



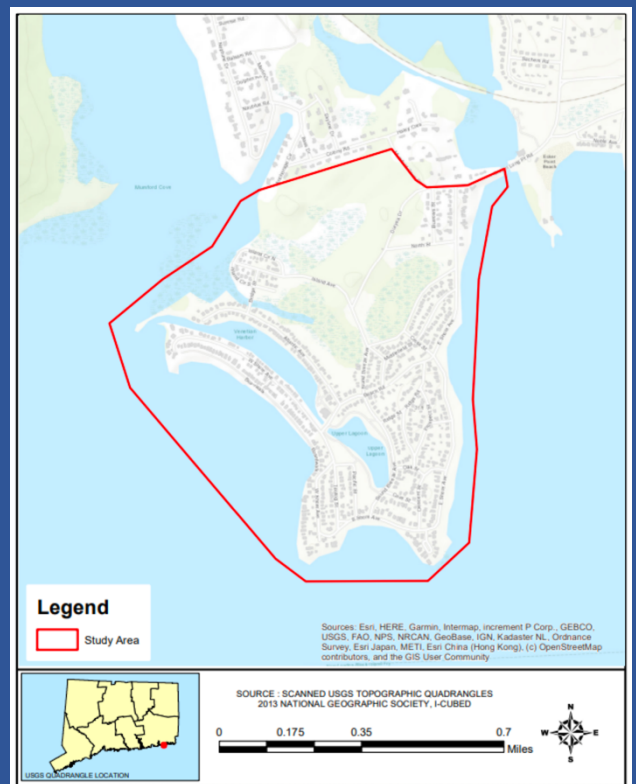
# Groton Long Point Climate Resiliency Plan Groton Long Point, Connecticut

## Executive Summary

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Prepared For:  
Groton Long Point Association Board of Directors

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## BACKGROUND & REASON FOR ACTION

The GLP community is increasingly more vulnerable to the long-term effects of climate change, rising tides and coastal storms. In addition, **there has never been a better time for Groton Long Point (“GLP”) to apply for federal and state funding to complete climate resiliency projects. Investing in non-federal matching grant funds now will ensure that Groton Long Point Association (“GLPA”) takes advantage of the historic amounts of state and federal grant funding available to rebuild smarter and safer for addressing the impacts of a changing climate.** The ability to apply for and potentially gain federal and state funding required a Vulnerability and Resilience plan be developed for GLPA.

Recognizing this vulnerability, in Q4-2022, the GLPA Board of Directors (“Board”) formed the Groton Long Point Ad-Hoc Resilience Committee (GLPRC), chaired by Jen Zick, Director, Long Term Planning. The committee sought out external environmental consulting support to develop a GLP Resilience Plan. As a result of a competitive bid process, the GLPRC recommended and obtained GLP Board approval to secure the services of **GZA GeoEnvironmental, Inc. (“GZA”) in concert with Coastal Ocean Analytics (“COA”)** to develop the GLP Resilience plan over the timeframe of April thru Nov 2023.

<b>Vulnerability &amp; Resilience Plan Tasks</b>	<b>TARGET START DATE</b>	<b>TARGET END DATE</b>
1. Kick-off Meeting	04/14/23	4/28/23
2. Existing Conditions Analysis and Climate Vulnerability Assessment	05/01/23	7/14/23
3. Public Meetings / Open Houses (2)	06/01/23	08/31/23
4. Climate Adaptation Strategies	07/17/23	09/29/23
5. Climate Vulnerability Assessment and Climate Adaptation Concept Strategies Report	09/06/23	10/31/23

The GLPRC is pleased to advise the GLP Board that the GLP Resilience Plan has been completed in line with the planned project timeline and budget. This Executive Summary has been developed to assist the GLPA Board digest the highlights, actions and recommendations stemming from the complete 213 page plan.

The Plan provides a planning tool for the GLPA to improve resilience to climate change for Groton Long Point (GLP). The overarching goal was to create a formalized climate resiliency plan that can be used as a starting point for future resilience improvement planning and implementation. The plan contains several highlighted recommendations for GLPA to pursue future grant funding for projects that will improve the climate resilience of natural resources and infrastructure and provide possible coastal flood mitigation strategies for homeowners.

