewide disclosure law were enacted. For that reason, the City

may want to work with state or regional leaders towards an appropriate state or regional disclosure law. The Florida Legislature has recently been considering legislation that would require disclosure of prior flooding events as well as disclosure of whether the property is located in a designated flood-hazard zone.⁴⁸⁹ Regardless of which level of government were to enact such a disclosure law, it could be helpful to first obtain feedback from stakeholders who will be affected, including property owners and real estate professionals.

E. Monitoring and Working with Private Sector Forces

Private sector forces should be monitored as the City modifies its policies over time to address sea level rise. Some of the private sector forces that are likely to be most affected by sea level rise are discussed below.

1. Real Estate Market

Effects on South Florida's real estate market may be sudden or gradual. It is difficult to predict how the market will respond to a complex issue such as sea level rise. The desirability of our South Florida location as a place to work and live may help to insulate the market, even as seas rise. That said, some analyses seem to suggest that the risk of sea level rise has begun affecting some Florida home prices.⁴⁹⁰ For example, a 2020 study by two Wharton professors found that between 2013-2018, the volume of homes sold in Florida's coastal areas with more sea level rise exposure fell, while the volume of sales in the lower-risk areas rose.⁴⁹¹ And a 2018 study led by Columbia University professors indicated that the risk of flooding was holding down coastal home prices in Miami-Dade County from rising as high as they otherwise would.⁴⁹² Additionally, a 2016 Miami Herald article cited a survey of 100 major real estate industry players that revealed that 65% of the respondents were concerned about the effects of climate change (up from 56% one year prior).⁴⁹³

However, a 2022 study by economists at Freddie Mac that looked at residential markets in coastal Florida generally indicated that homes in sea level rise-exposed areas only had price discounts where they were also located in FEMA-designated 100-year floodplains, which the economists noted is likely the result of flood insurance requirements rather than buyers' considerations of future sea level rise risk.⁴⁹⁴ Their report then concluded "either that there is a lack of awareness about SLR [sea level rise] risk or that SLR risk may not be factored into pricing decisions because it is a long-term risk and buyers are more focused on the short-term, not intending to own the home long enough for SLR to have an effect."⁴⁹⁵

If the real estate market does ultimately soften due to sea level rise concerns, or if it has already begun to do so, the City's ability to fund necessary adaptations will obviously be affected by decreased values of real property which are taxed on an ad valorem basis. According to a 2020 report by McKinsey Global Institute that looked at the likely effects on Florida real estate prices through 2050, anticipated real estate devaluations in that time period "could impact property tax revenue in some of the most affected counties [including Miami-Dade County] by about 15 to 30 percent."⁴⁹⁶

Of course, the more prepared the City is in terms of well-planned infrastructure investments and smart land use planning, the better its tax base will be able to withstand the effects of sea level rise.

2. *Mortgage Industry*

Even before investors react to the risks associated with sea level rise, it is likely that the mortgage industry (along with the insurance industry, which is discussed below) will lead the way in considering the risks to real estate values, in light of the long-range horizon of most mortgages (particularly residential mortgages). Indeed, if the current sea level rise projections (such as those from the Compact discussed in Section II. B. above) are accurate, then South Florida is as little as 10-20 years away from seeing significant effects from sea level rise within the life of a typical 30-year mortgage.

One can expect that some property owners might attempt to escape the full impact of their mortgage obligations in the face of increased flooding and declining property values. As was demonstrated during the economic recession in the late 2000s, government-assisted mortgage modification efforts are often politically popular.⁴⁹⁷ And it is reasonable to assume that some owners of perpetually flooded properties may attempt to use the common law defense of “impossibility of performance” when faced with foreclosure suits. In general terms, that doctrine provides that when a meaningful purpose of a contract is not performed due to a major superseding event, a court can determine that the affected party should not be held to the initial bargain.⁴⁹⁸ The argument would be that substantial sea level rise undermined the intended purpose of a mortgage obligation on a flooded property. While Florida courts have historically made the impossibility of performance defense inapplicable when the significant event which caused the impossibility was *foreseeable* at the time the mortgage relationship was entered into, there is uncertainty as to how a court would treat that defense in the context of sea level rise.⁴⁹⁹

In any event, property owners’ financial obligations over flooded properties are likely to be enforced in the decades to come. In the meantime, the City can monitor developments in the mortgage industry, changing mortgage practices, and the potential for fluctuations in property values.

3. *Insurance for Residents*

Insurance coverage options will be another factor impacting whether (and how) people continue to live and invest in South Florida. Insurance providers have begun to more closely consider the longer term prospective risk factors associated with sea level rise. Indeed, leaders of the insurance industry have developed an Actuaries Climate Index⁵⁰⁰ and an Actuaries Climate Risk Index,⁵⁰¹ which measure changes in climate extremes in North America, inform the insurance industry and the public about these changes, and help to statistically measure how climate change will impact insurance rates and coverages.⁵⁰² And a 2019 global survey found that 72 percent of insurance companies believe climate change will affect their business, although 80 percent of them have not taken significant steps to lessen climate risks.⁵⁰³ Swiss Re, the world’s largest reinsurer, has estimated that property losses from natural disasters due to climate change could increase more than 60 percent by 2040.⁵⁰⁴

The real property insurance market in Florida has already struggled in recent years. As reported by the Columbia Climate School: “Because of their outlay for previous hurricanes — and in part because of other issues in the litigation-friendly state — many major insurers have left Florida over the last 20 years, including 12 that have closed down since 2020, leaving only small in-state companies with fewer resources. Six insurance companies became insolvent [in 2022], unable to pay their debts, and 30 more Florida insurance companies are being monitored by state regulators because their finances are shaky. When insurance companies can’t pay their bills, they draw on their own reinsurance, which is insurance for insurance companies to deal with very high claims. But ... [r]einsurers are also beginning to leave the Florida market.”⁵⁰⁵

As mentioned previously, many Coral Gables residents living in FEMA flood zones obtain flood insurance through FEMA’s National Flood Insurance Program (“NFIP”). And FEMA recently changed how it calculates risk for the NFIP, calling its new strategy “Risk Rating 2.0.” While the old rates were based on a one-size-fits-all model for gauging the threat of flooding in communities, the risk analysis now uses a more sophisticated investigation that also includes rainfall levels, storm surge, and the cost to rebuild a property if it is destroyed by a natural disaster.⁵⁰⁶ And while sea level rise projections are not yet currently built directly into the mapping process, FEMA leaders have expressed that they are beginning to find ways to incorporate future climate change-related risks into their modeling.⁵⁰⁷

There are also concrete insurance-related benefits available to property owners in cities with sophisticated municipal adaptation planning. As noted previously, NFIP premiums are determined in part by FEMA’s Community Rating System (“CRS”), which awards points to communities that go above and beyond minimum flood plain management standards. Based on the points the community earns, it is assigned a class rating, with CRS 1 being the most desirable rating, and CRS 10 being non-participating. Each point decrease in a community’s CRS score results corresponds to a 5% premium discount for policyholders in that community.⁵⁰⁸ The City’s current CRS score is an impressive 5, which provides for a 25% reduction in insurance premiums annually for flood insurance policies.⁵⁰⁹

FEMA’s CRS Coordinator’s Manual lists the public information and floodplain management activities that communities receive credits for, including activities that advance the community’s work to: reduce flood damage to existing buildings; manage development in areas not mapped by the NFIP; protect new buildings beyond the minimum NFIP protection level; preserve and/or restore natural functions of floodplains; help insurance agents obtain flood data; and help people obtain more cost effective flood insurance.⁵¹⁰ Additionally, the CRS Coordinator’s Manual includes provisions related to credit for climate change and sea level rise planning.⁵¹¹ Under the 2017 Manual and the 2021 Addendum thereto, these considerations relating to “Future Conditions and Impacts of Climate Change” are:

- Credit is provided for communities that provide information about areas (not mapped on the FIRM) that are predicted to be susceptible to flooding in the future because of climate change or sea level rise.
- To become a Class 4 or better community, a community must (among other criteria) demonstrate that it has programs that minimize increases in future flooding.

- To achieve CRS Class 1, a community must receive credit for using regulatory flood elevations in the V and coastal A Zones that reflect future conditions, including sea level rise.
- Credit is provided when prospective buyers of a property are advised of the potential for flooding due to climate changes and/or sea level rise.
- Credit is provided when the community's regulatory map is based on future-conditions hydrology, including sea level rise.
- Credit is provided when a community accounts for sea level rise in managing its coastal A Zones.
- Credit is provided if a community's stormwater program regulates runoff from future development.
- Credit is provided for a community whose watershed master plan manages future peak flows so that they do not exceed present values.
- Credit is provided for a coastal community whose watershed master plan addresses the impact of sea level rise.
- Credit is provided for flood hazard assessment and problem analysis that address areas likely to flood and flood problems that are likely to get worse in the future, including (1) changes in floodplain development and demographics, (2) development in the watershed, and (3) climate change or sea level rise.⁵¹²

In terms of how communities should evaluate these risks, the CRS uses a “best available data” baseline for crediting community efforts to address sea level rise, and provides some guidance for what data local governments should use and how their projections should be calculated. For example, the 2021 Addendum to CRS Coordinator's Manual states: “In alignment with 13 federal agencies, the CRS defers to the Congressionally mandated National Climate Assessments produced by the U.S. Global Change Research Program to determine a baseline... [T]he CRS uses and recommends the U.S. Army Corps of Engineers' ‘Sea-Level Change Curve Calculator’.... The CRS anticipates that findings from future National Climate Assessments will be incorporated into the Sea-Level Change Curve Calculator. If not, then the CRS will provide further guidance to communities, as needed.”⁵¹³ The Addendum also explains that: “For information, outreach, and planning elements... and meeting CRS Class prerequisites, the community must project out at least to the year 2100 using the intermediate-high projection from the latest-available National Climate Assessment projection at the time of its planning process.”⁵¹⁴

The City of Ocala and Pinellas County currently hold the highest CRS ratings in the State of Florida – Class 3.⁵¹⁵ They each did so by taking major steps to reduce flood risks beyond the minimum requirements of the NFIP, including increasing flood protection, and implementing preparedness and mitigation activities.⁵¹⁶ Those efforts by Ocala and Pinellas County could provide inspiration and guidance to Coral Gables' efforts to continue improving its CRS rating.

It should be noted that substantial sea level rise would not only affect homeowner's insurance and windstorm insurance; it will also likely affect vehicle insurance, commercial liability insurance, and title insurance. And even health insurance markets may be affected due to health risks associated with contaminated flood waters, mold, and possible increases in pest-borne

diseases.⁵¹⁷ The City will want to track developments in these industries to see if coordinated helpful action can be taken to protect citizens.

4. *Private Litigation*

Another driving private sector force in the decades ahead will be private litigation. As properties are damaged by sea level rise, owners will inevitably be asking themselves: “Who can I sue?” And governmental agencies will not be the only defendants. For example, property owners might sue their neighbors whose property causes runoff on to their property when the neighbors are attempting to address their own flooding problems, or neighbors might sue each other for weakening the lateral or subjacent support that was provided to their land before the neighbors took actions to address flooding on their own property.⁵¹⁸

As one recent example, after the 2021 Champlain Towers building collapse discussed above, a class action lawsuit was brought, and ultimately settled, by survivors and family members against insurance companies, developers of an adjacent building, and other defendants, alleging that work on the adjacent building had destabilized Champlain Towers, which other analysis shows had already been undermined by salt water intrusion.⁵¹⁹

In the future, professionals, such as planners, architects, and realtors, may also become frequent targets of litigation. City leaders may want to work with local chapters of professional organizations – and even with the boards of condominium associations and homeowners’ associations – to encourage such professionals and leaders to become informed on this issue as they plan for the future.⁵²⁰

IX. Long-term Retreat

If current projections come to fruition, sea level rise and the other effects of climate change could make much of South Florida a challenging place to live at some point in the future. However, those scenarios do not take into account the substantial skill of humans to create solutions to complex and rapidly changing problems. Innovative solutions that we cannot even fathom today may help extend both the life of South Florida’s land and the quality of life of its residents. Nevertheless, for the sake of a more complete examination of the issue, we will briefly discuss issues associated with long-term retreat and shut-down planning on a City-wide scale in the event that portions of the City become unsustainable.

A. Precedent for Retreat

First, it should be observed that there is some precedent for community retreat and shut-down planning. For example, several island towns in the Chesapeake Bay area have disappeared in the last century as a result of a combination of land subsidence, erosion, and sea level rise. The last house on one such island, Holland Island, disappeared in 2010.⁵²¹ Most of the residents of Holland moved to the mainland, some barging their houses and reconstructing them on higher ground; and the structures that were too damaged to be moved either stayed behind or slipped into the Bay.⁵²²

Another offshore island in the Chesapeake Bay region – Smith Island – still exists but is shrinking. It has lost land and population, and residents have been demanding government projects like seawalls and jetties to protect the remaining land. Those efforts have struggled against the

public perception outside the island that the millions of dollars in public funds needed to protect so few people is not justifiable.⁵²³ After Superstorm Sandy, the State of Maryland and the federal government offered \$2 million to buy out Smith Island residents who wanted to leave. The residents were offered the highest appraised value for their land. But if they refused the buyout, these owners were not likely to receive any funds for rebuilding, because the government had deemed their properties a zone of habitual flooding. Residents expressed anger at the state and local governments for “turn[ing] their backs on [us],” especially because permits had been issued to build in those areas in the decades before.⁵²⁴ After substantial political pressure, \$15 million in federal relief money is being provided to assist Smith Island – to finance a breakwater project, pay for a jetty, fix their docks, and fund a “visioning” study to plan for the island’s future.⁵²⁵ One can envision similar political battles, and financing disputes, in South Florida.

As another cautionary tale, the town of Rodanthe in the Outer Banks of North Carolina is struggling to stay above water. Parts of the town are losing a dozen feet or more a year due to erosion and sea level rise. When one walks along Ocean Drive in Rodanthe, you see homes touching the waves, and beside one such home “a septic tank rises from the eroding beach.”⁵²⁶ For safety reasons, officials have cut off power to some of the homes.⁵²⁷ Property owners have asked federal, state, and local authorities to assist, but, according to a Washington Post report, “so far, officials have demurred, saying the cost-benefit analysis doesn’t work because of Rodanthe’s small tax base and the fact that the erosion is so relentless.... In short, no cavalry is coming.”⁵²⁸

B. Reduced Services and Related Taxation Question

1. Reducing Services

Dr. Harold Wanless, who has written about the long-term future of South Florida, makes a grim recommendation that local governments should immediately establish sea level rise thresholds at which City services and infrastructure maintenance will be terminated to particular neighborhoods.⁵²⁹ Indeed, there may come a point in the future at which local governments in South Florida can no longer feasibly provide some services to some areas.

As discussed earlier, it is possible that affected properties could be purchased through voluntarily acquisitions before the property is no longer maintainable in terms of government services and infrastructure. Alternatively, eminent domain powers may provide an option to depopulate an increasingly unsafe or unsustainable area.

But with respect to reducing transportation infrastructure services under such a scenario, Florida law generally permits municipalities to cede control over roads to the encompassing county, and there are also specific procedures and requirements for closing or abandoning roads.⁵³⁰ The Florida appellate decision in the *Jordan v. St. Johns County* case, discussed in Section IV. B. above, which involved the effects of erosion and sea level rise on St. Johns County’s ability to maintain a county road, indicates that that county’s failure to formally abandon the road in adherence to those statutory provisions (as opposed to simply deciding not to maintain the road) helped support the residents’ claim for liability.⁵³¹ Should a local government desire to no longer maintain a perpetually flooded road in the future, any such applicable statutory procedures would need to be adhered to.⁵³²

With respect to public utility services, Florida law permits the discontinuation of public utility services by private companies, under appropriate circumstances, provided certain procedures are followed, such as formal proceedings in which the public is sufficiently represented and so long as the public utility service provider could demonstrate that the reduction in services is economically required (e.g., that continued provision of the service would result in substantial losses).⁵³³ Substantial sea level rise might give rise to the type of economic losses that could justify discontinuation of utility services; however, the City and its counsel will need to monitor case law developments on this issue, including what legal standards are applied in the context of any municipally-run (versus privately-run) public utilities.

It should also be noted that Florida law provides several tools by which a Florida municipality can reduce its size and/or the scope of the services it provides. Incorporated Florida municipalities can dissolve or contract their physical boundaries through statutorily-prescribed methods such as dissolution or contraction. Such options are governed by Florida Statutes Chapters 165 and 171.

2. Taxation Issues Where Services are Reduced

If the level of City services has been wound down in an area, can taxing continue when not all basic governmental services are being provided to the property? The answer to this question will generally depend, in the first instance, on the type of tax involved. Certain funding sources, such as special assessments, user/utility fees, and development impact fees, must relate to a service being provided, and therefore the City would likely be prohibited from collecting such funding sources if the underlying services were not being provided.⁵³⁴ As for the City's portion of residents' general *property* taxes, those are paid on an ad valorem basis. And if a property's value suffers from the effects of sea level rise (including reduced capacity for government services), the fair market value of that property would almost certainly decrease, thereby decreasing the property tax obligation for that property owner. Stated differently, even if the City's ad valorem millage rate were to stay the same, these property owners would presumably be paying lower taxes, in part because of the decreased level of municipal services.⁵³⁵

C. Relocating Residents

In some areas of the world, it is becoming a critically important question to ask -- Where will persons displaced by the effects of climate change be relocated and how can governmental agencies help in that relocation? According to the United Nations University Institute for Environment and Human Security and the International Organization for Migration, between 50 million and 200 million people worldwide could be displaced due to climate change by 2050.⁵³⁶

Although governmental assistance with safe relocation may not be necessary for most Coral Gables residents compared to residents in some parts of the world (such as remote island countries), it is still instructive to consider the experiences of groups that have already faced such issues. And it must be remembered that climate change effects are not expected to occur simply on a slow, steady, more predictable basis, but also upon the increased intensity of storms which could have large, sudden impacts.

As with any retreat, relocation of residents due to climate change typically occurs in waves – there are those who will leave early, those who will stay until things begin to worsen, and those who stay until they are physically or legally forced out. However, some geographically-isolated and culturally-insular groups have chosen to pursue mass relocation as a group. For example, residents of six villages in Fiji have already been relocated by the Fiji government, due to the effects of climate change.⁵³⁷ And the government in Fiji has earmarked 42 more villages for relocation in the next 5-10 years.⁵³⁸

Here in the United States, some remote Alaskan villages are dealing with the issue as a result of the effects of the melting Arctic ice. In 2022, the U.S. Government Accountability Office recommended creating a federal entity to coordinate efforts to relocate several Alaska Native villages.⁵³⁹

The political, financial, and social challenges that occur in these communities can be good examples to learn from. South Miami’s former Mayor, Philip Stoddard, who is a biology professor at Florida International University, has recommended that South Florida should “work toward a slow and graceful depopulation, rather than a sudden and catastrophic one.”⁵⁴⁰

However, a graceful depopulation would be financially costly, and it is not at all clear who would pay for any organized mass relocation. As the Director of the Alaska Immigration Justice Project, Robin Bronen, has explained, “There’s no government agency that has the responsibility to relocate a community, nor the funding to do it.”⁵⁴¹

The federal government would, no doubt, at least *attempt* to provide some assistance to communities in the U.S. that struggle with relocating. As noted in Section IV. C. above, HUD awards federal grants to help communities adapt to climate change. One of those grants – \$48 million for a town in southeastern Louisiana named Isle de Jean Charles – was the first allocation of federal tax dollars to move an entire community dealing with the impacts of climate change.⁵⁴² The homes and trailers in Isle de Jean Charles were mildewing and rusting due to increased flooding, and most of the trees were dead or dying because of saltwater intrusion. Under the terms of the federal grant, and after six years of planning and construction, the island’s residents began being resettled to drier land and to a new community in 2022.⁵⁴³ The new subdivision is located 40 miles northwest of Isle de Jean Charles.⁵⁴⁴ Marion McFadden, who worked on the program at HUD, said: “We see this as setting a precedent for the rest of the country, the rest of the world.”⁵⁴⁵ But even the relocation in Isle de Jean Charles — which involved moving only about 60 people — has been difficult to implement. Three previous resettlement efforts before 2022 failed because of logistical and political complications, and many residents of Isle de Jean Charles did not want to leave. But Ms. McFadden explained: “We could give the money to the island to build back exactly as before, but we know from the climate data that they will keep getting hit with worse storms and floods, and the taxpayer will keep getting hit with the bill.”⁵⁴⁶

Additionally, FEMA has a permanent relocation fund that provides some support for work that is “required as the result of [an] emergency or major disaster event,” but generally it is used only for work in relocating and restoring a community facility that has already been substantially destroyed and should not be rebuilt at its previous location due to the risk of “repetitive heavy damage.”⁵⁴⁷ The funds are to be used to reconstruct facilities “as they existed immediately prior to the disaster.”⁵⁴⁸

While a complete “relocation” of a city like Coral Gables may not be practical (particularly in light of the fact that the City is largely surrounded by even lower-lying land), the City is fortunate to have a ridge of relatively higher elevation land in the northern and central portion of the City.⁵⁴⁹ In fact, City Hall and much of the City’s business center core are already on that relatively less vulnerable land, making it more feasible for the City to sustain its core functions farther into the future than some of the surrounding areas, even if current sea level rise projections do come to fruition. As previously noted, this higher elevation land also provides an opportunity to redirect critical facilities and population density to those less vulnerable areas of the City over time.

