

## MEMORANDUM

**DATE:** May 17, 2024

**TO:** Samantha Reilly, City of Clearwater

**FROM:** Michael Antinelli and Alexandra Boswell (Brizaga)  
Ben Lehr (Chen Moore and Associates)

**RE:** City of Clearwater Tidal Flood Barrier Ordinance

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### Existing Code and Ordinance Review

The Brizaga team reviewed several codes, ordinances, and other documents as they relate to seawalls, revetments, and other relevant waterfront structures that have been incorporated throughout the state of Florida. During this review, our team examined the Broward County seawall ordinance (2020)<sup>1</sup> which requires all municipalities within the County to adopt the ordinance, the example Tampa Bay Regional Planning Council (TBRPC) model ordinance (2022)<sup>2</sup>, the City of Miami Beach seawall ordinance (2021)<sup>3</sup>, the City of Miami seawall ordinance (2020)<sup>4</sup>, and the City of Naples seawall ordinance (1987)<sup>5</sup>. The Pinellas County Code of Ordinances<sup>6</sup> was also reviewed. The TBRPC example is a model ordinance, and no records were found to show that the ordinance has been adopted in its entirety anywhere within the Tampa Bay Region.

The ordinances instituted by the Cities of Miami and Miami Beach, the TBRPC, and Broward County specifically identify sea level rise and tidal flooding as catalysts for their implementation. The City of Naples ordinance which was passed 36 years ago identifies an existing threat to public health, safety, and welfare due to failed seawalls or revetments as a catalyst for its implementation. This review of existing codes and ordinances considers their origination and intent.

The existing Code of Ordinances and the Community Development Code for the City of Clearwater were also reviewed for the instances in which seawalls are mentioned. These instances are discussed within the following sections as appropriate.

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<sup>1</sup>[Broward County Seawall Ordinance](#)

<sup>2</sup>[TBRPC Model Seawall Ordinance](#)

<sup>3</sup>[City of Miami Beach Seawall Ordinance](#)

<sup>4</sup>[City of Miami Seawall Ordinance](#)

<sup>5</sup>[City of Naples Seawall Ordinance](#)

<sup>6</sup>[Pinellas County Water and Navigation Regulations](#)

## Pinellas County Code of Ordinances

Prior to evaluating the nuances of the various ordinances provided by the municipalities studied, it is critical to understand the context through which the proposed seawall ordinance for the City of Clearwater will be evaluated.

Following discussions with staff members within the Water and Navigation division of the Public Works Department at Pinellas County, the following applicability was identified:

1. Any seawall improvements or replacements where the waterward face of the proposed seawall is located within 12 inches of the waterward face of the existing seawall is not subject to County review.
2. Any seawall improvements or replacements where the waterward face of the proposed seawall is located greater than 12 inches of the waterward face of the existing seawall is subject to County review, specifically for a dredge/fill permit.
3. Any new seawall where a seawall does not currently exist is subject to County review.
4. Any shoreline improvements involving work in the waterway that is not classified by (1) – (3) above is subject to County review. This includes but is not limited to revetments and living shorelines.

## Definitions

The review of the various ordinances began with an evaluation of definitions to identify similarities and differences with respect to certain key terms, beginning with the definition of seawalls and bulkheads.

### Seawalls and Bulkheads

According to the United States Army Corps of Engineers (Army Corps) Manual EM 1110-2-1614<sup>7</sup>:

*“The terms bulkhead and seawall are often used interchangeably. However, a bulkhead is primarily intended to retain or prevent sliding of the land, while protecting the upland area against wave action is of secondary importance. Seawalls, on the other hand, are more massive structures whose primary purpose is interception of waves.”*

The definitions provided by the Army Corps are not well translated among the various legal documents and are inconsistent across the samples reviewed. In most cases, a primary purpose of the ordinance is to set the requirements for **bulkheads**, which are designed to stabilize the waterfront in areas that experience limited wave action except during the most extreme storms.

The City of Miami Beach and Broward County utilize the same definition for a **seawall**, which is generally consistent with the definition provided by the Army Corps. The language provided by the City of Miami ordinance provides greater detail and is also generally consistent with the Army Corps definition. The **seawall** definitions provided by the City of Naples and by the TBRPC are more closely aligned with the Army Corps definition of a **bulkhead**.

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<sup>7</sup>[Design of Coastal Revetments, Seawalls, and Bulkheads](#)

The City of Miami Beach and the City of Miami utilize the same definition for a **bulkhead**, which is consistent with the definition provided by the Army Corps. The **bulkhead** definition provided by the TBRPC is more closely aligned with the definition of a **seawall** provided by the Army Corps, and is identical to the definition of a **seawall** provided by the City of Miami Beach and Broward County. No **bulkhead** definition is provided by the City of Naples, though the term is referenced within the ordinance. The term **bulkhead** is not used by Broward County at all, as the County favors the term **tidal flood barrier**.

While the terms are often used interchangeably and the discrepancies may appear trivial, the consistent application of nomenclature is a key factor in assuring that ordinances and regulations are interpreted, applied, and enforced correctly and in a manner consistent with guidance from other regulatory bodies such as the Army Corps of Engineers and the Florida Department of Environmental Protection, both of which have jurisdiction over work within submerged lands.

Definitions for the terms **seawall** or **bulkhead** are not provided within the City of Clearwater Code of Ordinances or Community Development Code.

### Tidal Flood Barrier

Broward County favors the term **tidal flood barrier** in its ordinance. The TBRPC model ordinance also utilizes the term **tidal flood barrier**. The definitions provided by both entities are identical:

*“Tidal flood barrier means any structure or shoreline feature including, but not limited to, banks, berms, green-grey infrastructure, seawalls, seawall caps, upland stem walls, or other infrastructure that impedes tidal waters from flowing onto adjacent property or public right-of-way, and located within or along a tidally influenced area.”*

Broward County goes one step further however to carve out specific types of waterfront features and includes a second sentence that reads:

*“This definition is not meant to include rip-rap, derelict erosion control structures, or permeable earthen mounds that do not provide an impermeable water barrier to tidal flooding.”*

Neither the City of Miami nor the City of Naples define or reference the term **tidal flood barrier** in their ordinances.

The City of Miami Beach does not define the term; however, it is referenced in a clause that reads:

*“This section shall not be construed to require the installation of a seawall where other flood protection measures and living shorelines serve as an equally effective tidal flood barrier.”*

The term **tidal flood barrier** in this context offers greater flexibility to property owners in selecting the type of shoreline protection infrastructure improvements they wish to install on their property. This is a

valuable tool for property owners who may not have the means to undertake a major waterfront infrastructure improvement project. This definition becomes particularly important when examining the responsibility of the property owner to maintain their **tidal flood barrier** in good repair.

The term **tidal flood barrier** is not utilized anywhere within the City of Clearwater Code of Ordinances or Community Development Code.