## INTRODUCTION

The Groton Long Point (GLP) Climate Resiliency Plan (Plan) provides a framework to help build resilience to climate change in the Groton Long Point area located in the Town of Groton on Fishers Island Sound. The Plan presents a proactive approach to addressing the effects of climate change on coastal flooding (i.e., rising sea levels and increasing storm surge); increasing precipitation (i.e., heavy rainfall intensity and frequency), and increasing high temperatures. This plan presents strategies and measures to support decision makers with future resilience improvements for the following natural hazards:

**Coastal Flooding:** Water levels within Long Island Sound (and Fishers Island Sound) are rising. Over the last century, sea levels along the northern East Coast have risen faster than the global mean rate. Sea level rise results in higher high tides as well as higher extreme water levels during Nor'easters, tropical storms, and hurricanes. The net effect will be to increase the GLP's flood risk, which can significantly impact local infrastructure, private and public properties, utilities, and natural and recreational features.

**Increasing Precipitation:** Heavy precipitation events are increasing in intensity and frequency. Areas that exhibit nuisance flooding or ponding now are expected to exhibit more frequent and more significant flooding in the future.

**Increasing High Temperatures:** Future projected temperature changes for the Northeastern United States are expected to increase more than average temperatures. Cold waves are projected to become less intense while heat waves will become more intense. The number of days below freezing is projected to decline while the number of days above 90°F is expected to rise.

To address the effects of a changing climate, the Plan:

- Characterizes the natural hazards resulting from climate change, including flood hazards (i.e., sea level rise, increasing storm surge, and increasing precipitation) and increasing temperatures in GLP.
- Identifies the GLP's vulnerability to flooding hazards and increasing temperatures.
- Identifies and prioritizes climate adaptation strategies and measures that can be employed to minimize the impacts to GLP from flooding hazards and increasing temperatures.
- Introduces climate resiliency and adaptation into the GLPA's planning processes, including the future Town of Groton Resilience and Sustainability Plan, future revisions to the Town's Natural Hazard Mitigation Plan Update and other planning efforts.

## READING THE PLAN

**Section 1** introduces the plan, project team, study area, and plan methodology including the six-step vulnerability assessment and climate adaptation planning process; and presents input provided from the public and stakeholders on the Plan.

**Section 2** characterizes the assets located within GLP

**Section 3** characterizes the natural hazards resulting from climate change in GLP.

**Section 4** assesses the vulnerability of GLP assets to climate change hazards.

**Section 5** reviews climate adaptation and resilience strategies for climate change.

**Section 6** identifies and prioritizes the climate adaptation and resilience recommendations for GLP.

## RESULTS AT A GLANCE

### Vulnerability Assessment

**Flood and Precipitation Hazards:** GLP's vulnerability to coastal flooding and intense precipitation flooding was evaluated by completing an inventory of essential community facilities, buildings and structures, infrastructure, transportation systems, and natural and recreational resources in GLP and comparing their location and approximate elevation to available flooding data.

**Essential Facilities:** The GLP Fire and Police Departments are vulnerable to coastal flooding. The ground elevation at the facilities is at 4 feet NAVD88 which is below the present day and future 100-year flood hazard. Both essential facilities are also located at elevations below the present day and future 10-year flood hazard area, and thus have a high coastal flood vulnerability.

The GLP DPW Facility located at 30 Duryea Drive is located at elevation 12 feet NAVD88. This is above the present day and future 10-year flood hazard. It is located slightly above the present day 100-year flood hazard, and below the future 100-year flood hazard, and is considered to have a moderate and high coastal flood vulnerability, respectively.

**Infrastructure:** The stormwater drainage system has high vulnerability to increasing intense precipitation and coastal flooding. Increasing intense precipitation is expected to overwhelm the drainage system more frequently. Members of the community have observed that parts of the GLP are not adequately drained, suggesting the existing drainage system may not be adequate to handle future rainfall intensity. Coastal flooding will also affect the stormwater drainage system by submerging the outfalls and backflowing through drainage pipes unless tide gates/valves are installed to prevent reverse flows.