D. Clean-up of Abandoned Land

Experts predict that toxic pollution of water and land will be caused by the remnants of inundated buildings (such as drywall, formaldehyde, and electrical components), damaged sewer lines, damaged septic tanks, landfills, gas pipelines, fuel tanks, electrical grids, and even cemeteries.⁵⁵⁰ The City may wish to consider now what steps can be taken to prevent such pollution as the seas rise and as climate change exacerbates the strength and intensity of storms and accompanying storm surge events.

With the help of its own infrastructure vulnerability assessments, the City can begin to work to ensure that its own infrastructure and buildings are either designed or retrofitted to avoid such pollution problems. The City can also help to educate the public about this issue and about the wide array of federal, state, and local laws and regulations that prohibit even passive and unintentional pollution from one’s property.⁵⁵¹

While certain laws (state and federal statutes and regulations, as well as common law nuisance and negligence principles) may require cleanup of toxins before a property is abandoned due to perpetual flooding,⁵⁵² a critical question is – Who would have any incentive or ability to pay for cleanup in such a circumstance? And, as a threshold question – Who will even own these perpetually flooded properties? As noted in Section VII. D. above, under the public trust doctrine set forth in the Florida Constitution, the State owns all lands below mean high water on the Atlantic and Gulf coasts and holds it in trust for the use and enjoyment of the public.⁵⁵³ However, for properties that are not below mean high water but that are perpetually inundated, the answer is not so clear. It can be reasonably presumed that many of those properties would eventually be abandoned by owners who owe more to mortgage holders than the property is worth. And even if a mortgage company could foreclose on the property, the mortgage company would likely not want to take title to flooded property. And while the property taxes may go unpaid, leading to the issuance of a tax certificate, it is unlikely that anyone would want to purchase a tax lien certificate on the property either. The tax lien could then result in ownership of the property by the County or other governmental entity.⁵⁵⁴ Under such a chain of events, the cost of cleaning up abandoned would, most likely, fall onto governmental agencies (and/or non-profit organizations) at the end of the day.

With this in mind, one way to ensure that Coral Gables is protected from such pollution and blight is to create a trust fund for the highest risk Adaptation Action Areas, which builds interest and can be used to clean up any abandoned land. Grant funding might be one source for such a trust fund, and ad valorem taxes could be another option. While a special assessment in the

affected area might appear to be another logical funding choice, the City would have to take into account the strict legal requirements relating to special assessments, including ensuring that the property burdened by the assessment would be deemed to derive a “special benefit” from the project or service funded by the assessment and that the assessment for the project or service is properly apportioned. (*See* discussion in Section IV. C.(2) above.) Regardless of how it is funded, such a trust fund could be vital in ensuring that the City is positioned to address future expenses relating to the environmental, health, and safety consequences of sea level rise.

X. Next Steps

Finally, the following are some potential next steps the City might consider, in light of all of the policy options and legal considerations discussed herein:

- (1) Continue to gather, and frequently update, actionable data from trusted and dependable sources;
- (2) Identify additional potential stakeholders and collaborators in the community with an interest in sea level rise adaptation;
- (3) Continuously engage and inform the public and other stakeholders through educational efforts;
- (4) Monitor and evaluate the benefits obtained for the City and its residents for adaptation measures taken to date;⁵⁵⁵
- (5) Consider more formal notices or notice requirements of sea level rise-related risks;
- (6) Continue to lead by example by considering sea level rise when planning and investing in the City’s own public infrastructure, particularly the City’s stormwater system, roadways, sewer and septic systems, waterways and bridges, and City-owned buildings and parks;
- (7) Research and pursue available sources of funding for adaptation efforts, and continue investing in long-term funds for adaptation;
- (8) Implement even more of the recommendations found in the Southeast Florida Regional Climate Action Plan 3.0, as appropriate;
- (9) Continue making updates to the City’s comprehensive plan to reflect sea level rise implications;
- (10) Consult with land use counsel regarding adopting additional legally appropriate and cost efficient ways to restrict long-term, infrastructure-intensive development in hazard-prone areas, including using zoning tools, building code and resilient design measures, setbacks and buffers, conditional development tools, rebuilding restrictions, and restrictions on coastal armoring; and

- (11) Make decisions regarding the thresholds at which public investments in the highest risk areas will be shifted from protection measures into trust funds to be used for voluntary land buyouts.

Thinking longer-term now will position the City to make the best possible decisions for itself and the community, as it faces the extraordinary challenges presented by the effects of sea level rise.

This white paper is intended to be periodically updated, at the will of the City Commission, in the years to come, to reflect further changes in the available scientific projections, the shifting legal landscape, new best practices regarding adaptation policies, and the City's own changing priorities and on-the-ground challenges.

¹ Prepared by Abby Corbett, Shareholder at Stearns Weaver Miller Weissler Alhadeff & Sitterson P.A., with the substantial assistance of numerous members of City staff and the City Attorney's office.

² *Sea Level Change Glossary*, NASA.GOV, <https://sealevel.nasa.gov/glossary> (last visited Dec. 30, 2024).

³ It should be noted that the City is also making substantial efforts to be a leader on climate mitigation efforts as well. By way of example, the City has a 10-year sustainability master plan that includes proposed projects for City operations and a sustainability analysis of the overall community. *Sustainability Master Plan*, CITY OF CORAL GABLES, Oct. 26, 2015, available at <https://www.coralgables.com/sites/default/files/2022-05/SustainabilityPlan.pdf> (last visited Dec. 30, 2024). The City also has a greenhouse gas emissions inventory report. *Greenhouse Gas Inventory Report*, CITY OF CORAL GABLES, 2018, available at https://www.coralgables.com/sites/default/files/2022-11/210802_GHG%20Inventory%20Report_Update.pdf (last visited Dec. 30, 2024). And the City is working to educate residents about what steps they can take to reduce their own carbon footprint. *Reduce Your Carbon Footprint*, CITY OF CORAL GABLES, <https://www.coralgables.com/departments/public-works/sustainable-public-infrastructure-division/services/environmental/reduce-your-carbon-footprint> (last visited Dec. 30, 2024). See also *Sustainability*, CITY OF CORAL GABLES, <https://www.coralgables.com/departments/public-works/sustainability> (last visited Dec. 30, 2024); *Environmental Initiatives*, CITY OF CORAL GABLES, <https://www.coralgables.com/departments/sustainability> (last visited Dec. 30, 2024).

⁴ JOHN COOK, *ET AL.*, QUANTIFYING THE CONSENSUS ON ANTHROPOGENIC GLOBAL WARMING IN THE SCIENTIFIC LITERATURE, ENVTL. RES. LETTS. Vol. 8, No. 2, 0240024 (May 15, 2013), available at <https://iopscience.iop.org/article/10.1088/1748-9326/8/2/024024> (last visited Dec. 30, 2024) (examining approximately 12,000 academic papers on climate change between 1991-2011, and finding that, of those papers expressing an opinion on human-caused global warming, “97.1 percent endorsed the consensus position that humans are causing global warming”); KRISTA MYERS, *ET AL.*, CONSENSUS REVISITED: QUANTIFYING SCIENTIFIC AGREEMENT ON CLIMATE CHANGE AND CLIMATE EXPERTISE AMONG EARTH SCIENTISTS 10 YEARS LATER, ENVTL. RES. LETTS. Vol.16, No. 10, 104030 (Oct. 20, 2021), available at <https://iopscience.iop.org/article/10.1088/1748-9326/ac2774/pdf> (last visited Dec. 30, 2024) (“Out of a group of 153 independently confirmed

climate experts, 98.7% of those scientists indicated that the Earth is getting warmer mostly because of human activity such as burning fossil fuels.”).

⁵ See *Florida’s Sea Level Is Rising And It’s Costing Over \$4 Billion*, SEALEVELRISE.ORG, available at <https://sealevelrise.org/states/florida> (last visited Dec. 30, 2024) (stating that the rate of sea level rise near Virginia Key “has accelerated over the last ten years and is now rising by 1 inch every 3 years,” and explaining that “scientists know this because sea levels are measured every 6 minutes using equipment like satellites, floating buoys off the coast, and tidal gauges to accurately measure the local sea level as it accelerates and changes”). For data reflecting these local changes, see NOAA TIDES AND CURRENTS, *Water Levels: Virginia Beach, Biscayne Bay, FL* (2023), available at <https://tidesandcurrents.noaa.gov/waterlevels.html?id=8723214> (last visited Jan. 8, 2025). For a chart reflecting global increases since 1880, see *Climate Change Indicators in the United States: Sea Level*, U.S. ENVIRONMENTAL PROTECTION AGENCY (2022), <https://www.epa.gov/climate-indicators/climate-change-indicators-sea-level> (last visited Jan. 8, 2025). See also Brian McNoldy, *Water, Water, Everywhere: Sea Level Rise in Miami*, UM ROSENTHAL SCHOOL OF MARINE & ATMOSPHERIC SCIENCE, Oct. 3, 2014, available at <https://news.miami.edu/rosenstiel/stories/2014/10/water-water-everywhere-sea-level-rise-in-miami.html> (last visited Jan. 8, 2025).

⁶ See *Florida’s Geologic History*, FL DEP’T OF ENVTL. PROTECTION, <https://floridadep.gov/fgs/geologic-topics/content/floridas-geologic-history-and-formations> (last visited Jan. 8, 2025).

⁷ See *Climate Change Indicators in the United States: Sea Level*, U.S. ENVIRONMENTAL PROTECTION AGENCY (2022), <https://www.epa.gov/climate-indicators/climate-change-indicators-sea-level> (last visited Jan. 8, 2025).

⁸ See FLA. OCEANS & COASTAL COUNCIL, *CLIMATE CHANGE AND SEA-LEVEL RISE IN FLORIDA: AN UPDATE OF THE EFFECTS OF CLIMATE CHANGE ON FLORIDA’S OCEAN & COASTAL RESOURCES* 19, 15, 8, 13, 11 (Dec. 2010), available at <https://floridadep.gov/rcp/rcp/documents/climate-change-and-sea-level-rise-update> (last visited Jan. 8, 2025).

⁹ See, e.g., Evan Bush and Denise Chow, ‘Get To Work’: Climate Leaders Push Solutions And Urgency At Miami Conference, NBC NEWS, May 12, 2022, available at <https://www.nbcnews.com/science/environment/climate-leaders-push-solutions-urgency-miami-conference-rcna28216> (last visited Jan. 8, 2025); Elizabeth Kolbert, *The Siege of Miami*, THE NEW YORKER, Dec. 13, 2015, available at <http://www.newyorker.com/magazine/2015/12/21/the-siege-of-miami> (last visited Jan. 8, 2025); Robin Young, *Journalists Say Florida Is ‘Ground Zero’ For Climate Change. Here’s What They’re Doing About It*, WBUR, Aug. 5, 2019, available at <https://www.wbur.org/hereandnow/2019/08/05/florida-newsrooms-cover-climate-change> (last visited Jan. 8, 2025).

¹⁰ *QuickFacts: Coral Gables City, Florida*, U.S.. CENSUS BUREAU, <https://www.census.gov/quickfacts/fact/table/coralgables-city-florida/PST045222> (last visited Jan. 8, 2025).

¹¹ Information from City staff, supporting this figure, is on file with the author.

¹² Information from City staff, supporting these figures, is on file with the author.

¹³ See Elizabeth Kolbert, *The Siege of Miami*, THE NEW YORKER, Dec. 13, 2016, available at <http://www.newyorker.com/magazine/2015/12/21/the-siege-of-miami> (last visited Jan. 8, 2025).

¹⁴ See MITCHELL H. MURRAY, STORM-TIDE ELEVATIONS PRODUCED BY HURRICANE ANDREW ALONG THE SOUTHERN FLORIDA COASTS, 1994, at 11-12, *available at* <https://pubs.usgs.gov/of/1994/0116/report.pdf> (last visited Jan. 8, 2025).

¹⁵ SEFLACLIMATECOMPACT.ORG, <http://www.southeastfloridacclimatecompact.org/> (last visited Jan. 8, 2025).

¹⁶ *What is the Compact?*, SEFLACLIMATECOMPACT.ORG <https://southeastfloridacclimatecompact.org/what-is-the-compact> (last visited Jan. 8, 2025).

¹⁷ REGIONAL CLIMATE ACTION PLAN 3.0, SE. FLA. REG'L CLIMATE CHANGE COMPACT (Nov. 2022), *available at* https://southeastfloridacclimatecompact.org/wp-content/uploads/2022/12/SEFL_RCAP3_Final-1.pdf (last visited Jan. 8, 2025).

¹⁸ 2016 MUNICIPAL IMPLEMENTATION SURVEY REPORT, SE. FLA. REG'L CLIMATE CHANGE COMPACT (Feb. 2017), *available at* https://southeastfloridacclimatecompact.org/wp-content/uploads/2017/03/2016-Regional-Climate-Action-Plan-Municipal-Implementation-Survey-Report_Final.pdf (last visited Jan. 8, 2025).

¹⁹ CITY OF CORAL GABLES, Sea Level Impact: Climate Resiliency Dialogue, <https://www.coralgables.com/departments/public-works/right-way-maintenance-enforcement-division/services/waterways/sea-level-impact#1219> (last visited Jan. 8, 2025).

²⁰ *Id.*

²¹ UNIFIED SEA LEVEL RISE PROJECTION SOUTHEAST FLORIDA: 2019 UPDATE, SE. FLA. REG'L CLIMATE CHANGE COMPACT'S SEA LEVEL RISE AD HOC WORK GROUP, *available at* https://southeastfloridacclimatecompact.org/wp-content/uploads/2020/04/Sea-Level-Rise-Projection-Guidance-Report_FINAL_02212020.pdf (last visited Jan. 8, 2025).

²² *Id.* at 8.

²³ See NOAA'S NATIONAL OCEAN SERVICE, SEA LEVEL RISE TECHNICAL REPORT, 2022, *available at* <https://sealevel.globalchange.gov/resources/2022-sea-level-rise-technical-report> (last visited Jan. 8, 2025).

²⁴ See IPCC, AR6 SYNTHESIS REPORT: CLIMATE CHANGE, 2023, *available at* <https://www.ipcc.ch/report/ar6/syr/> (last visited Jan. 8, 2025).

²⁵ UNIFIED SEA LEVEL RISE PROJECTION SOUTHEAST FLORIDA, *supra* note 21, at 9.

²⁶ *Id.* at 10. These projections include global curves adapted for regional application: the median of the IPCC scenario as the lowest boundary (solid thin curve), the NOAA Intermediate High curve as the upper boundary for short-term use until 2070 (solid thick line), and the NOAA High curve as the upper boundary for medium and long-term use (dash dot curve). *Id.* The NOAA Extreme curve (dash curve) brackets the published upper range of possible sea level rise under an accelerated ice melt scenario, but the Compact notes that emissions reductions could reduce the rate of sea level rise significantly. *Id.*

²⁷ *Id.* at 12.

²⁸ See, e.g., University of Gothenburg, *Arctic Climate Modelling Too Conservative*, SCIENCE DAILY, Mar. 13, 2023, *available at* <https://www.sciencedaily.com/releases/2023/03/230313101127.htm> (last visited Jan. 8, 2025).

²⁹ UNIFIED SEA LEVEL RISE PROJECTION SOUTHEAST FLORIDA, *supra* note 21, at 17.

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- ³⁰ SE. FLA. REG’L CLIMATE CHANGE COMPACT, 2024 STATEMENT OF CONTINUED USE OF THE 2019 SOUTHEAST FLORIDA REGIONALLY UNIFIED SEA LEVEL RISE PROJECTION (Dec. 2024), *available at* https://southeastfloridacclimatecompact.org/wp-content/uploads/2024/12/2024-SLR-Statement_120924_FINAL.pdf (last visited Jan. 23, 2025).
- ³¹ SE. FLA. REG’L CLIMATE CHANGE COMPACT’S INUNDATION MAPPING AND VULNERABILITY ASSESSMENT WORK GROUP, ANALYSIS OF THE VULNERABILITY OF SOUTHEAST FLORIDA TO SEA LEVEL RISE (Aug. 2012), *available at* <http://www.southeastfloridacclimatecompact.org/wp-content/uploads/2014/09/vulnerability-assessment.pdf> (last visited Jan. 8, 2025).
- ³² *Id.*; *see also* SE. FLA. REG’L CLIMATE CHANGE COMPACT, RCAP IMPLEMENTATION GUIDANCE SERIES: REGIONAL IMPACTS OF CLIMATE CHANGE AND ISSUES FOR STORMWATER MANAGEMENT 17, *available at* <http://www.southeastfloridacclimatecompact.org/wp-content/uploads/2015/11/Stormwater-Guide.pdf> (last visited Jan. 8, 2025).
- ³³ FLA. DEP’T OF ECONOMIC OPPORTUNITY, HOW COUNTRIES, STATES, AND FLORIDA ADDRESS SEA LEVEL RISE: A COMPENDIUM OF CLIMATE ADAPTATION RESEARCH, *available at* <http://www.floridajobs.org/docs/default-source/2015-community-development/community-planning/crdp/compendiumnationalstatelocaladaptationprojects.pdf?sfvrsn=2> (last visited Jan. 8, 2025).
- ³⁴ SEA-LEVEL RISE VULNERABILITY ASSESSMENT TOOLS AND RESOURCES A GUIDE FOR FLORIDA’S LOCAL GOVERNMENTS, FL DEP’T OF ENVTL. PROTECTION, June 2015, *available at* https://floridadep.gov/sites/default/files/SLR-VA-tools-extended_1.pdf (last visited Jan. 8, 2025).
- ³⁵ *Sea Level Rise Viewer*, NOAA.GOV, <https://coast.noaa.gov/digitalcoast/tools/slr.html> (last visited Jan. 8, 2025).
- ³⁶ *Coastal Flood Exposure Mapper*, NOAA.GOV, <https://coast.noaa.gov/digitalcoast/tools/flood-exposure.html> (last visited Jan. 8, 2025); *Tips*, NOAA.GOV, <https://coast.noaa.gov/data/digitalcoast/pdf/flood-exposure-tips.pdf> (last visited Jan. 8, 2025).
- ³⁷ *Coastal Resilience Mapping Portal: Southeast Florida*, COASTALRESILIENCE.ORG, <https://maps.coastalresilience.org/seflorida/> (last visited Jan. 8, 2025).
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- ³⁹ *Flooding Vulnerability Viewer*, MIAMIDADECOUNTY.GOV, <https://gisweb.miamidade.gov/vulnerabilityviewer/> (last visited Jan. 8, 2025).
- ⁴⁰ *Building Impact Viewer*, MIAMIDADECOUNTY.GOV, <https://mdc.maps.arcgis.com/apps/webappviewer3d/index.html?id=b92a9fa4ff8847bf97f3e628a195a398> (last visited Jan. 8, 2025).
- ⁴¹ *Sea Level Scenario Sketch Planning Tool*, UFL.EDU, <http://sls.geoplan.ufl.edu/> (last visited Jan. 8, 2025).
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- ⁴³ MAP OF THE APPROXIMATE INLAND EXTENT OF SALTWATER AT THE BASE OF THE BISCAYNE AQUIFER IN MIAMI-DADE COUNTY, U.S. GEOLOGICAL SURVEY and MIAMI-DADE COUNTY (2018), *available at* https://pubs.usgs.gov/sim/3438/sim3438_pamphlet.pdf (last visited Jan. 8, 2025).

⁴⁴ *Sea Level Change Curve Calculator*, U.S. ARMY CORPS OF ENGINEERS, Sept. 20, 2022, https://cwbi-app.sec.usace.army.mil/rccslc/slcc_calc.html (last visited Jan. 8, 2025).