### Disrepair

**Disrepair** is not explicitly defined in any of the ordinances reviewed. However, all ordinances with the exception of the City of Naples include a clause that reads one of the following:

*“A shoreline protection structure is presumed to be in disrepair if it allows for upland erosion, transfer of material through the barrier/ wall or allows tidal waters to flow unimpeded through and/or over the top of the barrier/wall to adjacent properties or public right-of-way.” (Cities of Miami and Miami Beach)*

*“A tidal flood barrier is presumed to be in disrepair if it allows tidal waters to flow unimpeded through or over the barrier and onto adjacent property or public right-of-way.” (Broward County and TBRPC)*

There are two main differences between these definitions. The first is the use of the term **shoreline protection structure** versus the term **tidal flood barrier**. The implication for the former term is that good repair means the protection, stabilization, and maintenance of the shoreline. The other difference is that the consideration for a **shoreline protection structure** specifically includes the consideration of upland erosion.

Alternatively, the latter term is interested primarily in the flow of tidal waters onto adjacent property or public right-of-way. Upland erosion is not considered. By this logic, if a **tidal flood barrier** were to undermine or erode to the extent that a hazard were created for an adjacent property or structure, the **tidal flood barrier** would not be considered to be in **disrepair** as long as it continues to prevent the flow of tidal waters onto the adjacent property or right-of-way.

**Disrepair** is not defined within the City of Clearwater Code of Ordinances or Community Development Code. However, maintenance of seawalls is mentioned within Sections 3-1502 and 3-1503 of the City of Clearwater Community Development Code. The City requires that all seawalls shall be maintained in structurally sound condition and shall comply with applicable building and coastal construction codes. The city defines any seawall in a condition where the structural integrity is not maintained as a public nuisance.

### Substantial Repair

In standard building construction, the cost of the proposed improvements is compared to the value of the structure. Generally, when the ratio of proposed improvements to the value of the structure exceeds 50%, it is considered a **substantial repair** and the structure must be brought into compliance with current codes (building codes, electrical codes, flood codes, etc.) Historically, these codes have not been applicable to waterfront structures as they are not habitable and serve a different purpose. Therefore, it is left to the local governing body to determine an appropriate definition or threshold for **substantial repair** of the waterfront infrastructure. These definitions vary significantly across the different study areas.

In the City of Miami Beach, a **substantial repair** is defined as

*“Any improvement and/or repairs to the existing seawall with a cost of \$300 or more per linear foot.”*

This definition is specific to seawalls and is an aggressive definition of **substantial repair** that will require many property owners to bring their seawalls into compliance the moment work is done, as \$300 per linear foot is a very low threshold, depending upon the interpretation. This definition is vague, and could reasonably be interpreted in two ways. The first would apply the value of the work over the full length of the seawall. For example a \$10,000 isolated repair on a 100-foot seawall equates to \$100 per linear foot over the full length of the structure. Alternatively, if the \$10,000 isolated repair is limited to a 10-foot section, the cost of repair would be \$1,000 per linear foot on the repair section. It is unclear which of the two applies, and whether the latter interpretation would trigger improvements across the entirety of the structure or only on the isolated section.

Broward County, the TBRPC, and the City of Miami, are more consistent with the approach for standard building construction. Broward County, the TBRPC (and the City of Miami) consider **substantial repair** to mean improvements to a shoreline or shoreline structure along more than 50% (50% or more) of the property’s shoreline length; or modifications, alterations, or installation of appurtenant structure(s) exceeding 50% (50% or more) of the value of the existing structure along the shoreline. The City of Miami also includes any improvement resulting in an elevation change along 50% or more of the structure length.

What is not contemplated by any of the ordinances reviewed is the timeline for which repairs are measured. In building construction, improvements are often cumulative over a certain period of time. This approach prevents property owners from performing piecemeal improvements in a concerted effort to skirt compliance. Presumably, a property owner could install improvements on 50% of the waterfront with one project and install improvements on the other 50% under a separate permit. This approach would not trigger the substantial repair requirements for Broward County and TBRPC, as these entities define **substantial repair** as more than 50% of the shoreline length and the repairs are not cumulative over any length of time.

The Community Development Code of the City of Clearwater references substantial improvement with a 50% threshold for structures over various periods dependent upon the location of the structure.

Furthermore, the City should consider repairs and replacement in the context of a natural disaster, such as a hurricane. Tidal barriers would be an expensive undertaking while repairing a home due to flooding or wind damage. This should be considered in the context of insurable losses, displacement durations and expenses, and substantial improvement triggers.

### **Tidal Waters**

Throughout all ordinances reviewed, the term **tidal waters** is utilized to express the locations where the ordinances apply and the condition that defines noncompliance. However, only the City of Miami and the TBRPC provide a definition for **tidal waters**:

*“Any water that alternately rises and falls in a predictable and measurable rhythm or cycle due to the gravitational attraction of the moon and sun, including seasonal tide events such as king tides. Extreme tidal elevation changes caused by a storm event (i.e. storm surge) is not to be used as a determining factor of whether or not an existing shoreline protection structure is in violation of the city’s maintenance requirements.”*

This definition clearly identifies areas where tidal constituents are in effect and removes from consideration areas that are not directly hydrologically connected through overland flow. The absence of this definition from the City of Miami Beach, Broward County, and City of Naples ordinances leaves room for interpretation as to what constitutes **tidal waters** and may result in a divergence from the intent of the rule.

With the City of Clearwater Community Development Code, the term **tidal waters** is utilized to define *flood* or *flooding*, but is not itself defined.

## Height Thresholds

Each of the ordinances reviewed provides a minimum height requirement for the seawalls, bulkheads, tidal flood barriers, or shoreline protection structures. In no case is a maximum elevation specified.

### City of Miami Beach

The City of Miami Beach requires all new seawalls or existing seawalls that require substantial repairs to be constructed to a minimum elevation of 5.7 feet NAVD88. Existing seawalls that require repairs that are considered less than substantial may be constructed to a minimum elevation of 4.0 feet NAVD88 if designed and constructed to accommodate a minimum elevation of 5.7 feet NAVD88.

There is no explicit requirement for when improvements must be made. Instead, the required improvements are governed by enforcement, which relies on maintenance of seawalls in good repair. There is also no mechanism specified to indicate when a property owner must modify a seawall from 4.0 feet NAVD88 to 5.7 feet NAVD88.

The only requirement within the ordinance to demonstrate that the shoreline protection structures have been built in accordance with the City’s standard is a certification by a Professional Engineer stating such.

### Broward County

Broward County requires tidal flood barriers to have a minimum elevation of 5 feet NAVD88. All new or substantially improved or rehabilitated tidal flood barriers submitted prior to January 1, 2035 may be permitted a minimum elevation of 4 feet NAVD88 if designed and constructed to accommodate a minimum elevation of 5 feet NAVD88 by January 1, 2050.

Similar to the City of Miami Beach, there is no explicit requirement for when improvements must be made. Instead, the required improvements are governed by enforcement, which relies on maintenance of

seawalls in good repair. There is also no mechanism specified to indicate when a property owner must modify a seawall from 4 feet NAVD88 to 5 feet NAVD88.

There is no requirement within the ordinance to demonstrate that tidal flood barriers permitted at an elevation of 4 feet have been designed to accommodate an elevation of 5 feet.