The sanitary sewer system and utilities are generally located below grade within the study area. The sanitary sewer main is designed as a closed system, so surface flooding should not impact the system. However, potential deficiencies in the systems may lead to vulnerability. The sanitary sewer system is vulnerable to coastal flooding via water infiltration (groundwater seeps through cracks, leaky pipe joints, or deteriorated manholes) and corrosive damage from saltwater. Sanitary sewer systems are also vulnerable to any unauthorized inflow (stormwater enters through illegally connected rain leaders, basement sump pumps, or drains).

The GLP shoreline is exposed to coastal flooding. Higher water levels may warrant consideration of whether the shoreline should be raised in the future to protect GLP.

**Transportation Systems:** Roadways that are vulnerable to coastal flooding include: South Shore Ave, Groton Long Point Road, East Shore Ave, West Shore Ave, Island Circle, Cove Street, Atlantic Ave, Bridge Street, North Street, Pacific Street, Tautog Street, and Peck Street. The minimum elevations for the roadways listed above are all well below the present-day Federal Emergency Management Agency (FEMA) Base Flood Elevation (BFE) of 10 to 13 feet, NAVD88. Such flooding would be capable of significantly damaging or washing out the roadway. Therefore, and in combination with the observed flooding reported by the community, these roads are considered highly vulnerable to coastal flooding both currently and in the future.

**Recreational and Natural Resources:** Each of the nine areas of open space and recreational facilities within GLP (excluding the south tennis court) are at least partially flooded by the present day and future (2050) 10-year and 100-year floods. Flooding of the open space and recreational properties is likely to have a minor to moderate consequence. Therefore, open space and the recreational properties are considered to be moderately vulnerable.

The Natural Diversity Database Area borders the study area on most sides, and is present in most of the study area north of Atlantic Ave and Sound Breeze Ave. Much of these areas include inland and tidal marshes that are inundated by the present day and future (2050) 10-year and 100-year floods. Extreme water levels can drown marshes if inundated for too long. Therefore, the Natural Diversity Database Areas have a high vulnerability to the present day and future (2050) 10-year and 100-year floods.

**Increasing Temperature Hazards:** The study area's vulnerability to increasing temperatures was evaluated through analyses of temperature change data and land use in the study area, and a literature review of publications that

discuss the impacts of increasing temperatures. The major impact discussed in the publications was the health effects of heat waves. A main vision for the growth of the study area is to invite people to experience the transforming waterfront area or play sports at improved recreational facilities. For this reason, the study area has high vulnerability to increasing temperatures particularly in the form of heat waves. During heat waves, people are more prone to dehydration, heat exhaustion, and other medical emergencies. Heat and sunshine can also intensify ground-level pollution. Mitigation strategies to address heat waves is an important consideration for sustaining GLP's public health.

## **PUBLIC OUTREACH AND OVERVIEW**

GLPA and GZA facilitated in-person public education and outreach forums to gather public and community stakeholder input during the planning process for the project. GLPA used email, social media websites, community center postings and in-person canvassing to spread awareness of the project and public workshops.

GLPA and GZA used stakeholder outreach meetings as a platform to share information and gain support of key stakeholders. GZA worked with GLPA and the resiliency committee to arrange two (2) in-person workshops at key milestones in the project. The activities conducted, topics covered, and public input received during the two (2) public workshops are described below.

### **Public Workshop #1 (Introductory Workshop)**

The first public workshop was held on July 8, 2023, and served as an introduction to the planning program. Participants included GLP stakeholders (residents, business owners, etc.) and representation from GLPA staff and committee members as well. A total of 87 participants attended the first public workshop. During the first workshop, GLPA presented an introduction to the GLP Resilience Committee, the project overview and purpose, purpose for the public workshops, and introduced GZA and COA. GZA provided an overview of GZA's climate resiliency planning experience in Connecticut and the local area, an overview of the schedule including expectations and timelines, the project approach, an overview of GLP Assets and hazard inventories, which included projections of sea level rise (SLR) and heat for 2050. GZA concluded the presentation of the 2022 GLPA Resilience Survey results and provided an overview of the next steps. Workshop participants then worked in small groups on three (3) topics and responded to questions for each topic that included: 1) flooding; 2) heat; and 3) next steps. Participants identified causes of flooding in GLP, including:

- Downpours and heavy rainfall
- Clogged Drains
- Coastal Storms
- High and king tides
- Combination of heavy rainfall, coastal storms and tides
- Nor'easters and subtropical storms