⁴⁵ *Surging Seas: Risk Zone Map*, CLIMATECENTRAL.ORG, https://ss2.climatecentral.org/#12/40.7298/-74.0070?show=satellite&projections=0-K14_RCP85-SLR&level=5&unit=feet&pois=hide (last visited Jan. 8, 2025).

⁴⁶ *Hazen and Sawyer*, <http://www.hazenandsawyer.com> (last visited Jan. 8, 2025).

⁴⁷ ASSESSMENT OF SEA LEVEL IMPACTS ON EXISTING CITY OF CORAL GABLES INFRASTRUCTURE AND PRELIMINARY ADAPTATION PLAN, HAZEN & SAWYER, Oct. 2018 (on file with author, and available upon request).

⁴⁸ *Id.* at 5.

⁴⁹ A king tide is “the highest predicted high tide of the year at a coastal location.” KING TIDES, U.S. ENVIRONMENTAL PROTECTION AGENCY, June 2011, *available at* https://www.epa.gov/sites/default/files/2014-04/documents/king_tides_factsheet.pdf (last visited Jan. 8, 2025).

⁵⁰ ASSESSMENT OF SEA LEVEL IMPACTS ON EXISTING CITY OF CORAL GABLES INFRASTRUCTURE AND PRELIMINARY ADAPTATION PLAN, *supra* note 47, at 13.

⁵¹ *Id.* at 48-58.

⁵² *Id.*

⁵³ *Resilient Florida Program Planning Grant Awards Fiscal Year 2022-2023*, FL DEP’T OF ENVTL. PROTECTION, at 13, *available at* https://content.govdelivery.com/attachments/FLDEP/2023/02/13/file_attachments/2408386/2.13.23%20RFGP%20Planning%20Grant%20Awards%202022-23_PFT.pdf (last visited Jan. 8, 2025).

⁵⁴ See Fla. Stat. § 380.093(3) (2022).

⁵⁵ *Sea Level Impact: Interactive Map Tab*, CITY OF CORAL GABLES, <https://coralgablespublicworks-cggis.hub.arcgis.com/#Elev> (last visited Jan. 8, 2025); *see also* *Sea Level Rise & Storm Surge Impact Tool*, FLORIDA INTERNATIONAL UNIVERSITY and CITY OF CORAL GABLES, <https://slr.fiu.edu/CoralGables> (last visited Jan. 8, 2025).

⁵⁶ NATIONAL FLOOD INSURANCE PROGRAM, FLOOD INSURANCE MANUAL, Oct. 2022, at D: 2-4 (Appendix D: Flood Maps), *available at* https://www.fema.gov/sites/default/files/documents/fema_nfip-flood-insurance-full-manual_102022.pdf (last visited Jan. 8, 2025).

⁵⁷ See *FEMA Preliminary Flood Insurance Rate Maps*, GABLES SMART CITY HUB, <https://crs-firm-cggis.hub.arcgis.com/> (last visited Jan. 13, 2025) (provides access to FEMA FIRM panels, flood maps showing properties affected, and other useful resources). *See also* *Miami-Dade County GIS*, MIAMI-DADE.GOV, <http://gisweb.miamidade.gov/floodzone> (last visited Jan. 13, 2025).

⁵⁸ This information was provided to the author by City staff, and is based on data collected by FEMA.

⁵⁹ NATIONAL FLOOD INSURANCE PROGRAM, FLOOD INSURANCE MANUAL, *supra* note 56, at 1:2. *See also* FL DIVISION OF EMERGENCY MANAGEMENT, FLOODPLAIN MANAGEMENT IN FLORIDA: QUICK GUIDE, 2017, *available at* <https://www.floridadisaster.org/contentassets/5a671dfdfadf45ab9a2c61635e2a4fed/quick-guide-for-floodplain-management.pdf> (last visited Jan. 13, 2025).

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- ⁶⁰ *Coral Gables, FL: Flood Information*, FORERUNNER, <https://coralgablesfl.withforerunner.com/properties> (last visited Jan. 13, 2025).
- ⁶¹ *Sea Level Impact: Tidal & Water Level Monitoring*, CITY OF CORAL GABLES, <https://www.coralgables.com/departments/public-works/right-way-maintenance-enforcement-division/services/waterways/sea-level-impact#1217> (last visited Jan. 13, 2025).
- ⁶² *Coral Gables Water Quality Assessment Project*, MIAMI WATERKEEPER, Mar. 16, 2021, https://www.miamiwaterkeeper.org/coral_gables_water_quality_assessment_project (last visited Jan. 13, 2025).
- ⁶³ City staff has already created a detailed, parcel by parcel, interactive map of the septic systems and the sanitary sewer system in the City. *See Sanitary Sewer System Map*, CITY OF CORAL GABLES, <https://i300eng.maps.arcgis.com/apps/webappviewer/index.html?id=3fc697e4195d4f18b9a4ee9b47b90838> (last visited Jan. 13, 2025).
- ⁶⁴ For an example of such a plan, *see* CITY OF PUNTA GORDA ADAPTATION PLAN, TECH. RPT. NO. 09-4 (2009), available at <http://www.cakex.org/sites/default/files/Punta%20Gorda.pdf> (last visited Jan. 13, 2025).
- ⁶⁵ *See Resilient Florida Program - Statewide Assessment*, FL DEP'T OF ENVTL. PROTECTION, <https://floridadep.gov/rcp/resilient-florida-program/content/resilient-florida-program-statewide-assessment> (last visited Jan. 13, 2025).
- ⁶⁶ *See* Lance Dixon, *Coral Gables Partners With FIU For Sea-Level Rise Discussions*, MIAMI HERALD, Feb. 11, 2016, available at <http://www.miamiherald.com/news/local/community/miami-dade/coral-gables/article59939126.html> (last visited Jan. 13, 2025).
- ⁶⁷ *See, e.g.,* Christopher Joyce, *Rising Sea Levels Made This Republican Mayor A Climate Change Believer*, National Public Radio, May 17, 2016, available at <http://www.npr.org/2016/05/17/477014145/rising-seas-made-this-republican-mayor-a-climate-change-believer> (last visited Jan. 13, 2025); Justin Worland, *Miami Is Beating The Sea*, TIME MAGAZINE, June 30, 2016, available at <http://time.com/4389178/miami-is-beating-the-sea> (last visited Jan. 13, 2025); Maria Rosa Higgins Fallon, *Mayor Cason Joins Group Addressing Coastal Flooding And Sea Level Rise*, MIAMI'S CMTY. NEWSPAPERS, Nov. 10, 2015, available at <http://communitynewspapers.com/coralgables/mayor-cason-joins-group-addressing-coastal-flooding-and-sea-level-rise> (last visited Jan. 13, 2025).
- ⁶⁸ *Flood Insurance Rate Maps*, GABLES SMART CITY HUB, <https://crs-firm-cggis.hub.arcgis.com/> (last visited Jan 13, 2025).
- ⁶⁹ *See, e.g.,* HURRICANE PREPAREDNESS GUIDE, CITY OF CORAL GABLES, 2022, available at <https://www.coralgables.com/media/608> (last visited Jan. 13, 2025).
- ⁷⁰ RESOLUTION ON PROGRAM FOR PUBLIC INFORMATION, CITY OF CORAL GABLES, 2022, available at <https://coralgables.legistar.com/LegislationDetail.aspx?ID=5920349&GUID=5944AED1-86AF-4694-B39A-88DBA9EF8285> (Attachment 4: "Coral Gables PPI Final") (last visited Jan. 13, 2025).
- ⁷¹ *Id.* at 19-22.
- ⁷² *Id.* at 14.

⁷³ SO. FLA. REG’L PLANNING COUNCIL, ADAPTATION ACTION AREAS: POLICY OPTIONS FOR ADAPTIVE PLANNING FOR RISING SEA LEVELS 27 (Nov. 2013) [hereinafter “SFRPC AAA POLICY OPTIONS”], available at <http://www.southeastfloridaclimatecompact.org/wp-content/uploads/2014/09/final-report-aaa.pdf> (last visited Jan. 13, 2025).

⁷⁴ CLIMATE ACTION RECOMMENDATIONS: A BLUEPRINT FOR ADDRESSING CLIMATE CHANGE AT THE MUNICIPAL LEVEL, CITY OF PENSACOLA CLIMATE MITIGATION AND ADAPTATION TASK FORCE, 2018, available at <https://www.cityofpensacola.com/DocumentCenter/View/15491/Climate-Mitigation-and-Adaptation-Task-Force-Report-PDF> (last visited Jan. 13, 2025).

⁷⁵ FLORIDA ADAPTATION PLANNING GUIDEBOOK, FL DEP’T OF ENVTL. PROTECTION, June 2018, available at https://floridadep.gov/sites/default/files/Adaptation_Planning_Guidebook_0.pdf (last visited Jan. 13, 2025).

⁷⁶ *Why is Sea Level Rise Important to Me*, SE. FLA. REG’L CLIMATE CHANGE COMPACT, available at https://southeastfloridaclimatecompact.org/wp-content/uploads/2022/04/Why-is-sea-level-rise-important-to-me_.pdf (last visited Jan. 13, 2025).

⁷⁷ Robin Bronen, *Climate-Induced Community Relocations: Using Integrated Social-Ecological Assessments to Foster Adaptation and Resilience*, ECOLOGY AND SOCIETY, Vol. 20, No. 3 (2015), available at <http://www.ecologyandsociety.org/vol20/iss3/art36/> (last visited Jan. 13, 2025).

⁷⁸ Amy Huva, *Visualizing Climate Impacts: Here. Now. Us.*, CLIMATE ACCESS, Mar. 24, 2015, available at <http://www.climateaccess.org/campaign/here-now-us> (last visited Jan. 13, 2025).

⁷⁹ CLIMATE ACCESS, THE PREPARATION FRAME: A GUIDE TO BUILDING UNDERSTANDING OF CLIMATE IMPACTS AND ENGAGEMENT IN SOLUTIONS (Mar. 2015), available at <https://climateaccess.org/resource/preparation-frame/> (last visited Jan. 13, 2025); Hunter Cutting, *Climate Change: Polling Analysis and Talking Points*, CLIMATE ACCESS (2012), <http://www.climateaccess.org/resource/climate-change-polling-analysis-and-talking-points> (last visited Jan. 13, 2025).

⁸⁰ ISABELLA FURTH & HEIDI GANTWERK, VIEWPOINT LEARNING, INC., CITIZEN DIALOGUES ON SEA LEVEL RISE: START WITH IMPACTS/END WITH ACTION (2013), available at <https://climateaccess.org/resource/citizen-dialogues-sea-level-rise> (last visited Jan. 13, 2025).

⁸¹ *Seven Best Practices for Risk Commc’n*, NOAA Digital Coast, <https://coast.noaa.gov/digitalcoast/training/risk-communication.html> (last visited Jan. 13, 2025).

⁸² *Assessing Sea Level Rise Impacts in an Environmental Science Class in Florida*, NOAA Digital Coast, <https://coast.noaa.gov/digitalcoast/stories/broward-college.html> (last visited Jan. 13, 2025).

⁸³ *Stories From The Field: Helping Minnesota Residents Understand Local Flooding Issues and Potential Solutions*, NOAA Digital Coast, <https://coast.noaa.gov/digitalcoast/stories/duluth.html> (last visited Jan. 13, 2025).

⁸⁴ *Green Infrastructure, Milwaukee Metro. Sewage District*, <http://www.mmsd.com/gi/green-infrastructure> (last visited Jan. 13, 2025).

⁸⁵ CLIMATE ADAPTATION STORY: BRINGING STORMWATER MANAGEMENT DOWN TO THE NEIGHBORHOOD, FRESHWATER FUTURE, available at <http://www.ecoadapt.org/data/documents/DetroitStoryRS.pdf> (last visited Jan. 13, 2025).

⁸⁶ *NH Coastal Adaptation Workgroup*, <https://www.nhcaw.org/who/> (last visited Jan. 13, 2025).

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- ⁸⁷ See *Central and Southern Florida System Section 216 Flood Resiliency Study*, US ARMY CORPS OF ENGINEERS, <https://www.saj.usace.army.mil/CSFFRS/> (last visited Jan. 13, 2025); Christina Vazquez, *U.S. Army Corps Of Engineers Plan To Protect Miami-Dade Coast From Flooding And Storm Surge Ongoing*, LOCAL10NEWS, Feb. 16, 2021, <https://www.local10.com/news/local/2021/02/16/us-army-corps-of-engineers-plan-to-protect-miami-dade-coast-from-flooding-and-storm-surge-ongoing/> (last visited Jan. 13, 2025); Mark Rankin, *USACE Signs Chief's Report For Miami-Dade Coastal Storm Risk Management Project*, US ARMY CORPS OF ENGINEERS, Sept. 29, 2022, <https://www.saj.usace.army.mil/Media/News-Stories/Article/3186662/usace-signs-chiefs-report-for-miami-dade-coastal-storm-risk-management-project/> (last visited Jan. 13, 2025).
- ⁸⁸ See Natalie Jimenez Peel, Cynthia McFadden & Alexandra Chaidez, *Biden Is Betting Big On Nuclear Energy. But What Happens If The Next Hurricane Ian Strikes Turkey Point?*, NBC NEWS, Oct. 21, 2022, <https://www.nbcnews.com/news/investigations/biden-betting-big-nuclear-energy-happens-hurricane-ian-strikes-turkey-rcna52810> (last visited Jan. 13, 2025). See also *Miami-Dade Cnty. v. Fla. Power & Light Co.*, 208 So.3d 111, 116 (Fla. 3d DCA 2016) (noting that “The City of Miami presented evidence that the sea level and storm surges would be a problem for the proposed two nuclear reactors [at Turkey Point].”).
- ⁸⁹ See Justin Gillis, *Flooding of Coast, Caused by Global Warming, Has Already Begun*, N.Y. TIMES, Sept. 3, 2016, available at http://www.nytimes.com/2016/09/04/science/flooding-of-coast-caused-by-global-warming-has-already-begun.html?_r=0 (last visited Jan. 13, 2025) (quoting the late Harvey Ruvin from Miami-Dade County: “I don’t see doom and gloom here; I see opportunity... We’re talking about the most robust possible jobs program you can think of, and one that can’t be outsourced.”).
- ⁹⁰ See Julio Frenk, *UM President: Charting The Course To Our New Century*, MIAMI HERALD, Jan. 30, 2016, available at <http://www.miamiherald.com/opinion/op-ed/article57352998.html> (last visited Jan. 13, 2025).
- ⁹¹ FIU Sea Level Solutions Center, <https://environment.fiu.edu/slsc/> (last visited Jan. 13, 2025).
- ⁹² Lance Dixon, *Coral Gables Partners With FIU For Sea-Level Rise Discussions*, MIAMI HERALD, Feb. 11, 2016, available at <http://www.miamiherald.com/news/local/community/miami-dade/coral-gables/article59939126.html> (last visited Jan. 13, 2025).
- ⁹³ FAU Sea Level Rise Summits, <http://www.ces.fau.edu/conferences/summits.php> (last visited Jan. 13, 2025).
- ⁹⁴ Robert C. Jones Jr., *New Course Offers Deep Dive Into The Dynamics Of Sea Level Rise*, UNIVERSITY OF MIAMI NEWS, Oct. 24, 2022, <https://news.miami.edu/stories/2022/10/new-course-offers-deep-dive-into-the-dynamics-of-sea-level-rise.html> (last visited Jan. 13, 2025).
- ⁹⁵ See Thomas Ruppert, *Reasonable Investment-Backed Expectations: Should Notice of Rising Seas Lead to Falling Expectations for Coastal Property Purchasers?*, 26 J. LAND USE & ENVTL. L. 239, 266 (2011) available at <https://www.flseagrant.org/publication/reasonable-investment-backed-expectations-should-notice-of-rising-seas-lead-to-falling-expectations-for-coastal-property-purchasers> (last visited Jan. 13, 2025).
- ⁹⁶ *Accord Clark v. City of Kansas City, Mo.*, 99 F. Supp. 2d 1064, 1068 (W.D. Mo. 2000) (“Certainly, it would be desirable for cities to warn their citizens of impending natural disasters and/or hazards... However, that which is desirable is not necessarily required.”).

⁹⁷ U.S. CONST. amend. V.

⁹⁸ *Kelo v. City of New London, Conn.*, 545 U.S. 469, 496 (2005).

⁹⁹ See *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419 (1982); *Lucas v. S. Carolina Coastal Council*, 505 U.S. 1003, 1019 (1992); *Penn Central Transp. Co. v. City of New York*, 438 U.S. 104, 124 (1978); *Nollan v. Cal. Coastal Comm’n*, 483 U.S. 825 (1987).

¹⁰⁰ See *Shands v. City of Marathon*, 999 So. 2d 718, 723 (Fla. 3d DCA 2008); *State v. Basford*, 119 So. 3d 478, 482 (Fla. 1st DCA 2013); *Taylor v. Vill. of N. Palm Beach*, 659 So. 2d 1167, 1171 & n.1 (Fla. 4th DCA 1995); *Palazzolo v. Rhode Island*, 533 U.S. 606, 617 (2001); *Lucas*, 505 U.S. at 1019; *Penn Central*, 438 U.S. at 124. See also *Bradley v. City of Miami*, 2017 WL 3205506, at *4 (S.D. Fla. 2017) (“The bulk of the reported Florida inverse condemnation cases relate to regulatory takings where the plaintiff was required to show ‘a substantial deprivation of all beneficial use’ of the property to obtain just compensation.”).

¹⁰¹ See Ruppert, *supra* note 95, at 246; *Severance v. Patterson*, 370 S.W.3d 705, 726 (Tex. 2012) (holding that Texas statute mandating disclosure to beachfront landowners of potential emplacement of rolling easement due to coastal erosion and storm events was germane to property owner’s expectations in taking context, but that notice was insufficient to immunize state from requirement to compensate property owner when it emplaced the easement). See also *Metro. Dade Cnty. v. Fontainebleau Gas & Wash, Inc.*, 570 So. 2d 1006 (Fla. 3d DCA 1990) (holding that property owners are deemed to purchase property with constructive knowledge of the law including applicable land use regulations).

¹⁰² EASTERN RESEARCH GRP., WHAT WILL ADAPTATION COST? AN ECONOMIC FRAMEWORK FOR COASTAL COMMUNITY INFRASTRUCTURE (June 2013), available at <https://coast.noaa.gov/digitalcoast/training/adaptation-pub.html> (last visited Jan. 13, 2025). The NOAA report also provides citations to journal articles and reports about real-world examples of how governmental entities in the United States and around the world have applied these principles in making sea level-rise related investment decisions, such as how the Gulf of Mexico region is addressing flooding risk post-Hurricane Katrina and how the Scandinavian area of Europe is preparing for sea level rise. See *id.* at Appendix C: Relevant Case Studies.

¹⁰³ Information from City staff, supporting this figure, is on file with the author.

¹⁰⁴ RCAP IMPLEMENTATION GUIDANCE SERIES: REGIONAL IMPACTS OF CLIMATE CHANGE AND ISSUES FOR STORMWATER MANAGEMENT, *supra* note 32, at 11.

¹⁰⁵ Information, provided by City staff, regarding this project is on file with the author.

¹⁰⁶ Information, provided by City staff, supporting this figure, is on file with the author.

¹⁰⁷ Information, provided by City staff, regarding this project is on file with the author.

¹⁰⁸ Information, provided by City staff, supporting this figure, is on file with the author.

¹⁰⁹ *Id.*

¹¹⁰ See, e.g., *Ecological Dev., Inc. v. Walton Cnty.*, 558 So. 2d 1069, 1071 (Fla. 1st DCA 1990) (“A county is not obligated, nor can it be compelled, to perform or provide for any particular construction or maintenance, except such as it voluntarily assumes to do.”); *Gargano v. Lee Cnty. Bd. of Cnty. Comm’rs*, 921 So. 2d 661, 667 (Fla. 2d DCA 2006) (“It is well established that decisions concerning the maintenance of and need to construct roadways, bridges, and other similar services are political questions outside the purview of the courts.”).

¹¹¹ See *Pollock v. Fla. Dep't of Highway Patrol*, 882 So. 2d 928, 932-33 (Fla. 2004); *McCain v. Fla. Power Corp.*, 593 So. 2d 500, 502 (Fla. 1992); *Kaisner v. Kolb*, 543 So. 2d 732, 733-34 (Fla. 1989).

¹¹² *Tranon Park Condominium Association, Inc. v. City of Hialeah*, 468 So. 2d 912, 919-21 (Fla. 1985).