### **City of Miami**

The City of Miami requires that the top elevation of seawalls, bulkheads, living shorelines, or other shoreline protection structures or elements shall be constructed to a minimum elevation of 6 feet NAVD88. This criteria applies to new construction or when substantial improvements to a property are performed. These structures or elements must also be capable of being raised to a final minimum elevation of at least 8 feet NAVD to mitigate high tide flooding associated with realized and additional sea level rise through the year 2070. Appropriate modification details illustrating this ability must be provided with the design submission to the City's building department for permit processing.

Unique to the City of Miami, a mechanism exists to trigger improvements based on upland activities. This ensures that when substantial improvements to a property are made, including redevelopment, the waterfront infrastructure is also upgraded.

Similar to the City of Miami Beach and Broward County, there is no explicit requirement for when improvements must be made. Instead, the required improvements are governed by enforcement, which relies on maintenance of seawalls in good repair. There is also no mechanism specified to indicate when a property owner must modify a seawall from 6 feet NAVD88 to 8 feet NAVD88.

### **TBRPC**

The TBRPC model ordinance specifies that by 2040, all new or substantially repaired or rehabilitated banks, berms, green-grey infrastructure, revetments, seawalls, seawall caps, upland stemwalls, or other similar infrastructure shall be designed and constructed to perform as tidal flood barriers, and shall have a minimum elevation of 5 feet NAVD88 to account for projected sea level rise in combination with high tides by 2070. It goes on to require that the heights specified shall be reviewed no less than every 5 years in conjunction with updates to the national sea level rise projections.

Similar to the City of Miami Beach, Broward County, and the City of Miami, there is no explicit requirement for when improvements must be made. Instead, the required improvements are governed by enforcement, which relies on maintenance of seawalls in good repair.

The requirement for a review every 5 years presents a challenge regarding the methodology and determination of appropriate thresholds. Additionally, if the minimum elevation requirement is changed every 5 years, uniformity of the waterfront will be near impossible to achieve. This could adversely impact those properties with lower seawalls, as flooding will be concentrated in those locations during a storm surge event.

### City of Naples

The City of Naples requires that the cap elevation for all seawalls and revetments fronting on protected tidal waters shall be equal to or greater than 4.5 feet NGVD29, or 5.5 feet NGVD29 on open bays and channels. Seawalls and revetments fronting on freshwater canals and lakes shall be equal to or greater than the local high water elevation as determined for a 25-year return frequency design storm event.

While the elevation requirements are explicit, there is a carve-out in a later section of the City of Naples ordinance exempting seawalls or revetments requiring minor repairs from the technical specifications. However, this ordinance was authored 36 years ago, and it is expected that any existing seawalls or revetments that were exempt from this requirement at that time have since undergone major repairs or been replaced.

### City of Clearwater

The City of Clearwater Community Development Code, Section 3-602 requires that:

*“The elevation of sea walls on the west shore of Clearwater Harbor or Clearwater Bay shall be not less than six feet above mean sea level. The elevation of sea walls on the east shore of Clearwater Harbor or Clearwater Bay and on the shore of the Gulf of Mexico shall be not less than six feet above mean sea level.”*

Mean Sea Level is defined within the Community Development Code as:

*“The average height of the sea for all stages of the tide. It is used as reference for establishing various elevations within the floodplains. For purposes of this Development Code, the term is synonymous with National Geodetic Vertical Datum (NGVD).”*

Based on these definitions, the minimum seawall elevation at the locations specified within the City of Clearwater is currently 6 feet NGVD29 (~5.14 feet NAVD88), which is approximately 0.14 feet above the minimum elevation specified within the TBRPC model ordinance.

### Enforcement Mechanisms

All ordinances reviewed have protocols to enforce them. These are generally triggered by the identification of shoreline protection structures or tidal flood barriers that are in a state of disrepair as defined by the individual jurisdictions.

The various jurisdictions provide variable timelines for property owners to bring their shoreline protection structures or tidal flood barriers into compliance. Various penalties are applied as well.

Generally, there is a window of opportunity to allow the property owner to make progress toward remedying the violation, as well as a timeframe for completion of the work. This largely depends upon the permit requirements of the regulatory bodies governing the work. In Miami Beach, for example, the Miami-Dade County Department of Regulatory and Economic Resources has jurisdiction and often takes one year or more to process permits. As such, the City of Miami Beach provides 730 days to remedy the violation.



Broward County and the TBRPC model ordinance both offer a 60-day window to demonstrate progress towards repairing the cited defect, and repairs are required to be complete within 365 days after receipt of the citation. The TBRPC also allows for this timeline to be extended based on reasonable progress, which could be open to interpretation. No specific penalties are outlined in either ordinance.

## Other Considerations

The selected ordinances were also reviewed for any additional critical sections that may significantly impact the intent and enforcement of the City of Clearwater's proposed ordinance. One such area is applicability.

### Applicability

The City of Miami Beach ordinance is applicable to *“(1) all new waterfront construction and substantial improvements; or (2) all new seawalls; or (3) substantial improvements to shorelines and shoreline structures.”*

The Broward County ordinance *“applies to all new tidal flood barriers, substantial repair or substantial rehabilitation to shorelines and shoreline structures, and the installation of any fixed infrastructure attached to tidal flood barriers (such as mooring structures). This article is not applicable to oceanfront beaches or shorelines seaward of the Coastal Construction Control Line.”*

While the City of Miami ordinance does not specify applicability, permits for waterfront improvements are required. *“No waterfront improvement or structure shall be constructed, reconstructed or repaired until a permit authorizing such construction, reconstruction or repair has been obtained from the building department.”*

The TBRPC model ordinance *“applies to 1) all new tidal flood barriers, 2) the replacement, substantial repair or substantial rehabilitation of shorelines and shoreline structures, and 3) the installation of any fixed infrastructure attached to tidal flood barriers (such as mooring structures). This article is not applicable to oceanfront beaches, passes, inlets or shorelines seaward of the Coastal Construction Control Line.”*

### Shoreline Types

The City of Miami Beach, Broward County, and the TBRPC all allow for the use of various types of waterfront infrastructure including but not limited to seawalls or bulkheads, berms, and living shorelines.

The TBRPC model ordinance, however, specifies a Shoreline Overlay District, intended to protect private property, public right-of-way, or other public infrastructure, natural shoreline and coastal resources. It then identifies allowable shoreline types at a parcel level. This is much more restrictive to property owners than the other ordinances evaluated as part of this review. The creation of a Shoreline Overlay District in this manner would require an intensive effort to ensure accuracy. Furthermore, any deviation from the requirements specified in the Overlay District would require a public interest determination which is a highly subjective exercise that may present legal liabilities.