Participants also identified locations in GLP that have been impacted by flooding in the past, including:

- Beach Road
- West Shore
- Atlantic Avenue
- South Beach

- Outer Lagoon
- Pedestrian pathway around Lagoon
- South Shore and Sound Breeze intersection
- East Shore and Crescent intersection

Some Participants noted that they have observed an increase in the number of days over 90° F in recent years. Participants indicated that the rising temperatures affected business owners, residents, and community members in the following ways:

- Increasing drought conditions
- Changes in nearby forestry resulting in a dying off of trees from diseases
- Trouble renting properties without air-conditioning (AC)
- Increased electricity bills resulting from increase in need for running ACs
- Increased moisture and mildew in homes without AC

### **Public Workshop #2 (Final Workshop)**

The Final Workshop presenting the Summary of the Plan Progress Timeline Overview, Public Input from the July 8, 2023 workshop, Draft Vulnerability Assessment Results, Overview of Climate Adaptation Actions and Strategies and Next Steps was held on August 19, 2023. A total of 88 participants attended the second public workshop. During this workshop, GZA presented an overview of the natural hazards that may impact GLP. Temperature and precipitation projections were presented to exhibit how these hazards will become more severe in the future due to the impacts of climate change. Additionally, the present day 10-year and 100-year flood hazard areas were presented along with the estimated future boundaries with the effect of sea level rise.

Additionally, GZA presented the results of the vulnerability assessment, showing what assets are vulnerable to present day and future hazards. GZA then provided an overview of typical climate adaptation measures for flooding and extreme heat. Participants then discussed the different adaptation measures and the feasibility of such measures to protect GLP from future extreme heat and flooding hazards.

### **Public Outreach Takeaways**

GZA used the responses from the survey conducted during Public Workshop #1 to inform the vulnerability assessment and adaptation strategies. The reported locations of repetitive flooding were evaluated more closely during the vulnerability assessment to characterize the sources of the flooding.

Further, understanding the extent of flooding in the past and how it has affected businesses and properties in GLP helped to inform which adaptation strategies to present to the public during the second workshop. Then, the responses from Public Workshop #2 regarding the potential adaptation strategies were considered when developing recommendations in this plan.

## **RESILIENCE AND ADAPTATION STRATEGIES AND MEASURES**

The following adaptation measures were preferred by the GLPA during an initial screening meeting due to their anticipated effectiveness and potential for GLPA to directly participate in implementation. The table below provides a summary of the highlighted measures anticipated to improve the resiliency of Groton Long Point, with further discussion of benefits and challenges.

In reviewing these measures, it is important to note that GLP is faced with the challenge of being both potentially widely impacted by flooding by measure of the areal extent of land under water and by the magnitude of flood depth under extreme and high consequence weather events such as a category 3+ hurricane, the 100-yr flood or 1% annual chance flood (with areas exceeding 10 ft deep with high velocity wave action). As a result, measures that increase GLP’s resilience, the ability to bounce back from more frequent flooding and Nor’easters such as the 10-year flood event or the 10% annual chance flood, will be more sensible for GLP to invest in than flood mitigation measures to prevent flood inundation in a 100-year flood.