¹¹³ See *Wallace v. Dean*, 3 So. 3d 1035, 1047 (Fla. 2009).

¹¹⁴ See *id.* at 1048; *Henderson v. Bowden*, 737 So. 2d 532, 537 (Fla. 1999); *City of Pinellas Park v. Brown*, 604 So. 2d 1222, 1226 (Fla. 1992); *City of Daytona Beach v. Palmer*, 469 So. 2d 121, 122 (Fla. 1985); *Brown v. Miami-Dade Cnty.*, 837 So. 2d 414, 417 (Fla. 3d DCA 2001); *Moore v. Fla. Fish & Wildlife Conservation Comm'n*, 861 So. 2d 1251, 1253 (Fla. 1st DCA 2003); *Pierre v. Jenne*, 795 So. 2d 1062, 1064 (Fla. 4th DCA 2001).

¹¹⁵ See *Fla. Dep't of Nat. Resources v. Garcia*, 753 So. 2d 72, 75 (Fla.2000) (a governmental entity operating a public swimming area owes the same operational-level duty to invitees as a private landowner – to maintain the premises in a reasonably safe condition and to warn the public of any dangerous conditions of which it knew or should have known); *Slemp v. City of North Miami*, 545 So. 2d 256, 258 (Fla. 1989) (duty to maintain and properly operate existing flood protection device); *Palm Beach Cnty. Bd. of Comm'rs v. Salas*, 511 So. 2d 544, 545 (Fla. 1987) (maintenance of intersection). Note, while severe weather events such as hurricanes are often considered “acts of God,” see *Goldberg v. Florida Power & Light Co.*, 899 So. 2d 1105, 1114 (Fla. 2005), the so-called “act of God” or *vis major* defense applies in Florida to limit liability for contractual obligations. See *Mailloux v. Briella Townhomes, LLC*, 3 So. 3d 394, 396 (Fla. 4th DCA 2009) (“In Florida, acts of God, impossibility of performance, and frustration of purpose are well-recognized defenses to nonperformance of a contract.”). By contrast, to what extent a weather or climate event relieves a tortfeasor of liability depends on the extent of the event’s reasonable foreseeability and whether the tortfeasor proximately contributed to the injuries or damages. See *Asgrow-Kilgore Co. v. Mulford Hickerson Corp.*, 301 So. 2d 441, 445 (Fla. 1974); see also *Skandia Ins. Co. v. Star Shipping*, 173 F. Supp. 2d 1228, 1243 (S.D. Ala. 2001) (the accident or damage must be unforeseeable and unavoidable to support the defense).

¹¹⁶ See generally Fla. Stat. § 768.14 (2022) (waiver of sovereign immunity in tort actions).

¹¹⁷ *Commercial Carrier Corp. v. Indian River Cnty.*, 371 So. 2d 1010, 1019 (Fla. 1979).

¹¹⁸ *Wallace*, 3 So. 3d at 1053-54. In addition, water management districts are statutorily immunized from suit for damages caused by the failure of a stormwater management system. See Fla. Stat. § 373.443 (2022) (immunizing “state or district. . . for the recovery of damages caused by the partial or total failure of any stormwater management system” or other works related to their management of water resources); Fla. Stat. § 373.403(10) (2022) (defining “stormwater management system” as one “designed and constructed or implemented to control discharges which are necessitated by rainfall events”); *Barnes v. Dist. Bd. of Trustees of St. Johns River State Coll.*, 147 So. 3d 102, 108 (Fla. 1st DCA 2014) (holding that “section 373.433 was intended to provide a broader scope of immunity” than that of the “[i]mmunity for . . . planning level activities [which] exists under section 768.28” under conditions “where a partial/total failure of a stormwater management system occurs and the failure arises from the control or regulation of the system”).

¹¹⁹ U.S. CONST. amend. V.

¹²⁰ See *Loretto*, 458 U.S. 419; *Lucas*, 505 U.S. at 1019 (1992); *Penn Central*, 438 U.S. at 124; *Nollan*, 483 U.S. 825.

¹²¹ *Patchen v. Fla. Dep't of Agric. & Consumer Servs.*, 906 So. 2d 1005, 1011 (Fla. 2005).

¹²² *Slemp v. City of N. Miami*, 545 So. 2d 256, 257-58 (Fla. 1989) (holding that “city’s alleged failure to maintain and operate its pumps properly is an operational level activity and is thus subject to traditional tort analysis,” and that while the city may not “in the abstract, [have] a duty to protect individual property owners from flooding due to natural causes, [o]nce the city has undertaken to provide such protection, by building a storm sewer pump system, for example, it assumes the responsibility to do so with reasonable care” such that “[i]f the city negligently fails to properly maintain or operate the system, it can be held liable for damage caused by that failure”); see also *Union Park Mem'l Chapel v. Hutt*, 670 So. 2d 64 66-67 (Fla. 1996) (“It is clearly established that one who undertakes to act, even when under no obligation to do so, thereby becomes obligated to act with reasonable care.”).

¹²³ *City of St. Petersburg v. Collum*, 419 So. 2d 1082 (Fla. 1982). But see *id.* at 1085 (holding that “defects inherent in the overall *plan* for an improvement, as approved by a governmental entity, are *not* matters that in and of themselves subject the entity to liability”) (emphasis added).

¹²⁴ *Id.* at 1086.

¹²⁵ See, e.g., *Orlando v. Broward Cnty.*, 920 So. 2d 54, 58 (Fla. 4th DCA 2005) (school board had sovereign immunity, even where it knew of hazardous walking routes surrounding a school, because, among other reasons, the school board “did not create the dangerous condition”); *Cutler v. City of Jacksonville Beach*, 489 So. 2d 126, 127-28 (Fla. 1st DCA 1986) (city had sovereign immunity from suit alleging the city failed to provide sufficient lifeguards at a beach location because the city did not create the dangerous condition which caused drowning); *Barrera v. State Dep't of Transp.*, 470 So. 2d 750, 751-52 (Fla. 3d DCA 1985) (Florida Department of Transportation had sovereign immunity from suit arising from a truck’s collision with a low-clearance bridge where the Department did not design or build the bridge).

¹²⁶ See *Sea Level Impact: Interactive Map*, CITY OF CORAL GABLES, available at <https://www.coralgables.com/departments/sustainability/sea-level-impact> (last visited Jan. 13, 2025).

¹²⁷ See *Dep't of Transp. v. Konney*, 587 So. 2d 1292, 1296 (Fla. 1991) (“The decision of whether to upgrade this intersection is a judgmental, planning-level function, to which absolute immunity applies.”); *Neilson*, 419 So. 2d at 1078 (“[T]he failure to properly maintain existing traffic control devices and existing roads may also be the basis of a suit against a governmental entity. We caution, however, that the maintenance of a particular street or intersection means maintenance of the street or intersection as it exists. It does not contemplate maintenance as the term may sometimes be used to indicate obsolescence and the need to upgrade a road by such things as widening or changing the means of traffic control.”).

¹²⁸ Compare *Drake v. Walton Cnty.*, 6 So. 3d 717, 720-21 (Fla. 1st DCA 2009) (holding that Walton County engaged in a taking of private property when it diverted water across owner’s property because the water diversion substantially interfered with the owner’s property rights for more than a momentary period, it was continuous or reasonably expected to continuously recur, and it resulted in a substantial deprivation of the beneficial use of the property) with *Hansen v. City of Deland*, 32 So. 3d 654 (Fla. 5th DCA 2010) (affirming trial court’s finding that city’s

pumping of water into a dry drainage basin on private property was not a compensable taking even though property remained partially flooded for about 15 months, because owners were allowed full use of their homes during the flooding and only a fraction of their yards were under water).

¹²⁹ *Ideker Farms v. United States*, 151 Fed.Cl. 560 (Fed. Cl. 2020).

¹³⁰ *Id.* at 584.

¹³¹ *Id.*

¹³² *Ideker Farms v. United States*, No. 21-1875, Fed. Cir. (filed Apr. 22, 2021); *see also* David Taylor, *Argument Recap - Ideker Farms v. United States*, FED CIRCUIT BLOG, Nov. 10, 2022, available at <https://fedcircuitblog.com/2022/11/10/argument-recap-ideker-farms-v-united-states/> (last visited Jan. 13, 2025).

¹³³ Alex Harris, *Miami Beach Is Raising Roads For Sea Rise. Lawsuits Say They're Causing Flooding Too*, WUSF Public Media, Nov. 13, 2021, available at <https://wusfnews.wusf.usf.edu/environment/2021-11-13/miami-beach-is-raising-roads-for-sea-rise-lawsuits-say-theyre-causing-flooding-too> (last visited Jan. 13, 2025).

¹³⁴ *Varcamp Properties, LLC, et al. v. City of Miami Beach*, Case No. 22-cv-21371-King/Damian (S.D.F.L. 2022).

¹³⁵ *Varcamp Properties, LLC, et al. v. City of Miami Beach*, Case No. 2022-024602-CA-01 (Fla. 11th Cir. Cir. 2022).

¹³⁶ *See also, e.g., Anhoco Corp. v. Dade Cnty.*, 144 So. 2d 793 (Fla. 1962) (inverse condemnation caused by County digging ditches in front of access points); *Palm Beach Cnty. v. Tessler*, 538 So. 2d 846 (Fla. 1989) (inverse condemnation caused by constructing a retaining wall in front of property); *Drake*, 6 So. 3d 717 (county diverted water across appellant's land to alleviate flooding elsewhere.)

¹³⁷ *Jordan v. St. Johns County*, 63 So. 3d 835, 839 (Fla. 5th DCA 2011).

¹³⁸ *Id.* at 838; *id.* at 839 (quoting *Palm Beach Cnty.*, 538 So. 2d at 849) (“There is a right to be compensated through inverse condemnation when governmental action causes a substantial loss of access to one’s property even though there is no physical appropriation of the property itself. It is not necessary that there be a complete loss of access to the property. However, the fact that a portion or even all of one’s access to an abutting road is destroyed does not constitute a taking unless, when considered in light of the remaining access to the property, it can be said that the property owner’s right of access was substantially diminished. The loss of the most convenient access is not compensable where other suitable access continues to exist.”).

¹³⁹ *Jordan*, 63 So. 3d at 838-39. *See also Litz v. Maryland Dept. of Environment*, 131 A.3d 923, 932 (Md. 2016) (favorably citing and discussing *Jordan*).

¹⁴⁰ *St. Bernard Parish Gov’t v. United States*, 887 F.3d 1354, 1360 (Fed. Cir. 2018).

¹⁴¹ *See* FLA. SEA GRANT, ENVIRONMENTALLY COMPROMISED ROAD SEGMENTS – A MODEL ORDINANCE (Oct. 2015), available at <https://www.flseagrant.org/publication/environmentally-compromised-road-segments-a-model-ordinance> (last visited Jan. 13, 2025).

¹⁴² *Id.* at Recitals at 2-3.

¹⁴³ *Id.* § 3.

¹⁴⁴ *Id.* § 5.

¹⁴⁵ MANUAL OF UNIFORM MINIMUM STANDARDS FOR DESIGN, CONSTRUCTION AND MAINTENANCE FOR STREETS AND HIGHWAYS, FLORIDA DEPARTMENT OF TRANSPORTATION, 2018, *available at* <https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/roadway/floridagreenbook/2018-florida-greenbook.pdf?> (last visited Jan. 13, 2025).

¹⁴⁶ *Id.* at 1-9.

¹⁴⁷ See Thomas Ruppert, Erin L. Deady, *et al.*, *Legal Issues When Managing Public Roads Affected By Sea Level Rise: Florida*, 2019, *available at* <https://www.flseagrant.org/wp-content/uploads/2022/10/FLORIDA-ROADSWHITEPAPER-FINAL-SPRING-2019.pdf> (last visited Jan. 13, 2025). For example, the white paper has a section on how and when local governments might be able to legally abandon roads under Florida law. *Id.* at 18-21.

¹⁴⁸ See *Jordan*, 63 So. 3d at 838; *Ecological Development, Inc. v. Walton Cnty.*, 558 So. 2d 1069, 1072 (Fla. 1st DCA 1990); Fla. Stat. § 95.361(2) (2022).

¹⁴⁹ *City of Lauderhill v. Rhames*, 864 So. 2d 432, 437 (Fla. 4th DCA 2003) (quoting *Nicholas v. Pa. State Univ.*, 227 F.3d 133, 139 (3d Cir. 2000)).

¹⁵⁰ See *Chicago Title Ins. Co. v. Butler*, 770 So. 2d 1210, 1214-15 (Fla. 2000) (“The test to be applied in determining whether a statute violates due process [when no fundamental constitutional rights are implicated] is whether the statute bears a rational relation to a legitimate legislative purpose in safeguarding the public health, safety, or general welfare and is not discriminatory, arbitrary, or oppressive.”).

¹⁵¹ *Haire v. Fla. Dep’t of Agric. & Consumer Servs.*, 870 So. 2d. 774, 786 (Fla. 2004).

¹⁵² *L. Maxcy, Inc. v. Mayo*, 139 So. 121, 131 (Fla. 1931).

¹⁵³ See also Abigail Corbett, Jason Koslowe, & Isabelle Lopez, *Sea Level Rise Adaptation: Funding Sources*, 34 ELULS REPORTER 8 (June 2017), *available at* <https://www.flseagrant.org/wp-content/uploads/2022/10/Seawalls-Sea-Level-Rise-Induced-Flooding.pdf> (last visited Jan. 13, 2025).

¹⁵⁴ See FLA. CONST. art. VII, § 9; *Gilreath v. Gen. Elec. Co.*, 751 So. 2d 705, 707 (Fla. 5th Dist. App. 2000).

¹⁵⁵ *Sarasota Cnty. v. Sarasota Church of Christ, Inc.*, 667 So. 2d 180, 183 (Fla. 1995).

¹⁵⁶ See *id.*

¹⁵⁷ Miami-Dade County 2024 Adopted Millage Rates, *available at* http://www.miamidade.gov/pa/millage_tables.asp (last visited Jan. 13, 2025).

¹⁵⁸ Pursuant to Article VII of the Florida Constitution, the municipal millage rate may be raised to 10 mills as a general matter, and above 10 mills under certain circumstances where the increase is approved by a vote of the electorate. See FLA. CONST. art. VII, § 9; see also *Bailey v. Ponce de Leon Port Auth.*, 398 So. 2d 812, 815 (Fla. 1981).

¹⁵⁹ Fla. Stat. § 170.01(1) (2022).

¹⁶⁰ Fla. Stat. § 170.201(1) (2022).

¹⁶¹ See *Desiderio Corp. v. City of Boynton Beach*, 39 So. 3d 487, 493 (Fla. 4th DCA 2010).

¹⁶² See *Collier Cnty. v. State*, 733 So. 2d 1012, 1017 (Fla. 1999) (quotation omitted); see also Fla. Stat. § 170.01(2) (2022); Fla. Stat. § 170.201(1) (2022).

¹⁶³ *Desiderio Corp.*, 39 So. 3d at 493 (quoting *Klemm v. Davenport*, 129 So. 904, 907 (Fla. 1930)).

¹⁶⁴ See *Lake Cnty. v. Water Oak Mgmt. Corp.*, 695 So. 2d 667, 670 (Fla. 1997); *Webb v. Scott*, 176 So. 442, 445-46 (Fla. 1936).

¹⁶⁵ See *Lake Cnty.*, 695 So. 2d at 670.

¹⁶⁶ See *id.* (fire protection services); *Quietwater Ent., Inc. v. Escambia Cnty.*, 890 So. 2d 525, 527 (Fla. 1st DCA 2005) (mosquito control services).

¹⁶⁷ SFRPC AAA POLICY OPTIONS, *supra* note 73, at 23.

¹⁶⁸ There are, at the most recent count, over 300 boats behind fixed bridges in the City, and many of those boats already cannot access the Bay except at low tide.

¹⁶⁹ *City of Gainesville v. State*, 863 So. 2d 138, 144 (Fla. 2003) (internal citation omitted).

¹⁷⁰ See *id.* See also *Discount Sleep of Ocala, LLC v. City of Ocala*, 300 So.3d 316, 322 (Fla. 5th DCA 2020) (holding that the “special benefit” required of a valid special assessment should be interpreted the same as the “benefit not shared by other members of the society” required for a valid user fee).

¹⁷¹ See *City of Gainesville*, 863 So. 2d at 144-45 (quoting 70C Am. Jur. 2d, *Special or Local Assessments*, at § 2 (2000)).

¹⁷² See *City of Gainesville*, 863 So. 2d at 145.

¹⁷³ See *I-4 Commerce Ctr., Phase II, Unit I v. Orange Cnty.*, 46 So. 3d 134, 136 (Fla. 5th DCA 2010).

¹⁷⁴ See *id.* at 136; Fla. Stat. § 180.13(2) (2022) (providing that municipalities are authorized to establish “just and equitable” utility rates). See also generally THOMAS RUPPERT & ALEX STEWART, SEA-LEVEL RISE ADAPTATION FINANCING AT THE LOCAL LEVEL IN FLORIDA § V.C. (2015), available at <https://www.flseagrant.org/publication/sea-level-rise-adaptation-financing-at-the-local-level-in-florida> (last visited Jan. 13, 2025).

¹⁷⁵ Fla. Stat. § 403.0893 (2022).

¹⁷⁶ Fla. Stat. § 403.031(17) (2022) (“‘Stormwater utility’ means the funding of a stormwater management program by assessing the cost of the program to the beneficiaries based on their relative contribution to its need.”).

¹⁷⁷ See *Setai Hotel Acquisition, LLC, et al. v. City of Miami Beach*, Case No. 2019-022086-CA-01 (Fla. 11th Cir. Cir. 2019).

¹⁷⁸ CITY OF CORAL GABLES’ 2024-2025 BUDGET, at 52, available at <https://www.coralgables.com/sites/default/files/2025-01/FY25%20Adopted%20Budget.pdf> (last visited Jan. 13, 2024).

¹⁷⁹ *Id.* at 51.

¹⁸⁰ *Id.* at 107.

¹⁸¹ *Id.*

¹⁸² *Id.*

¹⁸³ *Id.* at 108. See also CITY OF CORAL GABLES, 2024 STORM WATER SEA LEVEL RISE CAPITAL IMPROVEMENTS CHART, available at <https://www.coralgables.com/sites/default/files/2024-05/Storm-Water-Sea-Level-Rise-Pgm-Yr-8-CH.pdf> (last visited Jan. 23, 2025).

¹⁸⁴ See JESSICA GRANNIS, ADAPTATION TOOL KIT: SEA-LEVEL RISE AND COASTAL LAND USE (Dec. 2020), at 30, available at

https://www.georgetownclimate.org/files/report/Adaptation_Tool_Kit_SLR.pdf (last visited Jan. 13, 2025).

¹⁸⁵ *Nollan*, 483 U.S. 825.

¹⁸⁶ *Dolan v. City of Tigard*, 512 U.S. 374, 375 (1992). *See also* Section VI. E. regarding conditional development and exactions.

¹⁸⁷ Jessica Lipscomb, *Miami-Dade Could Ask Developers to Pay for Climate Change Costs*, MIAMI NEW TIMES, July 6, 2016, available at <http://www.miaminewtimes.com/news/miami-dade-could-ask-developers-to-pay-for-climate-change-costs-8576071> (last visited Jan. 13, 2025).

¹⁸⁸ Daniella Levine Cava, MEMO: REPORT REGARDING THE POTENTIAL USE OF IMPACT FEES TO ADDRESS THE EFFECTS OF SEA LEVEL RISE, MIAMI-DADE COUNTY, May 12, 2021, available at, <https://www.miamidade.gov/govaction/legistarfiles/Matters/Y2021/211208.pdf> (last visited Jan. 13, 2025).

¹⁸⁹ *See generally* Robert H. Freilich & Neil M. Popowitz, *How Local Governments Can Resolve Koontz's Prohibitions on Ad Hoc Land Use Restrictions*, 45 Urb. Law. 971, 983 (2013) (explaining why *voluntary* proffers made by developers to local governments to provide public facilities are generally not prohibited by federal case law).

¹⁹⁰ Fla. Stat. § 166.101(2)-(6) (2022).

¹⁹¹ Fla. Stat. § 166.111(1) (2022).

¹⁹² Fla. Stat. § 166.101(8) (2022); Fla. Op. Atty. Gen. 075-185 (June 19, 1975).

¹⁹³ *See Miccosukee Tribe of Indians of Florida v. S. Florida Water Mgmt. Dist.*, 48 So. 3d 811, 822 (Fla. 2010).