**Disclosure**

The Broward County and TBRPC ordinances included a disclosure section for real estate transactions. The required disclosure includes a specific statement to be listed in any contract for the sale of real estate in a tidally influenced area. The statement was as follows:

**THIS REAL ESTATE IS LOCATED IN A TIDALLY INFLUENCED AREA. THE OWNER MAY BE REQUIRED BY COUNTY OR MUNICIPAL ORDINANCE TO MEET MINIMUM TIDAL FLOOD BARRIER ELEVATION STANDARDS DURING CONSTRUCTION OR SUBSTANTIAL REPAIR OR SUBSTANTIAL REHABILITATION OF SEAWALLS, BANKS, BERMS, AND SIMILAR INFRASTRUCTURE OR WHEN REQUIRED TO ABATE NUISANCE FLOODING.**

**Technical Guidance**

Though not identified within the communities studied as part of this review, a document published by the City of Marco Island was found that provides technical guidance. In May 2018, the City of Marco Island released a Sewall Manual<sup>8</sup> for residents. The manual outlines technical specifications for seawalls and provides images depicting seawalls in disrepair. The document also goes into detail about how property owners can extend the lives of their seawalls and the overall permitting process.

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<sup>8</sup>[Marco Island Seawall Manual](#)

## Existing Shoreline Conditions

Since January 2020, the City of Clearwater has issued hundreds of marine based permits. Of these marine permits, there are 100 permits that involve seawalls, and these permits are either completed, active or in the review stages. Some of these permits included increasing the height of current seawalls. The height increase of the seawalls ranged from 12 to 24 inches. The beginning elevation of these projects was not mentioned within the permitting sheet furnished by the Client.

Without access to a seawall database, an alternative method was developed to understand the scope of how many seawalls are within Clearwater. Looking at satellite imagery, we have mapped all visible shorelines and seawalls, and the parcels on which they are located, based on available satellite imagery published within the ESRI ArcGIS basemaps. These maps are provided at the end of this memorandum.

To map the shoreline locations within the City of Clearwater, the publicly available Pinellas County Water Atlas<sup>9</sup> database was utilized. In total, approximately 51 miles of total shoreline was mapped, encompassing 6,805 parcels within the City of Clearwater. Of this, approximately 30 miles of seawalls were identified along Clearwater Harbor, Clearwater Bay, and Old Tampa Bay, encompassing 5,479 parcels

## Sea Level Rise

Sea level rise projections for Clearwater Beach were evaluated to identify appropriate height requirements. Multiple data sources were utilized including the Army Corps of Engineers Sea Level Rise Calculator<sup>10</sup>, the NOAA Tides and Currents database<sup>11</sup> (specifically the Clearwater Beach tidal station), and the 2022 NOAA Sea Level Rise Technical Report<sup>12</sup>. For relative sea level rise (SLR) trends, the Army Corps SLR calculator was set to the Clearwater Beach tidal station and the intermediate-low and intermediate-high projections from NOAA<sup>13</sup> (produced in 2017) were utilized. These projections utilize the year 2000 as a baseline. To utilize 2024 as a baseline, actual sea level rise observed between 2000 and 2024 was analyzed and removed from the total projection.

Tables 1 and 2 present the relative sea level rise projections from the year 2024, and the High Tide Flooding thresholds at Clearwater Beach under these sea level rise scenarios, respectively.

Additional figures are provided to illustrate sea level rise projections and th statistical analysis performed to identify observed changes in mean sea level.

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<sup>9</sup>[Pinellas County Water Atlas](#)

<sup>10</sup>[ACOE Sea Level Rise Calculator](#)

<sup>11</sup>[NOAA Tides and Currents](#)

<sup>12</sup>[2022 NOAA Sea Level Rise Technical Report](#)

<sup>13</sup>[NOAA 2017 Sea Level Rise scenarios](#)

**Table 1. Relative Sea Level Rise Projections at Clearwater Beach (feet)**

| Year | NOAA Intermediate-Low Sea Level Rise Projection | NOAA Intermediate-High Sea Level Rise Projection |
|------|---|--|
| 2024 | 0.00  | 0.00   |
| 2030 | 0.10  | 0.22   |
| 2040 | 0.29  | 0.64   |
| 2050 | 0.52  | 1.20   |
| 2060 | 0.72  | 1.89   |
| 2070 | 0.92  | 2.65   |

**Table 2. High Tide Flooding Threshold at Clearwater Beach (feet NAVD88)**

| Year | NOAA Intermediate-Low Sea Level Rise Projection | NOAA Intermediate-High Sea Level Rise Projection |
|------|---|--|
| 2024 | 2.72  | 2.72   |
| 2030 | 2.82  | 2.94   |
| 2040 | 3.01  | 3.36   |
| 2050 | 3.24  | 3.92   |
| 2060 | 3.44  | 4.61   |
| 2070 | 3.64  | 5.37   |

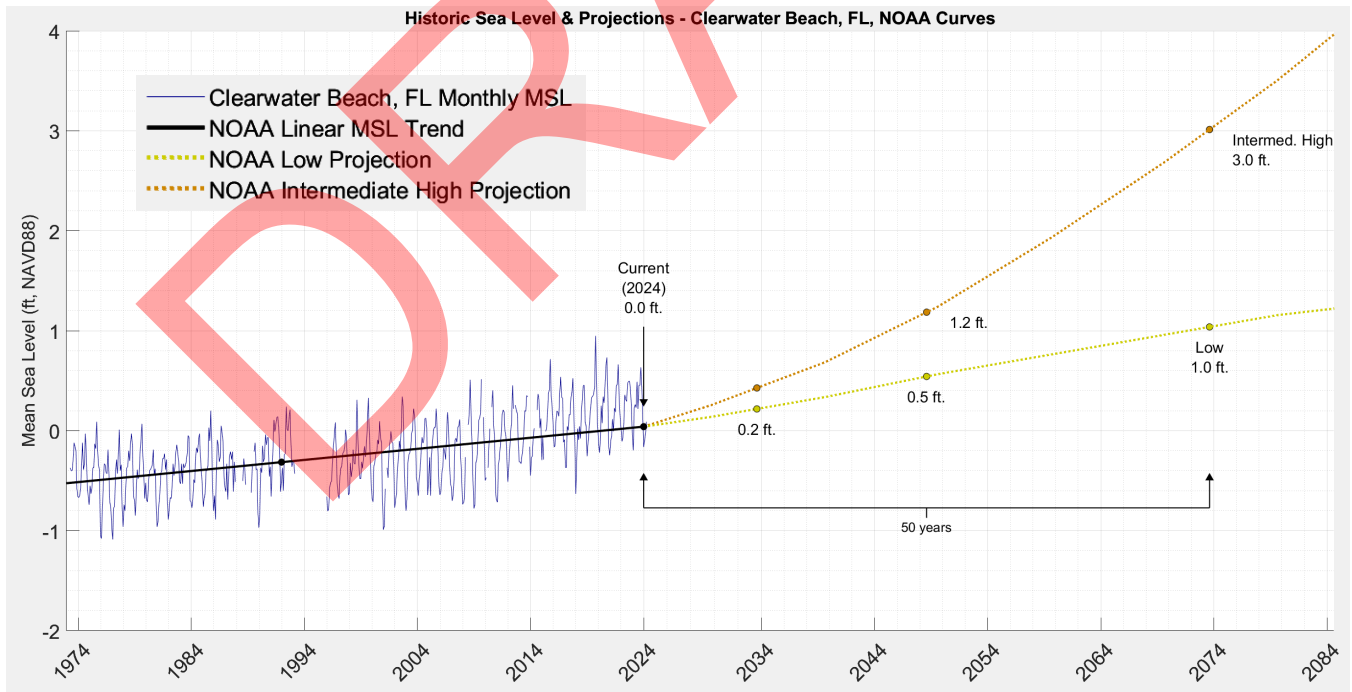


Figure 1. Historic mean sea level and projections at Clearwater Beach tidal station.