Measure	Purpose	Benefits	Challenges	Cost
<b>Evaluate Feasibility of Regional Flood Protection Barrier</b>	Protect study area by restricting flood waters by constructing a barrier that ties into high ground	Reduces or eliminates flooding (up to a certain design storm basis and design flood elevation or DFE)	Construction costs would be very high	Very High
			Viewshed, property ownership access permission	
			Likely to require cooperation of other communities	
			Need to consider impacts on flooding to east and west	
<b>Elevate Buildings located in lower lying areas</b>	Elevate existing buildings to be above the flood hazard area.	Protection from flooding	Largely responsibility of private property owners	High
		May result in reduced flood insurance rates	Construction costs could be high	
			Elevated structures may impact view of other properties.	
<b>Construct Additional Shoreline Protection and Wave Attenuation</b>	Reduce wave energy offshore to reduce wave runup and damage from high velocity wave action.	Dissipates wave energy, reducing storm surge for relatively frequent events	Unlikely to be feasible to provide protection to the 100-year flood level	High
		Provides habitat and ecosystem services	Construction costs would be quite high	
		Improves water quality	May be difficult to permit	
			Maintenance costs for vegetated systems	
<b>Install functional tide gates and backflow preventers on stormwater outfalls</b>	Ensures that stormwater can only flow in one direction. Keeps tides from the Fishers Island Sound out of the stormwater system.	Reduces total flow in stormwater main during combined coastal/precipitation flood	Requires annual maintenance	Medium
		Eliminates sunny day flooding of stormwater catch basins		
<b>Relocate Police and Fire Stations</b>	Move police and fire station out of flood hazard area.	Protection of building and assets from flooding	Construction costs would be quite high	High
		Improves ability for GLP emergency response during/after flood	Need to further evaluate feasibility	
			Surrounding roadways connecting to stations likely to be impassable during extreme floods	
<b>Conduct a detailed stormwater runoff study</b>	Evaluate the as-built stormwater system in the study area through detailed mapping and modeling to recommend methods to reduce stormwater flooding.	Development of scalable recommendations for green infrastructure or traditional capacity improvements to reduce stormwater ponding	Requires survey data and elevation information for stormwater system	Low to Medium
			Substantial cost to conduct study	
<b>Marsh restoration</b>	Evaluate restoration efforts for GLP marshes for flood storage and climate adaptation.	Provide storm protection and mosquito control	Requires permitting	Medium
		Nature-based solution	Does not protect against severe coastal flooding	
		Improves wildlife habitat		



## OPTIONS NOT HIGHLIGHTED IN THIS PLAN

This plan highlights certain options developed as part of the community outreach process, eligible for state and federal grant funding, and based on the experience of the project team. While it is not practical to include every potential option as part of the plan, effort was made to identify practical, appropriate potential solutions that are within the purview of GLP or that are otherwise frequently recommended for use in similar coastal settings (i.e., the flood protection barrier option). **Certain options including added sea walls around the Inner Lagoon and elsewhere, as well as dredging the lagoon were not highlighted individually because they were either duplicative of highlighted options (e.g., adding additional shoreline protection and wave attenuation) or judged to not meaningfully improve resilience in the context of flooding, extreme heat, and climate change interactions. This judgment is not to dismiss such options' feasibility in other potentially meaningful ways beyond the scope of this climate resiliency plan, including ecosystem restoration, navigation, or recreation.**

## ADAPTATION RECOMMENDATIONS

Measures/Actions were prioritized using the results of the plan with factors such as 1) hazard vulnerability reduction, 2) technical feasibility including anticipated costs, 3) ecological impact, and 4) GLP support.

**Stormwater Improvement:** Stormwater improvements are recommended at the Upper Lagoon, around GLP Harbor, and generally throughout the study area. A detailed engineering evaluation and analysis is required to identify specific stormwater improvements at the areas of concern. In general, flood measures include the following:

- Complete a detailed stormwater system inventory and computer modeling analysis to identify the capacity and limitations of stormwater systems in GLP and make site-specific recommendations for system improvements based on the results.
- Install functional tide gates and backflow preventers at stormwater outfalls.
- Restore marsh areas to provide additional stormwater and floodplain storage.

**Relocate Police and Fire Stations:** Relocation of the police and fire stations away from the 100-year flood hazard area is recommended to preserve GLP's emergency response capabilities during and after large floods.

- Evaluate the feasibility of relocating fire and police stations to the open space area north of existing GLP Public Works facility on Duryea Drive.
- Evaluate permitting feasibility of development in existing open space.

**Construct Additional Shoreline Protection and Wave Attenuation:** Evaluation of additional shoreline protection and wave attenuation is recommended to supplement the existing floodwall along shoreline roads.

- Conduct a coastal engineering study to assess feasibility of potential locations and types of shoreline protection methods, and environmentally beneficial structures such as EConcrete®.
- Provide wave attenuation methods and devices such as sills, breakwaters, or innovative technologies to protect against at least the 10-year wave height.
- Emphasize natural and nature-based features for more favorable regulatory review. Building additional hard structures may not be favorably received by regulators.

**Elevate Buildings:** Elevating buildings in the 100-year flood hazard area is one of the more common measures in coastal flood hazard zones.

- Elevate buildings to elevation 11 to 14 feet depending on location and in accordance with applicable building codes.
- Evaluate funding opportunities from FEMA to assist in elevating buildings.