¹⁹⁴ *See* FLA. CONST. art. VII, § 12; Fla. Stat. § 200.181(1), (3) (2022); *S. Florida Water Mgmt. Dist.*, 48 So. 3d at 823.

¹⁹⁵ *See Green Bonds*, U.S. DEPARTMENT OF ENERGY'S BETTER BUILDINGS INITIATIVE, <https://betterbuildingssolutioncenter.energy.gov/financing-navigator/option/green-bonds> (last visited Jan. 13, 2025).

¹⁹⁶ *See DC Water's Environmental Impact Bond*, U.S. ENVIRONMENTAL PROTECTION AGENCY, Feb. 28, 2023, <https://www.epa.gov/waterfinancecenter/dc-waters-environmental-impact-bond> (last visited Jan. 13, 2025).

¹⁹⁷ *Id.*

¹⁹⁸ *Id.*

¹⁹⁹ *Research Announcement: Rising Sea Level Signals Need For US State And Local Governments To Address Growing Climate Risks*, MOODY'S INVESTORS SERVICE, Sept 17, 2020, https://www.moodys.com/research/Moodys-Rising-sea-level-signals-need-for-state-and-local--PBM_1245928 (last visited Jan. 13, 2025).

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- ²⁰⁴ *FEMA Pre-Disaster Mitigation (PDM)*, FEMA.GOV, <https://www.fema.gov/grants/mitigation/pre-disaster> (last visited Jan 13, 2025).
- ²⁰⁵ *Id.*; *FY 2023 Pre-Disaster Mitigation Congressionally Directed Spending: Project List*, FEMA.GOV, <https://www.fema.gov/grants/mitigation/pre-disaster/fy23-congressionally-directed-spending#projects> (last visited Jan. 13, 2025).
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- ²⁰⁷ *See Climate Resilience and Adaptation*, U.S. DEPARTMENT OF HOUSING & URBAN DEVELOPMENT, https://www.hud.gov/climate/resilience_and_adaptation (last visited Jan. 13, 2025).
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²²⁵ Fla. Stat. § 255.065 (2022) (previously codified at Fla. Stat. § 287.05712 (2013)).

²²⁶ Fla. Stat. § 255.065(1)(j), (2), (3)(d)(4) (2022).

²²⁷ Fla. Stat. § 255.065(2)(a) (2022).

²²⁸ Fla. Stat. § 255.065(8) (2022).

²²⁹ Fla. Stat. § 255.065(3)-(5) (2022).

²³⁰ See Rowilson, *supra* note 224, at 36 n.13.

²³¹ See *id.* at 36, 38-39. The winning private bidder, I-595 Express, LLC (“Express, LLC”), was selected from a field of four qualifying bidders. Express, LLC’s bidding package estimated total construction costs in an amount that was \$275 million less than FDOT’s own internal estimates and a delivery date of 5 years from commencement, as opposed to the 20 years estimated by FDOT. Under the agreement, Express, LLC assumed sole responsibility for the financing, construction, and operation of the I-595 corridor improvements and operation of toll roads for a 35-year term (with the cost of overruns to be born exclusively by the private entity). Upon completion of the project, FDOT was required to make to Express, LLC five lump sum payments in the aggregate amount of \$685 million and 30 annual “availability payments” from revenues generated from the operation of the toll roads. Estimates suggest that, under the arrangement, Express, LLC could be able to achieve an approximate return of 12 percent on its investment. *Id.*

²³² See RCAP IMPLEMENTATION GUIDANCE SERIES: REGIONAL IMPACTS OF CLIMATE CHANGE AND ISSUES FOR STORMWATER MANAGEMENT, *supra* note 32, at 33. Details about this infrastructure work in Miami Beach can be found at: *Climate Adaptation, Miami Beach Rising Above*, <https://www.mbrisingabove.com/climate-adaptation/> (last visited Jan. 13, 2025).

²³³ See *DEP Provides \$500,000 to Longboat Key for Beach Renourishment*, DEP NEWS, July 27, 2015, available at <https://content.govdelivery.com/accounts/FLDEP/bulletins/10e5c86> (last visited Jan. 13, 2025).

²³⁴ *Monroe County Roads Vulnerability Analysis: Project Description*, KEY ROADS PLAN, <https://www.keysroadsplan.com/project> (last visited Jan. 13, 2025).

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²³⁶ *Id.*

²³⁷ *Id.*

²³⁸ *\$2.6b Storm And Sea Level Rise Project On Tap For Florida Keys*, KEYS WEEKLY, Jan. 9, 2023, available at <https://keysweekly.com/42/2-6b-storm-and-sea-level-rise-project-on-tap-for-florida-keys/> (last visited Jan. 13, 2025).

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²⁴⁰ BUILDING CLIMATE RESILIENCE IN CITIES THROUGH INSURANCE, CLIMATE POLICY INITIATIVE, Sept. 2021, available at <https://www.climatepolicyinitiative.org/wp-content/uploads/2021/10/Building-Climate-Resilience-in-Cities-Through-Insurance.pdf> (last access Jan. 13, 2025).

²⁴¹ *Id.* at 12.

²⁴² *Id.*

²⁴³ *Id.* at 11.

²⁴⁴ *Id.* at 9, 11-12.

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- ²⁴⁵ See Fla. Stat. §§ 163.3177, 163.3178 (2022).
- ²⁴⁶ See Fla. Stat. §§ 163.3177(1)(f)(3), 163.3177(2), 163.3177(5)(a) (2022).
- ²⁴⁷ See Erin L. Deady & Thomas Ruppert, *The Link Between Future Flood Risk and Comprehensive Planning*, 37 ELULS REPORTER 7, 10 (Sept. 2015), available at <http://eluls.org/wp-content/uploads/2015/06/September-2015-Edition-Final.pdf> (last visited Jan. 13, 2025).
- ²⁴⁸ See *id.* at 10-11.
- ²⁴⁹ Fla. Stat. § 163.3177(1)(f) (2022).
- ²⁵⁰ *Id.*
- ²⁵¹ Fla. Stat. § 163.3177(1)(f)(2) (2022).
- ²⁵² *Id.*
- ²⁵³ *Haire v. Fla. Dep’t of Agric. & Consumer Servs.*, 870 So. 2d. 774, 786 (Fla. 2004).
- ²⁵⁴ *Id.*; *cf. Ethyl Corp. v. EPA*, 541 F.2d 1, 25 (D.C. Cir.), *cert. denied*, 426 U.S. 941 (1976) (“Awaiting [scientific] certainty will often allow for only reactive, not preventive, regulation.”).
- ²⁵⁵ Fla. Stat. § 163.3178(2)(f) (2022).
- ²⁵⁶ Fla. Stat. § 163.3178(2)(f)(1) (2022).
- ²⁵⁷ ORDINANCE: TEXT AMEND. TO COMP. PLAN COASTAL MANAGEMENT ELEMENT, CITY OF CORAL GABLES, Feb. 13, 2018, available at <https://coralgables.legistar.com/LegislationDetail.aspx?ID=3340420&GUID=7A603651-F60C-4552-95F2-1101D2BBABF0&Options=ID|Text|&Search=coastal+management> (last visited Jan. 14, 2025).
- ²⁵⁸ Fla. Stat. § 163.3191(1) (2022).
- ²⁵⁹ See *Rainbow River Conservation, Inc. v. Rainbow River Ranch, LLC*, 189 So. 3d 312, 313 (Fla. 5th DCA 2016); *Nassau Cnty. v. Willis*, 41 So. 3d 270, 276 (Fla. 1st DCA 2010). See also Fla. Stat. § 163.3161(6) (2022) (“[N]o public or private development shall be permitted except in conformity with comprehensive plans.”); Fla. Stat. § 163.3194(1)(a) (2022) (providing that, once a local government has adopted a comprehensive plan, “all development undertaken by, and all actions taken in regard to development orders by, governmental agencies in regard to land covered by such plan” must be consistent with that plan); Fla. Stat. § 163.3177(1) (2022) (providing that a comprehensive plan is to “provide the principles, guidelines, standards, and strategies for the orderly and balanced future economic, social, physical, environmental, and fiscal development of the area...” and to “establish meaningful and predictable standards for the use and development of land and provide meaningful guidelines for the content of more detailed land development and use regulations”). But see Fla. Stat. § 163.3167(5) (2022) (creating narrow exception for certain vested rights).
- ²⁶⁰ See *Willis*, 41 So. 3d at 276-78; Fla. Stat. § 163.3215 (2022).
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- ²⁶² KRYSTLE MACADANGDANG & MELISSA NEWMONS, SEA LEVEL RISE READY: MODEL COMPREHENSIVE PLAN GOALS, OBJECTIVES AND POLICIES, TO ADDRESS SEA-LEVEL RISE IMPACTS IN FLORIDA, UNIVERSITY OF FLORIDA CONSERVATION CLINIC, May 2010, available at

<https://research.fit.edu/media/site-specific/researchfitedu/coast-climate-adaptation-library/united-states/florida/gulf-coast/Macadangdang--Newmons.--2010.--SLR-Ready.pdf> (last visited Jan. 14, 2025).

²⁶³ *Id.*

²⁶⁴ Fla. Stat. § 163.3178(1) (2022). This requirement is based, in part, on a concern by the Legislature that, in the event of a natural disaster, the State may have to provide financial assistance to local governments for the reconstruction of roads, sewer systems, and other public facilities. *Id.*

²⁶⁵ Fla. Stat. § 163.3178(2)(j) (2022); *see also* Fla. Stat. § 163.3178(2)(a), (2)(b) (2022).

²⁶⁶ COMPREHENSIVE PLAN, CITY OF CORAL GABLES, *supra* note 261, at “Coastal Management Element.”

²⁶⁷ *Id.*

²⁶⁸ Fla. Stat. § 161.053(1)(a) (2022); *see also* FLA. ADMIN. CODE ch. 62B-33.

²⁶⁹ COMPREHENSIVE PLAN, CITY OF CORAL GABLES, *supra* note 261, at Objective CMT-1.1.

²⁷⁰ It has been reported that “[t]hree South Florida native plants are in imminent danger of extinction due to a complex of threats that are worsened by the effects of sea level rise.” *See* Ramona Young-Grindle, *Rising Sea Level Spurs Florida Plant Listings*, COURTHOUSE NEWS SERVICE, Oct. 25, 2013, available at <https://www.courthousenews.com/rising-sea-level-spurs-florida-plant-listings> (last visited Jan. 14, 2025).

²⁷¹ *See* Fla. Stat. ch. 161 (2022).

²⁷² Fla. Stat. § 163.3177(6)(a) (2022).

²⁷³ Fla. Stat. § 163.3177(6)(a)(8)(b) (2022).

²⁷⁴ COMPREHENSIVE PLAN, CITY OF CORAL GABLES, *supra* note 261, at Policy FLU-1.10.2.

²⁷⁵ *See* Fla. Stat. § 163.3177(6)(d)(2)(k) (2022).

²⁷⁶ Fla. Stat. § 163.3177(6)(g)(6-7) (2022).

²⁷⁷ *See The Consequences of Climate Change*, NASA.GOV, <http://climate.nasa.gov/effects> (last visited Jan. 14, 2025).

²⁷⁸ *See Fla. Dept. of Revenue v. City of Gainesville*, 918 So.2d 250, 263 (Fla. 2005) (“[The] broad construction of municipal powers remains in force under article VIII, section 2(b), in which the Legislature’s remaining authority is to limit, rather than authorize, municipal powers.”).

²⁷⁹ *Projects that Protect: Local Mitigation Strategy*, MIAMI-DADE COUNTY, <https://www.miamidade.gov/global/emergency/projects-that-protect.page> (last visited Jan. 14, 2025).

²⁸⁰ LOCAL MITIGATION PLANNING HANDBOOK, FEMA, Mar. 2013, available at https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-planning-handbook_03-2013.pdf (last visited Jan. 14, 2025); LOCAL MITIGATION STRATEGY UPDATE MANUAL, FLORIDA DIVISION OF EMERGENCY MANAGEMENT (2023), available at [https://portal.floridadisaster.org/mitigation/MitigateFL/External/Local%20Mitigation%20Strategy%20\(LMS\)/2023%20LMS%20Update%20Manual.pdf](https://portal.floridadisaster.org/mitigation/MitigateFL/External/Local%20Mitigation%20Strategy%20(LMS)/2023%20LMS%20Update%20Manual.pdf) (last visited Jan. 14, 2025).

²⁸¹ COMPREHENSIVE PLAN, CITY OF CORAL GABLES, *supra* note 261, at Objective CMT-3.1; *id.* at Policy SAF-2.3.1.

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- ²⁸² POST-DISASTER REDEVELOPMENT PLAN, CITY OF PANAMA CITY (2019), *available at* https://www.rebuildpc.org/wp-content/uploads/2019/12/City-of-Panama-City_Redevelopment-Plan_FINAL.pdf (last visited Jan. 14, 2025).
- ²⁸³ FLA. DEP’T OF CMTY. AFFAIRS, POST-DISASTER REDEVELOPMENT PLANNING, A GUIDE FOR FLORIDA COMMUNITIES (Oct. 2010), *available at* <https://www.floridadisaster.org/globalassets/importedpdfs/post-disaster-redevelopment-planning-guidebook-lo.pdf> (last visited Jan. 14, 2025).
- ²⁸⁴ FLA. DEP’T OF ECONOMIC OPPORTUNITY, POST-DISASTER REDEVELOPMENT PLANNING, ADDRESSING ADAPTATION DURING LONG-TERM RECOVERY, 2D REVISED ED. (June 2018), *available at* https://floridadep.gov/sites/default/files/PDRP_SLR_Guidebook_Update_FINAL_061518-v8.pdf (last visited Jan. 14, 2025).
- ²⁸⁵ Maria Rosa Higgins Fallon, *Celebrating 90 Years: Coral Gables Today*, MIAMI’S COMMUNITY NEWS, Oct. 26, 2015, *available at* <https://communitynewspapers.com/coral-gables-news/celebrating-90-years-coral-gables-today> (last visited Jan. 14, 2025).
- ²⁸⁶ *Id.*
- ²⁸⁷ Chrystian Tejedor, *Seas Are Now Rising Higher Than Some Buildings’ Underground Garages*, FIU NEWS, Dec. 9, 2021, *available at* <https://news.fiu.edu/2021/seas-are-now-rising-higher-than-some-buildings-underground-garages> (last visited Jan. 14, 2025).
- ²⁸⁸ Jon Schuppe, *Surfside Collapse Exposes An Overlooked Threat: Saltwater Rising From Underground*, NBC NEWS, Feb. 17, 2022, *available at* <https://www.nbcnews.com/news/us-news/surfside-condo-collapse-salt-groundwater-rcna16473> (last visited Jan. 14, 2025).
- ²⁸⁹ See Andres Viglucci, *After Surfside Collapse, A Push Not Just For More High-Rise Inspections But Smarter Ones*, MIAMI HERALD, Jan. 25, 2022, <https://www.miamiherald.com/news/special-reports/surfside-investigation/article256589236.html> (last visited Jan. 14, 2025).
- ²⁹⁰ Fla. Stat. § 163.3177(6)(g)(10) (2022) (emphasis added). See also Fla. Stat. § 163.3164(1) (2022).
- ²⁹¹ Fla. Stat. § 163.3164(1) (2022).
- ²⁹² Fla. Stat. § 163.3177(6)(g)(10) (2022).
- ²⁹³ SE. FLA. REG’L CLIMATE CHANGE COMPACT COUNTIES, A REGION RESPONDS TO A CHANGING CLIMATE, 2012 REGIONAL CLIMATE ACTION PLAN, App. B, Work Group Recommendations at 40, App. B-2 (Oct. 2012), *available at* <http://www.southeastfloridaclimatecompact.org/wp-content/uploads/2014/09/regional-climate-action-plan-final-ada-compliant.pdf> (last visited Jan. 14, 2025).
- ²⁹⁴ *Id.* at App. B-1 – B-2.
- ²⁹⁵ See MACADANGDANG & NEWMONS, *supra* note 262 (citing the Town of East Hampton, New York – Coastal Erosion Overlay District); GRANNIS, *supra* note 184, at 39-40.
- ²⁹⁶ SO. FLA. REG’L PLANNING COUNCIL, ADAPTATION ACTION AREAS: A PLANNING GUIDEBOOK FOR FLORIDA’S LOCAL GOVERNMENTS (Aug. 2015), [hereinafter “SFRPC AAA GUIDEBOOK”], *available at* <https://www.floridajobs.org/docs/default-source/2015-community-development/community-planning/crdp/aaaguidebook2015.pdf> (last visited Jan. 14, 2025). See also SFRPC AAA POLICY OPTIONS, *supra* note 73.
- ²⁹⁷ SFRPC AAA GUIDEBOOK, *supra* note 296, at 67.

²⁹⁸ *Id.* at 72-73; *see also id.* at App. 3 (containing a more detailed checklist).

²⁹⁹ VILLAGE OF PINECREST, COMPREHENSIVE DEVELOPMENT MASTER PLAN UPDATE: GOALS, OBJECTIVES, POLICIES, Chapter 10, at Objective 10-1.6 (2016), *available at* <https://www.pinecrest-fl.gov/files/sharedassets/village/v/1/government/building-and-planning/documents/comprehensive-development.pdf> (last visited Jan. 14, 2025).

³⁰⁰ CITY OF SATELLITE BEACH COMPREHENSIVE PLAN, at Policy 1.14.2, *available at* <https://cms8.revize.com/revize/satellitebeachfl/Departments/community%20development/Comp%20Plan%20Amended%2011-3-2021.pdf> (last visited Jan. 14, 2025).

³⁰¹ *See* THOMAS RUPPERT, ESQ. & ALEXANDER STEWART, SUMMARY AND COMMENTARY ON SEA-LEVEL RISE ADAPTATION LANGUAGE IN FLORIDA LOCAL GOVERNMENT COMPREHENSIVE PLANS AND ORDINANCE (July 2015), *available at* <https://perma.cc/7VU6-ZGF4> (last visited Jan. 14, 2025).

³⁰² *Id.* at 6.

³⁰³ *See* CITY OF FORT LAUDERDALE, 2023-2027 COMMUNITY INVESTMENT PLAN, 256-71, *available at* <https://www.fortlauderdale.gov/government/departments-i-z/office-of-management-and-budget/budget-cip-and-grants-division/community-investment-plans> (last visited Jan. 14, 2025); *Adaptation Action Areas*, GYR.FTLAUDERDALE.GOV, <http://gyr.fortlauderdale.gov/greener-government/climate-resiliency/innovative-pilot-projects/adaptation-action-areas> (last visited Jan. 14, 2025).

³⁰⁴ *See* MD. CODE ANN., NAT. RES. § 8-1802 (2019).

³⁰⁵ *See Glisson v. Alachua Cnty.*, 558 So. 2d 1030 (Fla. 1st DCA 1990), *rev. denied*, 570 So. 2d 1304 (Fla. 1990).

³⁰⁶ SFRPC AAA GUIDEBOOK, *supra* note 296, at 50, 73.

³⁰⁷ *See Tampa-Hillsborough Cnty. Expressway Auth. v. A.G.W.S. Corp.*, 640 So. 2d 54, 58 (Fla. 1994).

³⁰⁸ *See Penn Central*, 438 U.S. at 124.

³⁰⁹ *See id.*

³¹⁰ *See Shands*, 999 So. 2d at 723 (holding that analyzing “substantial deprivation of economic use or reasonable investment-backed expectations ... requires a fact-intensive inquiry of impact of the regulation on the economic viability of the landowner’s property by analyzing permissible uses before and after enactment of the regulation”) (internal citation omitted); *Rith Energy, Inc. v. U. S.*, 247 F.3d 1355, 1364 (Fed. Cir. 2001) (no taking where lessee did not have reasonable investment-backed expectations that it would not be subject to regulatory oversight at the time it acquired lease).

³¹¹ *See Palazzolo*, 533 U.S. at 633 (O’Connor, J., concurring) (“[T]he regulatory regime in place at the time the claimant acquires the property at issue helps to shape the reasonableness of those expectations.”)

³¹² *See Lucas*, 505 U.S. at 1031 (“The fact that a particular use has long been engaged in by similarly situated owners ordinarily imports a lack of any common-law prohibition (though changed circumstances or new knowledge may make what was previously permissible no longer so). So also does the fact that other landowners, similarly situated, are permitted to continue the use denied to the claimant.”); *Keshbro, Inc. v. City of Miami*, 801 So. 2d 864, 870 (Fla. 2001)

(“[A] regulation eliminating the value of private property effects a taking unless the purpose of the regulation is to control a public nuisance.”) (internal quotation omitted).