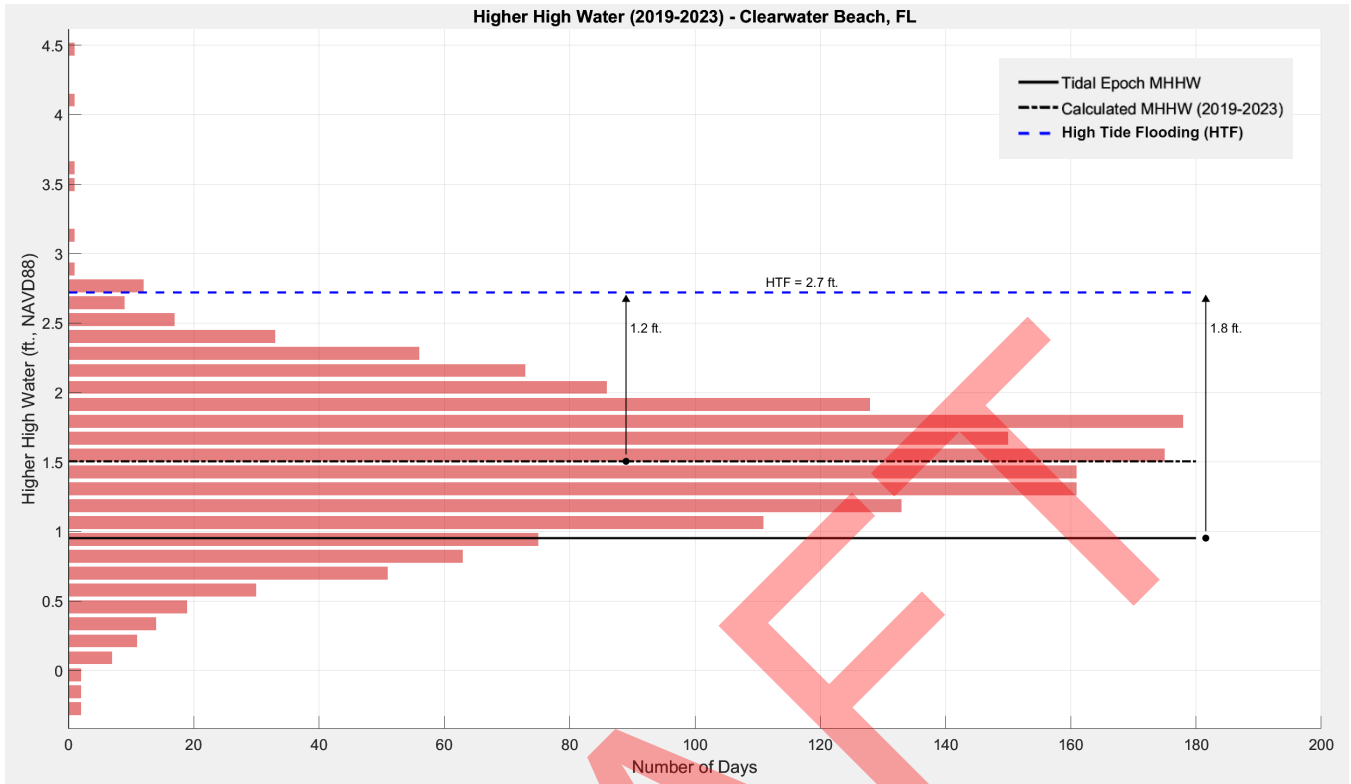


Figure 2. Statistical analysis of high water events at Clearwater Beach based on data collected 2019-2023.

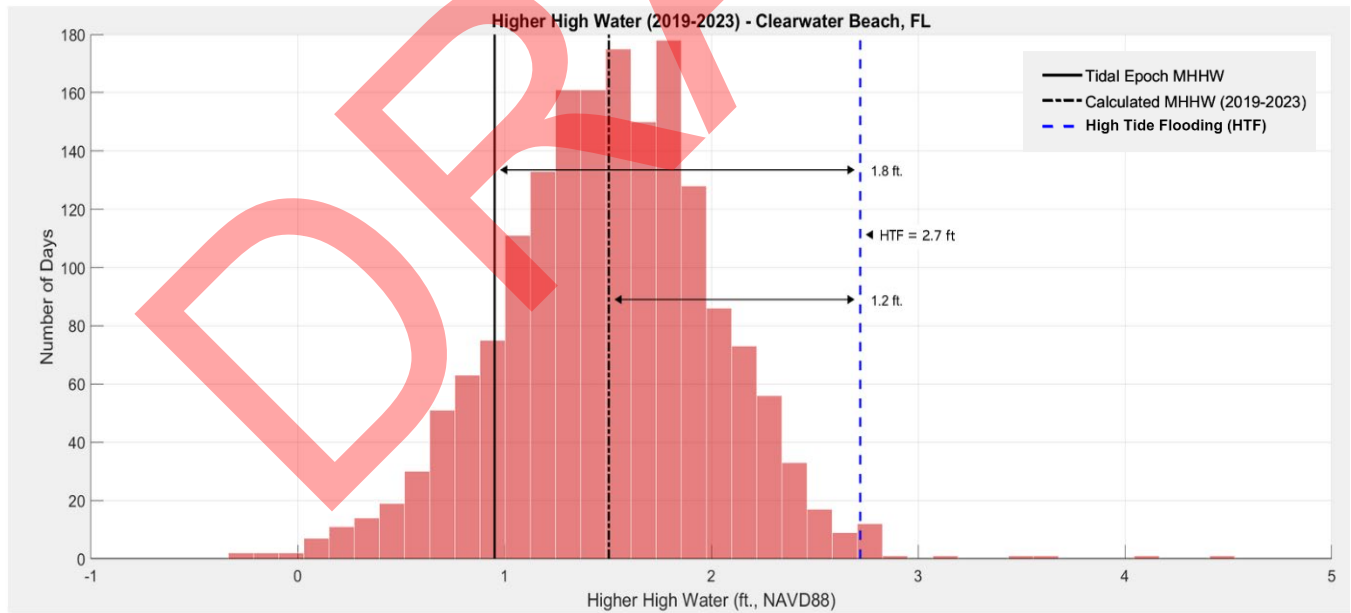


Figure 3. Statistical analysis of high water events at Clearwater Beach based on data collected 2019-2023.