³¹³ *Palm Beach Mobile Homes, Inc. v. Strong*, 300 So. 2d 881, 884 (Fla. 1974). *See also Lingle v. Chevron USA, Inc.*, 544 U.S. 528, 538 (2005) (“Government hardly could go on if ... [property] values ... could not be diminished without paying for every such change in the ... law.”) (internal citation omitted).

³¹⁴ Fla. Stat. § 70.001(2) (2022).

³¹⁵ *See generally* Richard Grosso & Robert Hartsell, *Old MacDonald Still Has a Farm: Agricultural Property Rights After the Veto of S.B. 1712*, 79 FLA. B. J. 41, 44 (March 2005).

³¹⁶ *See id.*; *see also Royal World Metropolitan v. City of Miami Beach*, 863 So. 2d 320 (Fla. 3d DCA 2003) (making no ruling regarding what constitutes an “inordinate burden” but holding that sovereign immunity does not shield a local government from application of the Bert Harris Act).

³¹⁷ *See generally* THOMAS RUPPERT AND CHELSEA MILLER, SEA-LEVEL RISE ADAPTATION AND THE BERT J. HARRIS, JR., PRIVATE PROPERTY RIGHTS PROTECTION ACT, 50 STETSON L. REV. 585 (2021), available at <https://www.flseagrant.org/wp-content/uploads/2022/10/Ruppert.Miller.BertHarrisAct.pdf> (last visited Jan. 14, 2025).

³¹⁸ *See, e.g., Bair v. City of Clearwater*, 196 So. 3d 577, 582-83 (Fla. 2d DCA 2016).

³¹⁹ *See City of Jacksonville v. Smith*, 159 So. 3d 888, 889 (Fla. 1st DCA 2015); Fla. Stat. § 70.001(3)(e) (2022) (“The terms ‘inordinate burden’ and ‘inordinately burdened’ ... [d]o not include ... remediation of a public nuisance at common law....”).

³²⁰ *Ocean Concrete, Inc. v. Indian River County*, 241 So.3d 181, 189 (Fla. 4th Dist. 2018).

³²¹ *Palm Beach Polo, Inc. v. Village of Wellington*, 918 So.2d 988 (Fla. 4th DCA 2006); *City of Jacksonville v. Coffield*, 18 So.3d 589, 594 (Fla. 1st DCA 2009).

³²² *Ocean Concrete*, 241 So.3d at 189.

³²³ *Id.* at 190.

³²⁴ *See* CITY OF CORAL GABLES, FL, ZONING CODE, § 14-214.1, available at <https://codehub.gridics.com/us/fl/coral-gables> (last visited Jan. 14, 2025).

³²⁵ *Id.*

³²⁶ *Id.* at §§ 14-214.6(C), 14-214.7.

³²⁷ *See, e.g., In re Forfeiture of 1969 Piper Navajo*, 570 So. 2d 1357, 1359 (Fla. 4th DCA 1990) (“If a statute is unreasonable, arbitrary, and capricious, it violates substantive due process rights guaranteed by the United States and Florida Constitutions.”) (citing *State v. Saiez*, 489 So. 2d 1125 (Fla. 1986)).

³²⁸ *See, e.g., Town of Hialeah Gardens v. Hebraica Cmty. Center, Inc.*, 309 So. 2d 212 (Fla. 3d DCA 1975); *Graham v. Estuary Properties, Inc.*, 399 So. 2d 1374, 1381 (Fla. 1981), *cert. denied, sub. nom., Taylor v. Graham*, 454 U.S. 1083 (1981).

³²⁹ *See, e.g., Graham*, 399 So. 2d 1374; *see also Glisson*, 558 So. 2d at 1035.

³³⁰ *Lasky v. State Farm Ins. Co.*, 296 So. 2d 9, 15-16 (Fla. 1974) (internal citation omitted).

³³¹ *See, e.g., Tomblin v. Town of Palm Beach*, 552 So. 2d 1182, 1183 (Fla. 4th DCA 1989)

³³² *Jordan*, 63 So. 3d at 837.

³³³ Overlay zones and many other adaptation regulatory tools are discussed in detail in the Georgetown Climate Center’s Adaptation Tool Kit publication, GRANNIS, *supra* note 184, at 19-44.

³³⁴ See CITY OF CORAL GABLES, FL, ZONING CODE, § 2-302, available at <https://codehub.gridics.com/us/fl/coral-gables> (last visited Jan. 14, 2025).

³³⁵ SFRPC AAA POLICY OPTIONS, *supra* note 73.

³³⁶ Grosso & Hartsell, *supra* note 315.

³³⁷ MACADANGDANG & NEWMONS, *supra* note 262.

³³⁸ *Id.*

³³⁹ See THOMAS RUPPERT, ESQ., PLANNING FOR SEA LEVEL RISE IN THE MATANZAS BASIN, APPENDIX H2: PLANNING FOR SEA LEVEL RISE TOOLKIT (June 2015), available at <https://planningmatanzas.files.wordpress.com/2012/06/h2-planning-for-sea-level-rise-toolkit.pdf> (last visited Jan. 14, 2025).

³⁴⁰ See CITY OF CORAL GABLES, FL, ZONING CODE, Appendix A, available at <https://codehub.gridics.com/us/fl/coral-gables> (last visited Jan. 14, 2025).

³⁴¹ Fla. Stat. 70.001(3)(e)(2) (2022).

³⁴² See *Penn Central*, 438 U.S. 104; *Goldblatt v. Town of Hempstead*, 369 U.S. 590 (1962); Fla. Stat. § 70.001(2) (2022). See also *Graham*, 399 So. 2d 1374 (upholding a development order that required half of a mangrove forest to remain undeveloped, because the action served a legitimate governmental purpose and still allowed the landowner to enjoy an economically viable use on the property as a whole; and stating that “an owner of land has no absolute and unlimited right to change the essential natural character of his land so as to use it for a purpose for which it was unsuited in its natural state and which injures the rights of others”).

³⁴³ See *Martin Cnty v. Yusem*, 690 So. 2d 1288, 1295 (Fla. 1997); *Smith v. City of Clearwater*, 383 So. 2d 681 (Fla. 2d D.C.A. 1980), *aff’d*, 403 So. 2d 407 (Fla. 1981).

³⁴⁴ *Glisson*, 558 So. 2d at 1037. See also Grosso & Hartsell, *supra* note 315, at 3.

³⁴⁵ *Lee County v. Morales*, 557 So. 2d 652, 655 (Fla. 2d DCA 1990), *rev. denied*, 564 So. 2d 1086 (Fla. 1990). See also Michael Allan Wolf, *Strategies for Making Sea-Level Rise Adaptation Tools “Takings-Proof,”* 28 J. LAND USE & ENVTL. L. 157, 176 (Spring 2013) available at <https://scholarship.law.ufl.edu/cgi/viewcontent.cgi?article=1425&context=facultypub> (last visited Jan. 14, 2025) (“The use of overlay zoning to impose greater restrictions on environmentally sensitive properties (floodplains, wetlands, critical habitat for protected species, and the like) has become routine in American cities and counties, and the Takings Clause has not posed a significant barrier for governments who pursue this strategy. Neither does the typical downzoning of a group of undeveloped parcels—that is, the imposition of more intense use (and perhaps height and area) restrictions by changing the zoning classification—warrant serious consideration by courts in which landowners cry ‘taking.’ Ever since the United States Supreme Court established in its 1926 decision in *Village of Euclid v. Ambler Realty Co.*[, 272 U.S. 365 (1926),] ‘that there is no fundamental constitutional right to the speculative value of a piece of property,’ landowners seeking to maximize their investment in real estate have for the most part been frustrated in their attempts to use the Due Process, Equal Protection, and Takings Clauses to reverse zoning and other comprehensive, expert-based, state and local land use restrictions.”).

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- ³⁴⁶ *City of Lauderdale*, 864 So. 2d at 437-38.
- ³⁴⁷ See SFRPC AAA POLICY OPTIONS, *supra* note 73.
- ³⁴⁸ See Fla. Stat. §§ 553.73(4)(a), (b) (2022).
- ³⁴⁹ A REGION RESPONDS TO A CHANGING CLIMATE, 2012 REGIONAL CLIMATE ACTION PLAN, *supra* note 293, at App. B-2.
- ³⁵⁰ SFRPC AAA POLICY OPTIONS, *supra* note 73.
- ³⁵¹ See NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE MANUAL § Lowest Floor Guide (May 2011), available at http://www.fema.gov/pdf/nfip/manual201105/content/07_lfg.pdf (last visited Jan. 14, 2025).
- ³⁵² CITY OF CORAL GABLES, FL, ZONING CODE, § 5-701(D), available at <https://codehub.gridics.com/us/fl/coral-gables> (last visited Jan. 14, 2025).
- ³⁵³ *Id.* at § 5-701(E).
- ³⁵⁴ CITY OF CORAL GABLES, FL, CODE, § 113-10(b)(6), (2021), available at https://www.municode.com/library/fl/coral_gables/codes/code_of_ordinances?nodeId=SPBLADERE_CH113FLDAPR (last visited Jan. 14, 2025).
- ³⁵⁵ *Id.* at § 113-1(e).
- ³⁵⁶ See CITY OF KEY WEST, FL, CODE, § 108-997 (2023), available at https://library.municode.com/fl/key_west/codes/code_of_ordinances (last visited Jan. 14, 2025). See also Justin Nobel, *Keeping A Rising Sea At Bay*, AUDUBON MAGAZINE, Sept.-Oct. 2014, available at <http://www.audubon.org/magazine/september-october-2014/keeping-rising-sea-bay> (last visited Jan. 14, 2025).
- ³⁵⁷ Reed Kariam, *Can Miami Design a Solution to Rising Seas?*, ARCHITECT MAGAZINE, July 10, 2019, https://www.architectmagazine.com/practice/can-miami-design-a-solution-to-rising-seas_o (last visited Jan. 14, 2025).
- ³⁵⁸ *Id.*
- ³⁵⁹ *Id.*
- ³⁶⁰ See *Westland Skating Center, Inc. v. Gus Machado Buick, Inc.*, 542 So. 2d 959, 962-63 (Fla. 1989); *Coachwood Colony MHP, LLC v. Kironi, LLC*, 263 So.3d 263, 264-65 (Fla. 5th DCA 2019).
- ³⁶¹ See *To Combat Rising Seas, Why Not Raise Up The Town?*, NATIONAL PUBLIC RADIO (May 3, 2013), available at <http://www.npr.org/2013/05/03/180824410/to-combat-rising-seas-why-not-raise-up-the-town> (last visited Jan. 14, 2025).
- ³⁶² See 42 U.S.C. §§ 12132, 12182. See also 28 CFR Pt. 35, Appendix A & B; 28 CFR Pt. 36, Appendix A.
- ³⁶³ See 42 U.S.C. § 3601, *et seq.*
- ³⁶⁴ See Florida Accessibility Code for Building Construction, adopted pursuant to Fla. Stat. § 553.503.
- ³⁶⁵ See Joey Flechas & Jenny Staletovich, *Miami Beach's Battle to Stem Rising Tides*, MIAMI HERALD, Oct. 23, 2015, available at <http://www.miamiherald.com/news/local/community/miami-dade/miami-beach/article41141856.html> (last visited Jan. 14, 2025).

³⁶⁶ See CITY OF CORAL GABLES, FL, ZONING CODE, art. 8, available at <https://codehub.gridics.com/us/fl/coral-gables> (last visited Jan. 14, 2025).

³⁶⁷ RESILIENT HERITAGE IN THE NATION’S OLDEST CITY: FINAL REPORT, CITY OF ST. AUGUSTINE, FL, Aug. 2020, available at <https://www.citystaug.com/DocumentCenter/View/4058/St-Augustine-Resilient-Heritage-Report> (last visited Jan. 14, 2025).

³⁶⁸ Fla. Stat. § 553.8991 (2024).

³⁶⁹ Fla. Stat. § 553.8991(3)(b) (2024).

³⁷⁰ The battle over the Port of Miami dredge project and its effect on rare coral in Biscayne Bay is one example of this issue. See Press Release, New study finds over half a million corals killed during Port of Miami dredging, USF COLLEGE OF MARINE SCIENCE, May 29, 2019, available at <https://www.usf.edu/marine-science/news/2019/new-study-finds-over-half-a-million-corals-killed-during-port-of-miami-dredging.aspx> (last visited Jan. 14, 2025). See also *Surfrider Foundation, Inc. v. Town of Palm Beach*, FL Division of Admin. Hearings, Case No. 08-1511, FL Dep’t of Env’tl. Protection Admin. Consolidated Final Order, July 15, 2009, available at https://www.doah.state.fl.us/ROS/2008/08001511_AFO.pdf (last visited Jan. 14, 2025) (denying Palm Beach a permit for beach fill and restoration because it failed to provide reasonable assurance that water resources would not be harmed and failed to mitigate for environmental impacts).

³⁷¹ RESILIENT HERITAGE IN THE NATION’S OLDEST CITY: FINAL REPORT, *supra* note 367, at 43-52.

³⁷² See, e.g., Elizabeth Kolbert, *The Siege of Miami*, THE NEW YORKER, Dec. 21 & 28, 2015, available at <http://www.newyorker.com/magazine/2015/12/21/the-siege-of-miami> (last visited Jan. 14, 2025).

³⁷³ Shira Rubin, *In Amsterdam, A Community Of Floating Homes Shows The World How To Live Alongside Nature*, WASHINGTON POST, Dec. 17, 2021, available at <https://www.washingtonpost.com/climate-solutions/interactive/2021/amsterdam-floating-houses-schoonschip/> (last visited Jan. 14, 2025).

³⁷⁴ Leanna Garfield, *Bangkok Is Sinkifng, So It Built A Park That Holds A Million Gallons Of Rainwater To Help Prevent Flooding*, BUSINESS INSIDER, Aug 1, 2018, <https://www.businessinsider.com/bangkok-park-holds-a-million-gallons-of-rainwater-to-prevent-flooding-2018-7#the-park-features-several-characteristics-that-help-it-retain-and-redirect-floodwaterthat-would-otherwise-flow-into-city-streets-2> (last visited Jan. 14, 2025).

³⁷⁵ *Platform Cities*, BORGES ARCHITECTS, 2022, <https://www.borgesarchitects.com/platform-cities> (last visited Jan. 14, 2025); Reed Kariam, *Can Miami Design a Solution to Rising Seas?*, ARCHITECT MAGAZINE, July 10, 2019, https://www.architectmagazine.com/practice/can-miami-design-a-solution-to-rising-seas_o (last visited Jan. 14, 2025).

³⁷⁶ Alex Harris, *Miami Beach Has a Bold Idea to Fight Sea Rise: Turn a Golf Course into Wetlands*, TAMPA BAY TIMES, Sept. 23, 2019, available at <https://www.tampabay.com/news/environment/2019/09/23/miami-beach-has-a-bold-idea-to-fight-sea-rise-turn-a-golf-course-into-wetlands/> (last visited Jan. 14, 2025).

³⁷⁷ *Id.*

³⁷⁸ These, and many other adaptation tools, are discussed in the Georgetown Climate Center’s Adaptation Tool Kit publication, GRANNIS, *supra* note 184, at 2-4.

³⁷⁹ SFRPC AAA POLICY OPTIONS, *supra* note 73.

³⁸⁰ An ecotone is a region of transition between two biological communities. *See* MERRIAM-WEBSTER ONLINE DICTIONARY (2022), MERRIAM-WEBSTER, <http://www.merriam-webster.com/dictionary/ecotone> (last visited Jan. 14, 2025).

³⁸¹ MACADANGDANG & NEWMONS, *supra* note 262.

³⁸² *See, e.g.*, CITY OF CORAL GABLES, FL, ZONING CODE, § 2-101(D)(4); *id.* § 2-102(D)(4); *id.* § 2-103(D)(4); *id.* § 2-104(D)(4); *id.* § 2-105(D)(4); *id.* § 2-402(B)(3); *id.* § 3-415(5); *id.* § 5-102(A)(5), available at <https://codehub.gridics.com/us/fl/coral-gables> (last visited Jan. 14, 2025).

³⁸³ *See* GRANNIS, *supra* note 184, at 26-28.

³⁸⁴ *Id.* at 29.

³⁸⁵ *See id.*; *see also* SFRPC AAA POLICY OPTIONS, *supra* note 73.

³⁸⁶ *Nollan*, 483 U.S. 825 (holding that a government could, without paying compensation, demand an easement as a condition for granting a development permit the government was entitled to deny, provided that the exaction would substantially advance the *same* government interest that would furnish a valid ground for denial of the permit).

³⁸⁷ *Dolan v. City of Tigard*, 512 U.S. 374, 375 (1992). *See also Koontz v. St. Johns River Water Management District*, 133 S. Ct. 2586, 2589 (2013) (holding that the government’s demand for property from a land-use permit applicant must satisfy the requirements of *Nollan* and *Dolan* even when the government denies the permit and even when its demand is for money). *See also* COMPREHENSIVE PLAN, CITY OF CORAL GABLES, *supra* note 261, at Policy CIE-1.6.3 (“The City will collect funds through the authority of the impact fee ordinance to support public facilities which have a ‘rational nexus’ to and provide a benefit for new development on which impact fees are imposed.”).

³⁸⁸ J. Peter Byrne, *Climate Exactions*, 75 MARYLAND L. REV. 758 (2016), available at <http://scholarship.law.georgetown.edu/facpub/1668/> (last visited Jan. 14, 2025).

³⁸⁹ *Id.* at 777.

³⁹⁰ *See* Fla. Stat. § 70.45 (2022).

³⁹¹ *See* GRANNIS, *supra* note 184, at 29.

³⁹² *Id.* at 32.

³⁹³ *Id.* at 31.

³⁹⁴ *Id.* at 32; SFRPC AAA POLICY OPTIONS, *supra* note 73.

³⁹⁵ MACADANGDANG & NEWMONS, *supra* note 262.

³⁹⁶ *See* FEMA, ANSWERS TO QUESTION ABOUT THE NFIP, at 20, 35 (Mar. 2022), available at <https://agents.floodsmart.gov/sites/default/files/fema-answers-to-questions-about-the-NFIP.pdf> (last visited Jan. 14, 2025).

³⁹⁷ *Id.* at 21.

³⁹⁸ *See, e.g., Esposito v. S. Carolina Coastal Council*, 939 F.2d 165, 170 (4th Cir. 1991) (holding that no taking occurs when a regulation deprives an owner of the right to rebuild a house if it is ever destroyed by a storm, in part because existing uses are still permitted and the future impact on those uses remains speculative); *Smith v. City of Clearwater*, 383 So. 2d 681, 685 (Fla. 2d DCA 1980) (“Appellants also argue that the ordinance which rezoned their wetlands as aquatic lands

constituted a ‘taking’ for public use.... While there is no doubt that appellants will not be able to do much with their wetlands in the face of aquatic zoning, there wasn’t very much they could have done with this land without such zoning. Except for a thirty foot strip above the high water mark, all of the property involved was submerged land.”). *See also* James Titus, *Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches Without Hurting Property Owners*, 57 MD. L. REV. 1279, 1349-52 (1998) (stating that “a regulation that eventually curtails the useful lifetime of real property is less likely to be a taking than a regulation requiring an immediate curtailment”).

³⁹⁹ GRANNIS, *supra* note 184, at 36-40.

⁴⁰⁰ *See, e.g.* NRC, MITIGATING SHORE EROSION ON SHELTERED COASTS 95 (2007), available at http://www.nap.edu/catalog.php?record_id=11764 (last visited Jan. 14, 2025); REBECCA STAMSKI, THE IMPACTS OF COASTAL PROTECTION STRUCTURES IN CALIFORNIA’S MONTEREY BAY NATIONAL MARINE SANCTUARY 3-12 (Feb. 2005), available at http://sanctuaries.noaa.gov/special/con_coast/stamski.pdf (last visited Jan. 14, 2025).

⁴⁰¹ *See* John Gibeaut, *Up Against the Sea Wall*, ABA JOURNAL (Jun. 11, 2006), http://www.abajournal.com/magazine/article/up_against_the_seawall/ (last visited Jan. 14, 2025); U.S. ENVIRONMENTAL PROTECTION AGENCY, SYNTHESIS OF ADAPTATION OPTIONS FOR COASTAL AREAS 12 (2009), available at <https://www.epa.gov/cre/synthesis-adaptation-options-coastal-areas> (last visited Jan. 14, 2025).