## Recommendations

Overall, there are several key takeaways that the City of Clearwater should consider when it comes to creating and adopting their seawall ordinance. The Brizaga team believes that the City should consider the following when it comes to creating their tidal flood barrier ordinance:

### Definitions

As demonstrated through the ordinance review, the definitions selected for the various terms used through the ordinances can have a significant impact on the application, enforcement and perceived intent of the ordinance. Recommended definitions are provided below:

#### Seawall

Begin with a portion of the City of Miami definition, with modifications:

*A ~~vertical or near-vertical, substantially impermeable~~ structure having a vertical, concave, or stepped seaward face that provides shoreline protection from waves while retaining upland soils. Seawalls are typically located on the ~~coast fronting beaches or other Tidally-Influenced waterways and are subject to storm surges with pounding surf, eroding shorelines, and wave overtopping from coastal storm or extreme high tide events.~~ along shorelines subject to heavy wave action.*

#### Bulkhead

Begin with the City of Miami definition, with modifications:

*A ~~vertical or near-vertical, substantially impermeable~~ structure erected along water or a waterway, ~~designed and constructed in such manner as to retain soil~~ be substantially impermeable and retain soil, safely sustain any loads, both vertical and lateral, that may come upon it, such as earth fill, water, moving traffic, storage of materials alongside, and the like. In coastal communities, Coastal-bulkheads are most often referred to as Seawalls; however, by definition, they are intended to act as a shoreline stabilization structure that primarily retains soil and provides minimal protection from waves.*

#### Shoreline Protection Structure

No definition has been provided by any of the entities for which ordinance were reviewed. This is a critical definition, as the intent of the ordinance can be summed up to be protection of the shoreline. The recommended definition draws from the term **tidal flood barrier** as defined by Broward County.

*Shoreline protection structure Tidal flood barrier means any structure or shoreline feature including, but not limited to, banks, berms, bulkheads, living shorelines, green-grey infrastructure, revetments, seawalls, seawall caps, upland stem walls, or other infrastructure with a primary purpose of stabilizing the shoreline location by retaining soil behind it. that impedes tidal waters from flowing onto adjacent property or public right-of-way, and located within or along a tidally influenced area. This definition is not meant to*

~~include rip-rap, derelict erosion control structures, or permeable earthen mounds that do not provide an impermeable water barrier to tidal flooding.~~

### Tidal Flood Barrier

Begin with the Broward County definition, with modifications:

~~Tidal flood barrier means any structure or shoreline feature including, but not limited to, banks, berms, bulkheads, living shorelines, green-grey infrastructure, revetments, seawalls, seawall caps, upland stem walls, or other infrastructure with a primary or secondary purpose of preventing tidal waters from flowing onto adjacent property or public right-of-way, and located within or along a tidally influenced area. This definition is not meant to include rip-rap, derelict erosion control structures, or permeable earthen mounds that do not provide an impermeable water barrier to tidal flooding.~~

### Disrepair

Establish definitions for disrepair. The definition of disrepair may be different for a shoreline protection structure and for a tidal flood barrier:

~~A shoreline protection structure is presumed to be in disrepair if it allows for upland erosion or soil transfer, transfer of material through the structure, or where the structural integrity is compromised. . . . ~~barrier/ wall or allows tidal waters to flow unimpeded through and/or over the top of the barrier/wall to adjacent properties or public right-of-way.~~~~

~~A tidal flood barrier is presumed to be in disrepair if it allows tidal waters to flow unimpeded through or over the barrier and onto adjacent property or public right-of-way.~~

This definition should be contemplated further with respect to structural integrity and what constitutes disrepair from an enforcement perspective. Timelines for repair under the enforcement section may also be required to be different for shoreline protection structures in disrepair.

### Substantial Repair or Substantial Improvement

Begin with the City of Clearwater definition under Section 8-102 of the Community Development Code, with modifications:

~~For the purposes of this Section, substantial repair or substantial improvement means With respect to any property located on Clearwater Beach or Sand Key, any combination of repairs, reconstruction, rehabilitation, additions or other improvements of a shoreline protection structure or tidal flood barrier during a five-year period that meets the substantial repair threshold. the cumulative cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement. The five-year period shall commence upon issuance of a building permit for the improvements. For the purposes of this Section, the substantial repair threshold shall be defined as any Seawall or Bulkhead repair modification to a shoreline protection structure or tidal flood barrier consisting of 50% or more of the length of the existing shoreline protection structure~~

*~~or tidal flood barrier, any repair modifications that are 50% or more of the cost of a new, in-kind shoreline protection structure or tidal flood barrier Seawall or Bulkhead along the length of the existing barrier or property shoreline before the start of construction of the improvement, or any improvement modification to the shoreline protection structure or tidal flood barrier Seawall or Bulkhead which results in an elevation change along 50% or more of the length of the existing shoreline protection structure or tidal flood barrier.~~*

## Tidal Waters

Begin with the City of Miami and TBRPC definition with modifications:

*~~Any water that alternately rises and falls in a predictable and measurable rhythm or cycle due to the gravitational attraction of the moon and sun, including seasonal tide events such as king tides. Extreme tidal elevation changes caused by a storm event (i.e. storm surge) is not to be used as a determining factor of whether or not an existing shoreline protection structure or tidal flood barrier is in disrepair. is in violation of the city's maintenance requirements.~~*

## Height Thresholds

The existing minimum height required by the City of Clearwater is in excess of the minimum guidance provided in the TBRPC model ordinance by less than two inches. It is recommended that the City maintain its minimum height requirement as-is, or modify it to be consistent with the model ordinance guidance for the purposes of transitioning the survey datum utilized from NGVD29 to NAVD88.

Rather than applying the minimum height requirement only to seawalls along Clearwater Harbor or Clearwater Bay as is currently written in the Community Development Code, this minimum height requirement should apply to all shoreline protection structures and tidal flood barriers within the City limits.

## Shoreline Overlay District and Green Infrastructure

As discussed in the ordinance review section of this memorandum, the TBRPC model ordinance, specifies a Shoreline Overlay District with a stated intent of protecting private property, public right-of-way, or other public infrastructure, natural shoreline and coastal resources. It then identifies allowable shoreline types at a parcel level. This approach is restrictive to property owners and could prohibit the installation of shoreline protection structures or tidal flood barriers appropriate for proposed upland improvements. Natural or planted shorelines often require a larger footprint for installation, and would restrict the available use of such areas.

Rather than mandating the employ of green infrastructure using a Shoreline Overlay District, other mechanisms to encourage the use of green infrastructure systems should be considered. These may include, but not be limited to expedited permitting, reduction of permit fees, and grants.



## Enforcement

It is recommended that the City provide a window of opportunity to allow property owners with shoreline protection structures or tidal flood barriers in disrepair to make progress toward remedying the violation, as well as a timeframe for completion of the work. The TBRPC model offers a 60-day window to demonstrate progress towards repairing the cited defect, and repairs are required to be complete within 365 days after receipt of the citation. The TBRPC also allows for this timeline to be extended based on reasonable progress, which is subjective in nature. Reasonable progress should be defined. The City may wish to distinguish disrepair to a shoreline protection structure experiencing caused by soil loss from disrepair caused by compromised structural integrity.