⁴⁰² As noted in Section VI.E above, there must be an “essential nexus” or “reasonable connection” between a dedication or impact fee and the anticipated needs of the impacted community due to the new development (e.g., due to the armoring). *See also* *Volusia Cnty. v. Aberdeen at Ormond Beach, L.P.*, 760 So. 2d 126, 134 (Fla. 2000); *St. Johns Cnty. v. Ne. Florida Builders Ass’n, Inc.*, 583 So. 2d 635, 637 (Fla. 1991).

⁴⁰³ *Wald Corp. v. Metropolitan Dade Cnty.*, 338 So. 2d 863, 868 (Fla. 3d DCA 1976).

⁴⁰⁴ *Ocean Harbor House Homeowners Ass’n v. Cal. Coastal Comm’n*, 163 Cal.App.4th 215, 237 (2008).

⁴⁰⁵ CITY OF CORAL GABLES, FL, ZONING CODE, § 3-706, available at <https://codehub.gridics.com/us/fl/coral-gables> (last visited Mar. 27, 2023).

⁴⁰⁶ *See* FREQUENTLY ASKED QUESTIONS – SEAWALL ORDINANCE IMPLEMENTATION, CITY OF FORT LAUDERDALE (Oct. 2, 2017), available at <https://gyr.fortlauderdale.gov/home/showpublisheddocument/25431/636427024349900000> (last visited Jan. 14, 2025) (explaining scope of ordinance, which includes a new minimum height requirement of 3.9 feet NAVD88 for new seawalls, for damaged seawalls requiring substantial repair, and for areas cited for allowing tidal waters to enter and impact adjacent properties).

⁴⁰⁷ Press Release, Miami Beach Commission Adopts First Seawall Ordinance of its Kind, CITY OF MIAMI BEACH, Jan. 13, 2021, available at <https://www.miamibeachfl.gov/wp-content/uploads/2021/01/Miami-Beach-Commission-Adopts-Seawall-Ordinance-.pdf> (last visited Jan. 14, 2025).

⁴⁰⁸ MACADANGDANG & NEWMONS, *supra* note 262.

⁴⁰⁹ To the extent soft armoring involves placing any fill in navigable waters – such as by expanding or creating sand dunes – such action may also require a U.S. Army Corps of Engineers permit in addition to other federal, state, and local permissions. *See generally* NRC, MITIGATING

SHORE EROSION ON SHELTERED COASTS 104-108 (2007), *available at* http://www.nap.edu/catalog.php?record_id=11764 (last visited Jan. 14, 2025).

⁴¹⁰ *Living Shorelines Homeowner Incentive Pilot Program*, CITY OF SATELLITE BEACH, https://satellitebeach.org/residents/sustainable_satellite/projects_programs/living_shorelines_homeowner_incentive_pilot_program.php (last visited Jan. 14, 2025).

⁴¹¹ SARASOTA COUNTY CODE § 54-721(a)(6) (2022), *available at* https://library.municode.com/fl/sarasota_county/codes/code_of_ordinances (last visited Jan. 14, 2025).

⁴¹² *Resilient Florida Program: Living Shorelines*, FL DEP'T OF ENVTL. PROTECTION, <https://floridadep.gov/rcp/resilient-florida-program/content/resilient-florida-program-living-shorelines> (last visited Jan. 14, 2025).

⁴¹³ *See Millender v. State DOT*, 774 So. 2d 767, 768 (Fla. 1st DCA 2000) (plaintiff was not barred by statute of limitations from bringing inverse condemnation action for land erosion due to government's rerouting of river where one government agency forced plaintiff to remove sea-wall constructed to stop that erosion; remanded for consideration of that action).

⁴¹⁴ *See* Section IV. B., *supra*. *See also* JON A. KUSLER, ASFPM, A COMPARATIVE LOOK AT PUBLIC LIABILITY FOR FLOOD HAZARD MITIGATION 4 (2009), *available at* <https://biotech.law.lsu.edu/blog/Kusler2008.pdf> (last visited Jan. 14, 2025).

⁴¹⁵ Fla. Stat. ch. 259 (2022) (Florida Land Conversation Act; Florida Preservation 2000 Act; Florida Forever Act).

⁴¹⁶ *See* NOAA, OFFICE OF OCEAN & COASTAL RESOURCE MANAGEMENT, ADAPTING TO CLIMATE CHANGE: A PLANNING GUIDE FOR STATE COASTAL MANAGERS 70 (2010), *available at* <https://coast.noaa.gov/data/czm/media/adaptationguide.pdf> (last visited Jan. 14, 2025); FEMA, PROPERTY ACQUISITION HANDBOOK FOR LOCAL COMMUNITIES (Oct. 1998), *available at* <https://www.fema.gov/pdf/government/grant/resources/hbfullpak.pdf> (last visited Jan. 14, 2025).

⁴¹⁷ GRANNIS, *supra* note 184, at 47.

⁴¹⁸ MACADANGDANG & NEWMONS, *supra* note 262. An analysis of the benefits and hurdles with utilizing land acquisition program in Florida, *see* Thomas Ruppert, John Fergus, and Enio Russe-Garcia, *Managing Property Buyouts at the Local Level: Seeking Benefits and Limiting Harms*, ENVIRONMENTAL LAW INSTITUTE, 2018, *available at* <https://www.flseagrant.org/publication/managing-property-buyouts-at-the-local-level-seeking-benefits-and-limiting-harms/> (last visited Jan. 14, 2025).

⁴¹⁹ *Id.*

⁴²⁰ *Sea Level Impact: Interactive Map*, CITY OF CORAL GABLES, *available at* <https://www.coralgables.com/departments/sustainability/sea-level-impact> (last visited Jan. 14, 2025).

⁴²¹ *See* MACADANGDANG & NEWMONS, *supra* note 262, at Policy 4.3.2.

⁴²² SFRPC AAA POLICY OPTIONS, *supra* note 73.

⁴²³ *See* THOMAS RUPPERT, ESQ., USE OF FUTURE INTERESTS IN LAND AS A SEA-LEVEL RISE ADAPTATION STRATEGY IN FLORIDA 3, *available at* https://www.flseagrant.org/wp-content/uploads/2022/10/Use-of-Future-Interests_8.8.12.pdf (last visited Jan. 14, 2025).

⁴²⁴ See *Florida Forever*, FL DEP’T OF ENVTL. PROTECTION, <https://floridadep.gov/lands/environmental-services/content/florida-forever> (last visited Jan. 14, 2025).

⁴²⁵ NOAA, OFFICE OF OCEAN AND COASTAL RESOURCE MANAGEMENT, COASTAL AND ESTUARINE LAND CONSERVATION PROGRAM FINAL GUIDELINES (June 2003), <https://coast.noaa.gov/data/czm/media/CELCPfinal02Guidelines.pdf> (last visited Jan. 14, 2025).

⁴²⁶ U.S. Fish and Wildlife Serv. (USFWS), *National Coastal Wetlands Conservation Grant Program*, <https://www.fws.gov/service/national-coastal-wetlands-conservation-grants> (last visited Jan. 14, 2025); USFWS, NATIONAL COASTAL WETLANDS CONSERVATION GRANT PROGRAM FACT SHEET (June 2022), https://www.fws.gov/sites/default/files/documents/2022-NCWCGP-Factsheet-508-compliant-2022-05-23_0.pdf (last visited Jan. 14, 2025).

⁴²⁷ See JAMES FRASER, *ET AL.*, IMPLEMENTING FLOODPLAIN LAND ACQUISITION PROGRAMS IN URBAN LOCALITIES, Center for Urban & Regional Studies, UNC Chapel Hill, report prepared for FEMA and National Science Foundation, at 7-8 (2003), available at https://www.researchgate.net/publication/237546980_Implementing_Floodplain_Land_Acquisition_Programs_in_Urban_Localities (follow “Download full-text PDF” hyperlink) (last visited Jan. 14, 2025). See also *Hazard Mitigation Assistance Grants*, FEMA.GOV, <https://www.fema.gov/grants/mitigation> (last visited Jan. 14, 2025).

⁴²⁸ *Alachua County Forever*, ALACHUA COUNTY, May 2022, <https://alachuacounty.us/Depts/landconservation/Pages/LandConservation.aspx> (last visited Jan. 14, 2025).

⁴²⁹ *Id.*

⁴³⁰ *Infrastructure Surtax*, ALACHUA COUNTY, <https://alachuacounty.us/Depts/Communications/Documents/ADACompliant/surtaxFactSheet.pdf> (last visited Jan. 14, 2025).

⁴³¹ *Id.*

⁴³² *Land Acquisition Program*, TOWN OF JUPITER, <https://www.jupiter.fl.us/1626/Land-Acquisition-Program> (last visited Jan. 14, 2025).

⁴³³ *Id.*

⁴³⁴ See *State v. Miami Beach Redevelopment Agency*, 392 So. 2d 875, 886 (Fla. 1980) (“The legislature has determined that projects using eminent domain to clear blighted areas and providing for the ultimate disposition of substantial portions of the acquired properties for use by private concerns in profit-making activities serve a public purpose. This determination, while not conclusive, is presumed valid and should be upheld unless it is arbitrary or unfounded unless it is so clearly erroneous as to be beyond the power of the legislature.”); *Broward Cnty. v. Ellington*, 622 So. 2d 1029, 1032 (Fla. 4th DCA 1993) (“[A] condemning authority satisfies its initial burden of proof concerning a reasonable necessity for condemnation by presenting evidence that it considered relevant factors, such as alternative sites, costs, long-range area planning, environmental and safety considerations, in making its decision.”).

⁴³⁵ See *Dade Cnty. v. Gen. Waterworks Corp.*, 267 So. 2d 633, 639 (Fla. 1972) (“[T]he proper valuation method or methods for any given [eminent domain] case are inextricably bound up with the particular circumstances of the case.”); see also Sorrell E. Negro, *Preparing, Adapting and*

Rebuilding: Rising Sea Levels Raise New Legal Concerns, 27 PROBATE & PROPERTY MAGAZINE 6 (Nov./Dec. 2013).

⁴³⁶ Thomas Kaplan, *Cuomo Seeking Home Buyouts in Flood Zones*, N.Y. TIMES, Feb. 3, 2013, available at http://www.nytimes.com/2013/02/04/nyregion/cuomo-seeking-home-buyouts-in-flood-zones.html?emc=eta1&_r=2& (last visited Jan. 14, 2025).

⁴³⁷ Pete Brush, *Smaller Sandy Buyout Sparks Fears over Future Storm Costs*, LAW360, May 14, 2013, available at <http://www.law360.com/articles/441547/smaller-sandy-buyout-sparks-fears-over-future-storm-costs> (last visited Jan. 14, 2025).

⁴³⁸ Kaplan, *supra* note 436.

⁴³⁹ Zak Koeske, *Three Years After Hurricane Sandy, Fox Beach Inches Toward Desolation*, S.I. LIVE, Oct. 26, 2015, available at https://www.silive.com/news/2015/10/3_years_after_sandy_fox_beach.html (last visited June 14, 2025).

⁴⁴⁰ GRANNIS, *supra* note 184, at 50-51.

⁴⁴¹ Fla. Stat. § 704.06(3) (2022).

⁴⁴² Fla. Stat. § 704.06(4)-(5) (2022).

⁴⁴³ Fla. Stat. § 704.06(4) (2022).

⁴⁴⁴ Fla. Stat. § 704.06(2) (2022).

⁴⁴⁵ *Id.*

⁴⁴⁶ Fla. Stat. § 704.06(4) (2022).

⁴⁴⁷ Fla. Stat. § 704.06(7) (2022).

⁴⁴⁸ Fla. Stat. § 704.06(10) (2022).

⁴⁴⁹ Fla. Stat. § 704.06(12) (2022).

⁴⁵⁰ *Coastal and Estuarine Land Conservation Program, Applying for a Land Conservation Grant*, COAST.NOAA.GOV, <https://coast.noaa.gov/czm/landconservation/applying/> (last visited Jan. 14, 2025).

⁴⁵¹ Rolling easements are a type of coastal adaptation tool developed by Jim Titus, an expert on sea level rise for the EPA. See James G. Titus, *Rolling Easements*, CLIMATE READY ESTUARIES PROGRAM (2011), available at <https://www.epa.gov/sites/production/files/documents/rollingeasementsprimer.pdf> (last visited Jan. 14, 2025).

⁴⁵² GRANNIS, *supra* note 184, at 52-53; TITUS, *supra* note 451, at 118.

⁴⁵³ GRANNIS, *supra* note 184, at 52-53.

⁴⁵⁴ *Id.*; TITUS, *supra* note 451, at 122.

⁴⁵⁵ FLA. CONST. art. X, § 11. See also FLA. CONST. art. II, §7(a); Fla. Stat. §161.088 (2022); *Stop the Beach Renourishment, Inc. v. Fla. Dep't of Environmental Protection*, 130 S. Ct. 2592 (2010); *McQueen v. S. Carolina Coastal Council*, 580 S.E.2d 116 (S.C. 2003).

⁴⁵⁶ MACADANGDANG & NEWMONS, *supra* note 262. It should also be noted that there appears to be some confusion regarding how rolling easements would work in the event of a substantial change in the location of a shoreline. Some commentators seem to assume that rolling easements might

bind the owners of more landward properties once the sea reaches their land even though those owners were never paid for the easement. To be clear, such a position is not what is being discussed here. *See* GRANNIS, *supra* note 184, at 44; Titus, 57 MD. L. REV. at 1313, 1342-47 (analyzing the takings implications of a permit condition that exacts a rolling easement).

⁴⁵⁷ Kelsey Bonham, *Changing Coastlines And The Rolling Conservation Easement*, SPINSHEET CHESAPEAKE BAY SAILING, Dec. 9, 2022, available at <https://www.spinsheet.com/chesapeake-bay/changing-coastlines-and-rolling-conservation-easement> (last visited Jan. 14, 2025).

⁴⁵⁸ *Id.*

⁴⁵⁹ *Id.*

⁴⁶⁰ *Id.*

⁴⁶¹ GRANNIS, *supra* note 184, at 57-59.

⁴⁶² *Id.* at 57.

⁴⁶³ *Id.* at 57-59; *see also* WILLIAM FULTON *ET AL.*, BROOKINGS INST., TDRS AND OTHER MARKET-BASED LAND MECHANISMS: HOW THEY WORK AND THEIR ROLE IN SHAPING METROPOLITAN GROWTH 7 (2004), available at https://www.academia.edu/76988704/TDRs_and_other_market_based_land_mechanisms_How_they_work_and_their_role_in_shaping_metropolitan_growth (last visited Jan. 14, 2025).

⁴⁶⁴ CITY OF CORAL GABLES, FL, ZONING CODE, § 14-204.2, available at <https://codehub.gridics.com/us/fl/coral-gables#/e88f5f7a-89c8-426b-a968-d39fee31678b/62417530-198b-4f3f-bf94-c538fbc93a9b/45848bb2-da5f-4900-9591-476ffa25a3d7/7a5705f8-e7ad-4c4a-8c4a-fed53ea5f39> (last visited Jan. 14, 2025).

⁴⁶⁵ SFRPC AAA POLICY OPTIONS, *supra* note 73.

⁴⁶⁶ MIAMI-DADE COUNTY, FL, CODE OF ORDINANCES, § 33B-41, *et seq.*

⁴⁶⁷ Sarasota County Comprehensive Plan, Future Land Use Policy 1.2.3, available at https://library.municode.com/fl/sarasota_county/codes/comprehensive_plan?nodeId=ELEMENT_3LAUS_CH7FULAUS_FLU_GOAL_1_FLU_OBJ_1.2_FLU_POLICY_1.2.3 (last visited Jan. 14, 2025) (“In the event that natural forces render a property located in the Coastal High Hazard Area unbuildable, or reduce the development potential of a property as allowed by the prior acreage and the underlying zone district, utilization of the Transfer of Development Rights concept will be encouraged.”).

⁴⁶⁸ MACADANGDANG & NEWMONS, *supra* note 262.

⁴⁶⁹ *See, e.g., Glisson*, 558 So. 2d at 1037 (TDR program a factor in dismissing facial takings challenged to wetlands regulations); *City of Hollywood v. Hollywood, Inc.*, 432 So. 2d 1332, 1337-38 (Fla. 4th DCA 1983) (holding that issuance of TDR as to one portion of property in exchange for leaving other portion of property undeveloped or to preserve beachfront was economically beneficial to property owner, such that TDR was not a taking).

⁴⁷⁰ *See Penn Central*, 438 U.S. at 137; *Suitum v. Tahoe Reg'l Planning Agency*, 520 U.S. 725, 749-50 (1997) (Scalia, J., concurring) (“TDRs can serve a commendable purpose in mitigating the economic loss suffered by an individual whose property use is restricted, and property value diminished, but not so substantially as to produce a compensable taking.”). *But see Wilkinson v. St. Jude Harbors, Inc.*, 570 So. 2d 1332, 1333 (Fla. 2d DCA 1990) (concluding that TDR credits are not real property for tax purposes).

⁴⁷¹ See SFRPC AAA POLICY OPTIONS, *supra* note 73, at 19.

⁴⁷² 26 U.S.C. § 170(h) (2022).

⁴⁷³ See Fla. Stat. § 704.06(7) (2022).

⁴⁷⁴ See *Water Storage Strategies*, SFWMD.GOV, <https://www.sfwmd.gov/our-work/water-storage-strategies> (last visited Jan. 14, 2025); CARA BOTTORFF, PAYMENTS FOR ECOSYSTEM SERVICES: CASES FROM THE EXPERIENCE OF U.S. COMMUNITIES 15-16 (2014), available at http://walker-foundation.org/Files/walker/2015/PESCases_BottorffC_20140716.pdf (last visited Jan. 14, 2025).

⁴⁷⁵ *Florida's Cooperative Conservation Blueprint*, FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION, <https://myfwc.com/conservation/special-initiatives/blueprint> (last visited Jan. 14, 2025); KIMBALL LOVE, COOPERATIVE CONSERVATION BLUEPRINT REGIONAL PILOT PROJECT: A STRATEGIC APPROACH TOWARD REGIONAL CONSERVATION CONNECTIVITY (2013), available at <https://myfwc.com/media/5862/strategicapproach.pdf> (last visited Jan. 14, 2025).

⁴⁷⁶ *Private Property Adaptation*, MIAMI BEACH RISING ABOVE, <https://www.mbrisingabove.com/your-home/private-property-adaptation> (last visited Jan. 14, 2025).

⁴⁷⁷ Martin Vassolo, *Miami Beach Offers \$20,000 Grants To Protect Private Homes, Businesses From Flooding*, MIAMI HERALD, July 12, 2022, available at <https://www.miamiherald.com/news/local/community/miami-dade/miami-beach/article263396718.html> (last visited Jan. 14, 2025).

⁴⁷⁸ *Id.*

⁴⁷⁹ Fla. Stat. § 403.892(2)(a) (2022).

⁴⁸⁰ See Ruppert, *supra* note 95, at 260-66.

⁴⁸¹ *Id.* at 272-74.

⁴⁸² *Id.*

⁴⁸³ *Id.*

⁴⁸⁴ Fla. Stat. § 161.57(2) (2022).

⁴⁸⁵ *Id.*

⁴⁸⁶ Fla. Stat. § 161.57(3) (2022). See also KEVIN WOZNIAK, *ET AL.*, FLORIDA'S COASTAL HAZARDS DISCLOSURE LAW: PROPERTY OWNER PERCEPTIONS OF THE PHYSICAL AND REGULATORY ENVIRONMENT at v. (July 2012), available at <https://research.fit.edu/media/site-specific/researchfitedu/coast-climate-adaptation-library/united-states/florida/statewide---florida/Wozniak-et-al.-2012.-Coastal-Hazards-Disclosure-Law.pdf> (last visited Jan. 14, 2025). While the State's coastal hazards disclosure law may be a model in some ways, a sea level rise disclosure requirement should be crafted so as to be more effective. A report commissioned by Florida Sea Grant revealed that 85.7% of covered property purchasers did not receive or do not recall receiving the required disclosure. See *id.* at vi. Florida Sea Grant has made recommendations of how to make that disclosure law more effective, which could also be applied to a sea level rise disclosure. See *id.* at 38-45.

⁴⁸⁷ Leon County Code of Laws § 12-8 (2022), available at https://library.municode.com/fl/leon_county/codes/code_of_ordinances (last visited Jan. 14, 2025).