## Disclosure

This section of the TBRPC model ordinance would require the utilization of a Shoreline Overlay District to determine applicability. Without a Shoreline Overlay District, a separate map would need to be developed to identify the specific properties for which disclosure would be required. The language specified by the TPRPC model ordinance should also be revised as appropriate.

## Technical Guidance

The preparation of a technical guidance document can assist property owners with anticipating potential violations, as well as reducing design costs when planning a project. This guidance document can focus on green infrastructure such as living seawalls and living shorelines, offering an additional incentive (reduction in design engineering costs) for property owners electing to install green infrastructure systems.

## Funding, Financing, and Other Considerations

Bringing every barrier up to new code, one at a time, will be a long and costly endeavor. The City can explore ways to encourage collective action or provide funding and financing options or benefits to assist in making the required improvements.

Funding or financing incentives that have been employed in other municipalities across the State include a matching grant for resilience improvements on private property or reduced permit fees for projects addressing a specific type of need. The City of Miami Beach has a Private Property Adaptation Program<sup>14</sup> that offers a 50% match up to \$20,000 for private property owners investing in flood mitigation measures, including seawall improvements. North Bay Village in Miami-Dade County is offering a 50% discount on home improvement permits to encourage resilience, which applies to impact doors and windows, window shutters, roof replacements or fortifications, generator installations, and solar panel installations.<sup>15</sup>

## City-Owned Tidal Barriers

The City will need to conduct an inventory of, evaluate the condition of, and develop a capital improvements plan for tidal barriers owned and maintained by the City.

<sup>14</sup>[Miami Beach Private Property Adaptation Program](#)

<sup>15</sup>[Resilient NBV Home Improvement Discount](#)

## Private Tidal Barrier Programs

Beyond financial incentives, various programs can be instituted to help property owners connect with neighbors and capture economies of scale, or enter into an association for maintenance of seawalls. The City of Punta Gorda, as an example, has a Canal Maintenance Division<sup>16</sup> responsible for the maintenance of seawalls and stabilization. Annual assessments of the seawall systems are conducted, and records are maintained in a GIS database. Financially, an organization like this could be structured similar to that of a homeowner's association, or alternatively could be structured as a special taxing district.

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<sup>16</sup>[Punta Gorda Canal Maintenance Division](#)

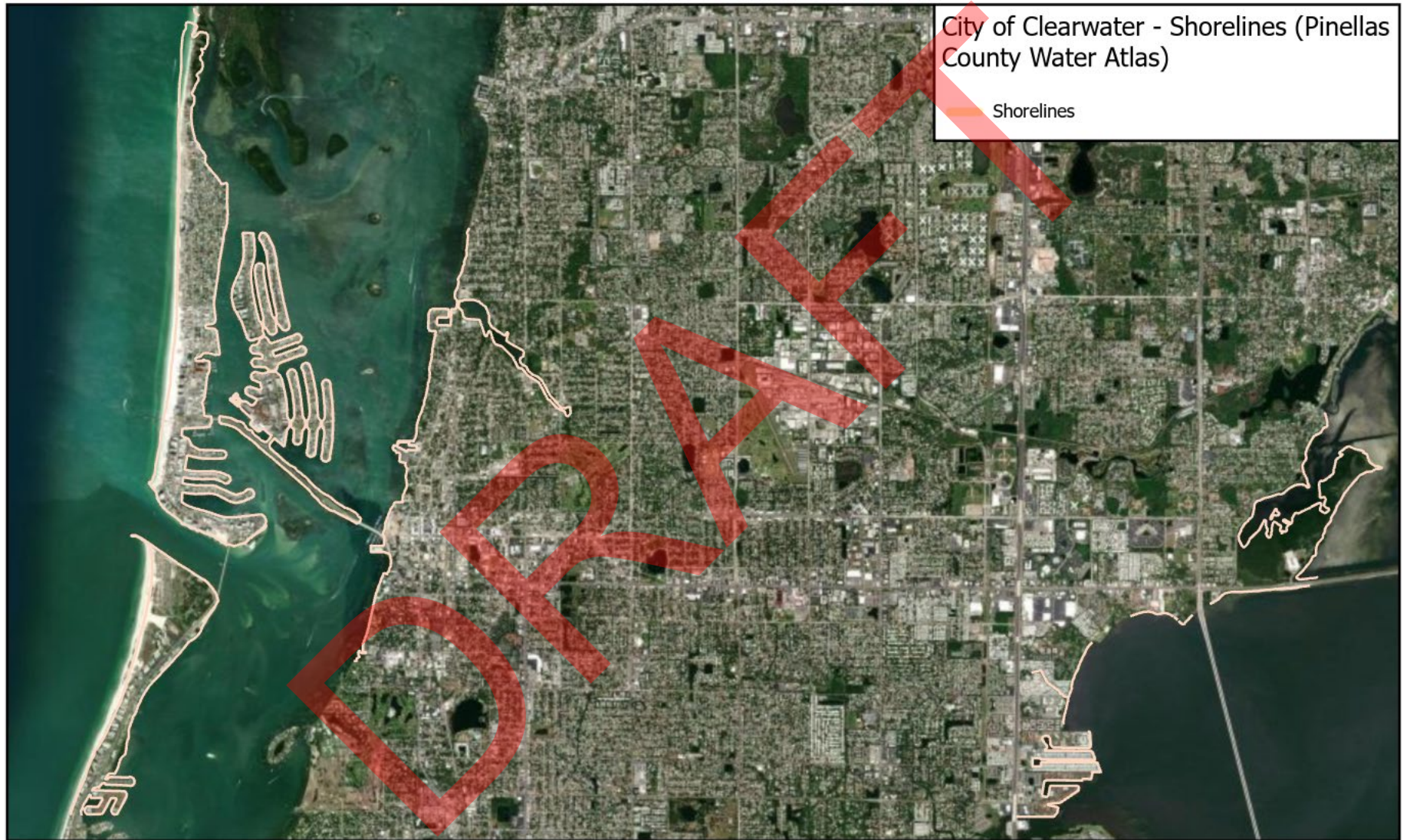


Figure 4. Map of Clearwater displaying all City shorelines, extracted from the Pinellas County Water Atlas.