⁴⁸⁸ See generally discussion in Section VI.A. *supra*. See also LARRY W. THOMAS, FAIR DISCLOSURE AND AIRPORT IMPACT STATEMENTS IN REAL ESTATE TRANSFERS, Airport Cooperative Research Program, at 8-15 (Nov. 2011), available at <https://nap.nationalacademies.org/read/14604/chapter/3> (last visited Jan. 14, 2025) (arguing, in an analogous context, that laws requiring a property owner to disclose the property's proximity to an airport do not effectuate regulatory takings, but rather are proper exercises of governmental police power).

⁴⁸⁹ See *Florida May Require Disclosure Of Flooding In Homes For Sale*, NEWS SERVICE OF FLORIDA, Feb. 5, 2023, available at <https://www.floridatrend.com/article/35911/florida-may-require-disclosure-of-flooding-in-homes-for-sale> (last visited Jan. 14, 2025).

⁴⁹⁰ See, e.g., Laurel Wamsley, *Is the Risk of Sea Level Rise Affecting Florida Home Prices? A New Study Says Yes*, NPR, Oct. 15, 2020, <https://www.npr.org/2020/10/15/924239753/is-the-risk-of-sea-level-rise-affecting-florida-home-prices-a-new-study-says-yes> (last visited Jan. 14, 2025); Katherine Kallergis, *Which Miami Condo Towers Will Be Most Affected By Sea Level Rise?*, THE REAL DEAL, Feb. 29, 2016, available at <http://therealdeal.com/miami/2016/02/29/which-miami-condo-towers-will-be-most-affected-by-sea-level-rise-map/> (last visited Jan. 14, 2025).

⁴⁹¹ Benjamin J. Keys and Philip Mulder, NEGLECTED NO MORE: HOUSING MARKETS, MORTGAGE LENDING, AND SEA LEVEL RISE, NATIONAL BUREAU OF ECONOMIC RESEARCH WORKING PAPER SERIES, Oct. 2020, available at <https://realestate.wharton.upenn.edu/working-papers/neglected-no-more-housing-markets-mortgage-lending-and-sea-level-rise/> (last visited Jan. 14, 2025).

⁴⁹² Steven A. McAlpine & Jeremy R. Porter, ESTIMATING RECENT LOCAL IMPACTS OF SEA-LEVEL RISE ON CURRENT REAL-ESTATE LOSSES: A HOUSING MARKET CASE STUDY IN MIAMI-DADE, FLORIDA, POPUL RES POLICY REV 37, 871–895 (2018), available at <https://doi.org/10.1007/s11113-018-9473-5> (last visited Jan. 14, 2025).

⁴⁹³ See Debora Lima, *The Real Real Estate Story*, MIAMI HERALD, June 5, 2016, available at <http://www.miamiherald.com/real-estate/article81971977.html> (last visited Jan. 14, 2025).

⁴⁹⁴ *Sea Level Rise and Impact on Home Prices in Coastal Florida*, FREDDIE MAC, Mar. 16, 2022, <https://www.freddiemac.com/research/insight/20220316-sea-level-rise-and-impact-home-prices-coastal-florida> (last visited Jan. 14, 2025).

⁴⁹⁵ *Id.*

⁴⁹⁶ Jonathan Woetzel, *et al.*, *Case Study: Will Mortgages And Markets Stay Afloat In Florida?*, MCKINSEY GLOBAL INSTITUTE, Apr. 2020, available at <https://www.mckinsey.com/capabilities/sustainability/our-insights/will-mortgages-and-markets-stay-afloat-in-florida> (last visited Jan. 14, 2025).

⁴⁹⁷ See Michelle Singletary, *Mortgage Modification Programs Still Have A Long Way To Go*, WASHINGTON POST, Jan. 26, 2013, available at https://www.washingtonpost.com/business/mortgage-modification-programs-still-have-a-long-way-to-go/2013/01/25/be47fed8-657e-11e2-85f5-a8a9228e55e7_story.html (last visited Jan. 14, 2025); Trulia Trends Team, *Asking What Our Country Can Do For Housing*, TRULIA, Dec. 14, 2011, available at <https://www.trulia.com/research/trulia-housing-policy-survey> (last visited Jan. 14, 2025) (74% of Democrats and 61% of Republicans surveyed during the 2012 election supported policies encouraging mortgage modification that reduces principal balances).

⁴⁹⁸ See *Am. Aviation, Inc. v. Aero-Flight Serv., Inc.*, 712 So. 2d 809, 810 (Fla. 4th DCA 1998).

⁴⁹⁹ See *id.*; *Dorvil v. Nationstar Mortgage LLC*, 2019 WL 1992932, at *15 (S.D.Fla. Mar. 26, 2019).

⁵⁰⁰ *Actuaries Climate Index*, NAIC CENTER FOR INSURANCE POLICY AND RESEARCH, Feb. 1, 2022, <https://content.naic.org/cipr-topics/actuaries-climate-index> (last visited Jan. 14, 2025).

⁵⁰¹ *Actuaries Climate Risk Index*, NAIC CENTER FOR INSURANCE POLICY AND RESEARCH, June 23, 2022, <https://content.naic.org/insurance-topics/actuaries-climate-index> (last visited Jan. 14, 2025).

⁵⁰² See Don Jergler, *RIMS 2016: Sea Level Rise Will Be Worse and Come Sooner*, INSURANCE JOURNAL, Apr. 12, 2016, available at <http://www.insurancejournal.com/news/national/2016/04/12/405089.htm> (last visited Jan. 14, 2025).

⁵⁰³ Renee Cho, *With Climate Impacts Growing, Insurance Companies Face Big Challenges*, COLUMBIA CLIMATE SCHOOL, Nov. 3, 2022, <https://news.climate.columbia.edu/2022/11/03/with-climate-impacts-growing-insurance-companies-face-big-challenges/> (last visited Jan. 14, 2025).

⁵⁰⁴ *Id.*

⁵⁰⁵ *Id.*

⁵⁰⁶ Phil Prazan, *FEMA Changes to Flood Insurance Renewals Now Factor in Sea Level Rise*, NBC NEWS MIAMI, Apr. 1, 2022, available at <https://www.nbcmiami.com/investigations/fema-changes-to-flood-insurance-renewals-now-factor-in-sea-level-rise/2727141/> (last visited Jan. 14, 2025).

⁵⁰⁷ Stephen Stock, *et al.*, *Rising Seas Could Raise Insurance Rates of Those Living Near Water*, NBC BAY AREA, Feb. 21, 2022, available at <https://www.nbcbayarea.com/news/local/climate-in-crisis/rising-seas-could-raise-insurance-rates-of-those-living-near-water/2816932> (last visited Jan. 14, 2025).

⁵⁰⁸ See *National Flood Insurance Program Community Rating System*, FEMA.GOV, <https://www.fema.gov/floodplain-management/community-rating-system> (last visited Jan. 14, 2025).

⁵⁰⁹ See RESOLUTION OF CITY COMMISSION REGARDING COMMUNITY RATING SYSTEM (R-2022-279), CITY OF CORAL GABLES, Nov. 9, 2022, available at <https://coralgables.legistar.com/LegislationDetail.aspx?ID=5920349&GUID=5944AED1-86AF-4694-B39A-88DBA9EF8285> (Attachment 1: “R-2022-279 - Signed”) (last visited Jan. 14, 2025).

⁵¹⁰ FEMA, NFIP CRS COORDINATOR’S MANUAL, FIA-15/2017, at iv., 110-1 (2017 ed.), available at https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_coordinators-manual_2017.pdf (last visited Jan. 14, 2025). See also FEMA, ADDENDUM TO NFIP CRS COORDINATOR’S MANUAL (2021), available at https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_coordinator-manual_addendum-2021.pdf (last visited Jan. 14, 2025).

⁵¹¹ *Id.* at 110-15, 110-16, 210-7, 320-11, 340-10, 400-14, 400-15.

⁵¹² *Id.* at 110-15, 110-16; FEMA, ADDENDUM TO NFIP CRS COORDINATOR’S MANUAL (2021), at A-42, A-43, available at https://www.fema.gov/sites/default/files/documents/fema_community-rating-system_coordinator-manual_addendum-2021.pdf (last visited Jan. 14, 2025) (“The CRS incorporates the consideration of sea level rise into a number of elements, including element HHS credit for higher study standards...; CEOS credit for coastal erosion open space...; CAZ credit for Coastal A Zones...; and WMP credit for a watershed master plan... Including sea level rise in

WMP is required for coastal communities to meet the Class 4 prerequisite, and HSS and CAZ credit with future-conditions hydrology is a Class 1 prerequisite.”).

⁵¹³ ADDENDUM TO NFIP CRS COORDINATOR’S MANUAL, *supra* note 512, at A-42, A-43.

⁵¹⁴ *Id.* at A-43.

⁵¹⁵ See *City of Ocala Nationally Recognized for Flood Insurance Community Rating System*, OcalaFL.ORG (Apr. 29, 2022), <https://www.ocalafl.org/Home/Components/News/News/1733> (last visited Jan. 14, 2025); *Community Rating System*, PINELLAS COUNTY (2022), <https://pinellas.gov/pinellas-county-florida-community-rating-system-crs> (last visited Jan. 14, 2025).

⁵¹⁶ *Id.*

⁵¹⁷ See FLA. INST. FOR HEALTH INNOVATION, HEALTH AND SEA LEVEL RISE: IMPACTS ON SOUTH FLORIDA (Apr. 2016), available at <https://www.ces.fau.edu/research/pdfs/Health-and-Sea-Level-Rise-Full-Report-2016.pdf> (last visited Jan. 14, 2025).

⁵¹⁸ See Alex Harris and Kyra Gurney, *As Miami Beach Battles Sea-Rise Flooding, Some Neighbors Feud Over The Fixes*, MIAMI HERALD, June 7, 2018, available at <https://www.miamiherald.com/news/local/community/miami-dade/miami-beach/article212256989.html> (last visited Jan. 14, 2025).

⁵¹⁹ *A Nearly \$1 Billion Settlement Is Reached In A Surfside Condo Collapse Lawsuit*, ASSOCIATED PRESS, May 11, 2022, available at <https://www.npr.org/2022/05/11/1098429031/nearly-1-billion-settlement-surfside-condo-collapse-lawsuit> (last visited Jan. 14, 2025); *Surfside Collapse Exposes An Overlooked Threat: Saltwater Rising From Underground*, *supra* note 288.

⁵²⁰ By way of example, planners might be mindful of AICP ethics rules, architects of AIA Code Rules (including Rules 2.104 and 2.106), realtors of NAR Article 2, attorneys of the Florida Bar ethics rules, and civil engineers of ASCE Canons 1 and 6.

⁵²¹ Timothy B. Wheeler, *Holland Island Home’s Demise Marks ‘End Of Era,’* THE BALTIMORE SUN, Oct. 22, 2010, available at <https://www.baltimoresun.com/news/environment/bs-xpm-2010-10-22-bs-gr-bay-vanishing-island-20101022-story.html> (last visited Jan. 14, 2025).

⁵²² Rona Kobell, *As Islands Slowly Submerge, Residents Rise Up, Refusing to Desert Their Homes*, HERITAGE, BAY JOURNAL, Oct. 26, 2014, available at https://www.bayjournal.com/news/climate_change/as-islands-slowly-submerge-residentsrise-up-refusing-to-desert-their-homes-heritage/article_e62e39d3-8336-589f-9e9b-4e8fc0ed7786.html (last visited Jan. 14, 2025).

⁵²³ *Id.*

⁵²⁴ *Id.*

⁵²⁵ *Id.*

⁵²⁶ Brady Dennis, *Retreat in Rodanth*, WASH. POST, Mar. 13, 2023, available at <https://www.washingtonpost.com/climate-environment/interactive/2023/obx-rodanthe-erosion-rising-sea-levels/> (last visited Jan. 14, 2025).

⁵²⁷ *Id.*

⁵²⁸ *Id.*

⁵²⁹ Harold R. Wanless, *The Coming Reality of Sea Level Rise: Too Fast Too Soon*, INSTITUTE ON SCIENCE FOR GLOBAL POLICY, at 3 (2015), available at <http://scienceforglobalpolicy.org/publication/the-coming-reality-of-sea-level-rise-too-fast-too-soon> (last visited Jan. 14, 2025).

⁵³⁰ See Fla. Stat. §§ 316.006, 336.09, 336.10, 336.12, 336.125 (2022).

⁵³¹ *Jordan*, 63 So. 3d at 838-39.

⁵³² The ability to formally abandon a road is an authority that is arguably limited to counties, rather than municipalities. See Fla. Att’y Gen. Op. 2004-47 (2004). However, a municipality could typically cede control over unmaintainable roads to the encompassing county via interlocal agreement, and the county could then choose whether to formally abandon the roads. See Fla. Stat. § 316.006(2)(c) (2022).

⁵³³ See *Greyhound Corp., Se. Greyhound Lines Div. v. Carter*, 131 So. 2d 735, 736 (Fla. 1961). Cf. *City of Winter Park v. Southern States Utilities, Inc.*, 540 So. 2d 178, 180 (Fla. 5th DCA 1989).

⁵³⁴ See Section IV.C. *supra*, for a discussion of the legal restrictions on those funding sources.

⁵³⁵ It appears to be an open question under Florida law whether a municipality could (or should) lower its millage rate to one area of the city (and not for the city as a whole) due to decreased services in some areas. Practically speaking, one could imagine an allocation based on a city’s budget expenditures, where the millage rate for a particular neighborhood is reduced in rough proportion to the percentage of the city’s general expenditure budget attributed to the particular services that are not being provided to property owners in that particular neighborhood. However, it is not clear whether that would be permissible, including under the provisions of the Florida Constitution and Florida Statutes that grant municipalities the power to set their millage rate.

⁵³⁶ Coral Davenport & Campbell Robertson, *Resettling the First American ‘Climate Refugees,’* N.Y. TIMES, May 2, 2016, available at <https://www.nytimes.com/2016/05/03/us/resettling-the-first-american-climate-refugees.html> (last visited Jan. 14, 2025).

⁵³⁷ Kate Lyons, *How To Move A Country: Fiji’s Radical Plan To Escape Rising Sea Levels*, THE GUARDIAN, Nov. 8, 2022, available at <https://www.theguardian.com/environment/2022/nov/08/how-to-move-a-country-fiji-radical-plan-escape-rising-seas-climate-crisis> (last visited Jan. 14, 2025).

⁵³⁸ *Id.* See also Press Release, *Vunidogoloa Relocation 2nd Phase Underway*, THE FIJIAN GOV’T, Sept. 1, 2014, available at <https://www.fiji.gov.fj/Media-Centre/News/VUNIDOGOLOA-RELOCATION-2ND-PHASE-UNDERWAY> (last visited Jan. 14, 2025).

⁵³⁹ Emily Witt, *An Alaskan Town Is Losing Ground—and a Way of Life*, THE NEW YORKER, Feb. 24, 2015, available at <https://www.newyorker.com/magazine/2022/11/28/an-alaskan-town-is-losing-ground-and-a-way-of-life> (last visited Jan. 14, 2025).

⁵⁴⁰ See Elizabeth Kolbert, *The Siege of Miami*, THE NEW YORKER (Dec. 21 & 28, 2015), available at <http://www.newyorker.com/magazine/2015/12/21/the-siege-of-miami> (last visited Jan. 14, 2025).

⁵⁴¹ Chris Mooney, *The Remote Alaskan Village that Needs to be Relocated Due to Climate Change*, WASHINGTON POST, Feb. 24, 2015, available at <https://www.washingtonpost.com/news/energy-environment/wp/2015/02/24/the-remote-alaskan-village-that-needs-to-be-relocated-due-to-climate-change/> (last visited Jan. 14, 2025). Robin

Bronen recommends development of some interesting adaptive governance frameworks to help relocate residents while keeping communities and cultures intact. *See* ROBIN BRONEN, CLIMATE-INDUCED COMMUNITY RELOCATIONS: CREATING AN ADAPTIVE GOVERNANCE FRAMEWORK BASED IN THE HUMAN RIGHTS DOCTRINE, N.Y.U. REVIEW OF LAW & SOCIAL CHANGE, 35 N.Y.U. 357 (2011), available at http://heinonline.org/HOL/Page?handle=hein.journals/nyuls35&div=15&g_sent=1&collection=journals (last visited Jan. 14, 2025).

⁵⁴² Coral Davenport & Campbell Robertson, *Resettling the First American ‘Climate Refugees,’* N.Y. TIMES, May 2, 2016, available at <https://www.nytimes.com/2016/05/03/us/resettling-the-first-american-climate-refugees.html> (last visited Jan. 14, 2025).

⁵⁴³ Kezia Setyawan, *Move-In Day For Isle De Jean Charles Resettlement Residents Marked With Relief - And Uncertainty*, WWNO NEW ORLEANS PUBLIC RADIO, Aug. 25, 2022, available at <https://www.wwno.org/coastal-desk/2022-08-25/move-in-day-for-isle-de-jean-charles-resettlement-residents-marked-with-relief-and-uncertainty> (last visited Jan. 14, 2025). *See also* *Isle de Jean Charles Resettlement Program*, LOUISIANA OFFICE OF COMMUNITY DEVELOPMENT & LOUISIANA DIVISION OF ADMINISTRATION, 2021, <https://isledejeancharles.la.gov/> (last visited Jan. 14, 2025).

⁵⁴⁴ *Resettling the First American ‘Climate Refugees,’* *supra* note 542.

⁵⁴⁵ *Id.*

⁵⁴⁶ *Id.*

⁵⁴⁷ 44 C.F.R. § 206.223(a) (2009); 44 C.F.R. §§ 206.226(f), 206.226(g) (2017).

⁵⁴⁸ 44 C.F.R. §§ 206.226, 206.226(g)(4) (2017).

⁵⁴⁹ *See Sea Level Impact: Interactive Map*, CITY OF CORAL GABLES, available at <https://www.coralgables.com/departments/sustainability/sea-level-impact> (last visited Jan. 14, 2025).

⁵⁵⁰ *See* Frank Bajak and Lise Olsen, *Hurricane Harvey’s Toxic Impact Deeper Than Public Told*, ASSOCIATED PRESS, Mar. 23, 2018, available at <https://apnews.com/article/environment-hurricanes-storms-tx-state-wire-north-america-e0ceae76d5894734b0041210a902218d> (last visited Jan. 14, 2025); Christopher Flavelle, *‘Toxic Stew’ Stirred Up by Disasters Poses Long-Term Danger, New Findings Show*, N.Y. TIMES, July 15, 2019, available at <https://www.nytimes.com/2019/07/15/climate/flooding-chemicals-health-research.html> (last visited Jan. 14, 2025); THE IMPACT OF CEMETERIES ON THE ENVIRONMENT AND PUBLIC HEALTH, WORLD HEALTH ORGANIZATION (1998), available at [http://apps.who.int/iris/bitstream/10665/108132/1/EUR_ICP_EHNA_01_04_01\(A\).pdf](http://apps.who.int/iris/bitstream/10665/108132/1/EUR_ICP_EHNA_01_04_01(A).pdf) (last visited Jan. 14, 2025).

⁵⁵¹ *See, e.g.*, the Florida Pollutant Discharge Prevention and Control Act (Chapter 376 of the Florida Statutes) and the Florida Air and Water Pollution Control Act, (Chapter 407 of the Florida Statutes).

⁵⁵² *See* Thomas Ruppert, *Take Out the Trash When You Leave: Cleaning Up Properties Abandoned to Rising Seas*, A BLUEPRINT FOR COASTAL ADAPTATION, 2021, available at https://www.flseagrant.org/wp-content/uploads/2022/08/A_Blueprint_for-Coastal_Adaptation-Thomas-R-Chapter.pdf (last visited Jan. 14, 2025); A. Mitchell Polinsky and Steven Shavell, *A Note On Optimal Cleanup And Liability After Environmentally Harmful Discharges*, 16

RESEARCH IN LAW & ECON. 17 (1994), *available at* http://www.law.harvard.edu/faculty/shavell/pdf/16_research_law_econ_17.pdf (last visited Jan. 14, 2025).

⁵⁵³ Fla. CONST. art. X, § 11.

⁵⁵⁴ *See* Fla. Stat. §§ 197.432, 197.443, 197.592 (2022).

⁵⁵⁵ For a discussion of the importance of monitoring and evaluating a local government's adaptation efforts, and ways to monitor and evaluate, *see* FLORIDA'S HANDBOOK FOR MUNICIPAL ACTION ON CLIMATE CHANGE, IFAS EXTENSION, UNIVERSITY OF FLORIDA, AND CLIMATE SMART, 2021, at 103-107, *available at* <https://www.flseagrant.org/wp-content/uploads/2022/07/Handbook-for-Municipal-Action-on-Climate-Change-Final-Draft-1-1.pdf> (last visited Jan. 15, 2025).