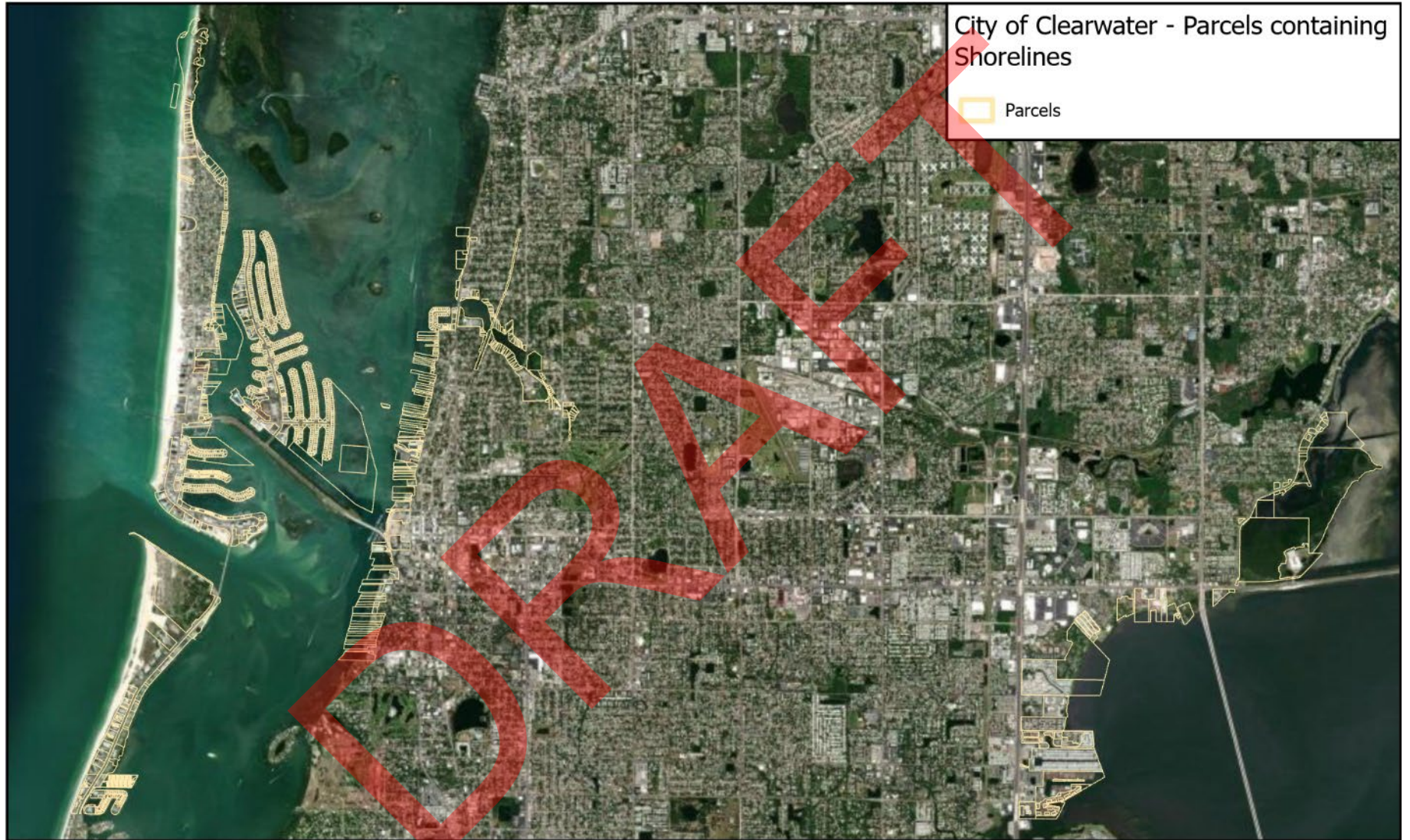


Figure 4. Map of Clearwater displaying all parcels containing shorelines.



Figure 5. Map of Clearwater displaying all visible seawalls, drawn via satellite imagery.

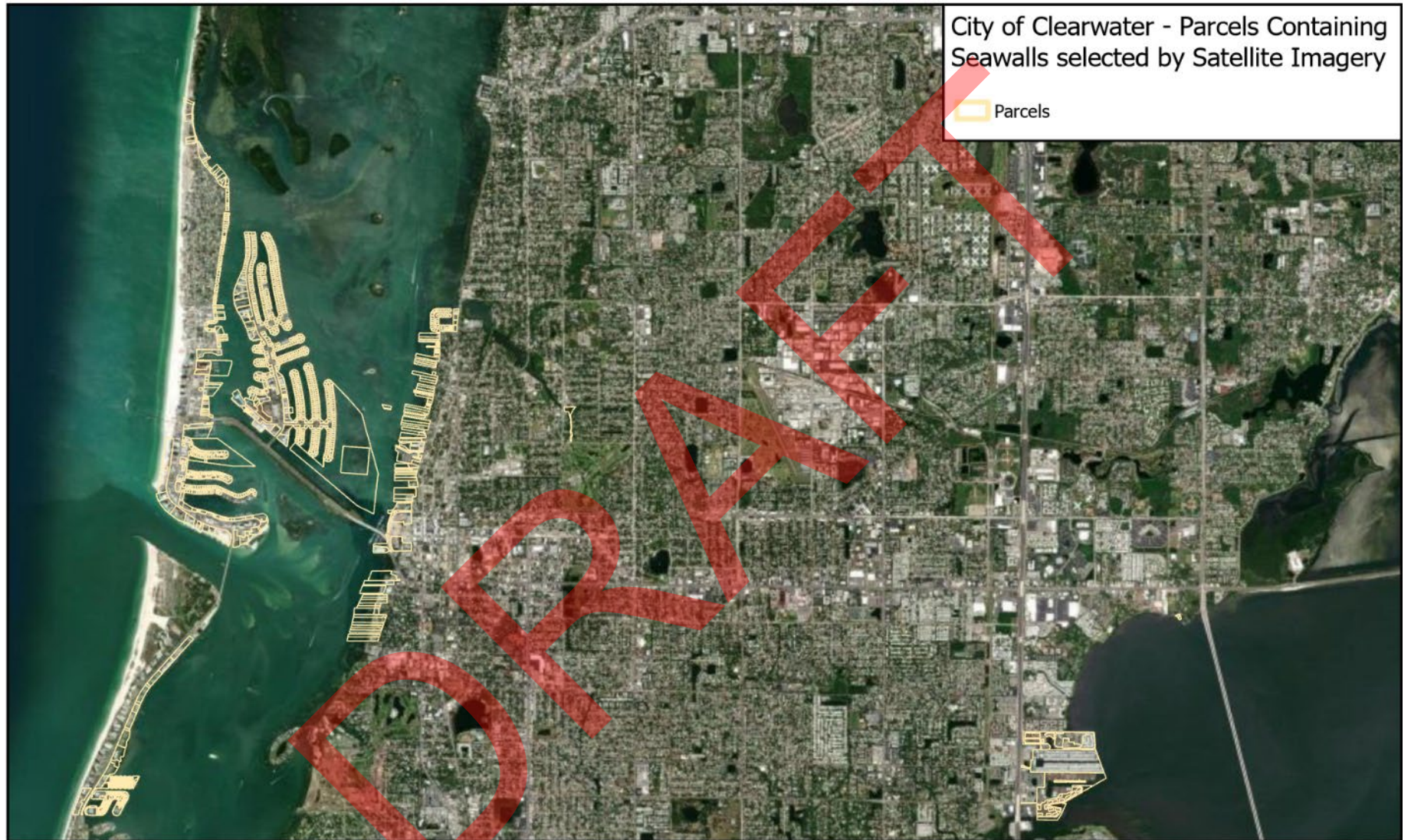


Figure 6. Map of Clearwater displaying all parcels containing seawalls, selected via satellite imagery.



Figure 7. Map of Clearwater displaying tidal water bodies, surface water bodies, and streams, selected via satellite imagery.