Funded Through: DEP AGREEMENT NO. CM238

Working Towards Resilient Coastal Communities

City of Pompano Beach

Vulnerability to Sea Level Rise Assessment Report

Prepared on: April 14

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City of Pompano Beach Vulnerability to Sea Level Rise Assessment Report for CM238

Working Towards Resilient Coastal Communities

This report was funded in part, through a grant agreement from the Florida Department of Environmental Protection, Florida Coastal Management Program, by a grant provided by the Office of Ocean and Coastal Resource Management under the Coastal Zone Management Act of 1972, as amended, National Oceanic and Atmospheric Administration Award No. # *NA11NOS4190073.* The views, statements, findings, conclusions and recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of the State of Florida, NOAA or any of their subagencies.

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Contents

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Report Summary

The City of Pompano Beach Vulnerability Report

Introduction

In the past century, sea level rise in South Florida rose 8-10 inches. In the future, the rate of sea level rise is expected to accelerate due to processes associated with global climate change. Broward County is highly vulnerable to sea level rise (SLR) due to its low lying topography. As a result, inundation, episodic flooding, drainage issues in low-lying areas and saltwater intrusions are significant threats. This document contains the vulnerability assessment of major municipal infrastructure in the City of Pompano Beach during one and two foot SLR scenarios using a regional inundation digital elevation model (DEM) which incorporates 2007 LiDAR elevation data. Vulnerable areas are displayed by a grid with a 50 foot cell size, categorized as "possible" and "more likely":

The individual colors are used to describe the uncertainty associated with the variability of the tidal data measurements and LiDAR elevation measurements. The purple areas have a 75-100% certainty of identifying elevations below the high tide and therefore are "More likely" to be vulnerable. Orange areas have a 25-74% certainty of being at elevations below the hide tide and represent areas of "Possible" vulnerability.

Municipal Infrastructure Assessments

Mapping of different sea level rise scenarios can help to identify areas at potential risk and aid in planning for a sustainable community. This Geographic Information Systems (GIS) based study specifically assessed the following municipal infrastructure for the potential impacts of sea level rise:

1. Airports
2. Bridges
3. City Arterial Roads
4. City Hall
5. City Parks
6. County Parks
7. Community Redevelopment Areas (CRAs)
8. Evacuation Routes
9. Fire Rescue Stations
10. Hospitals
11. Law Enforcement Assets
12. Schools
13. Potable Water Treatment
14. Waste Water Treatment

This work was funded, in part, through a grant agreement from the Florida Department of Environmental Protection, Florida Coastal Management Program.

Municipal Scale Inundation Maps

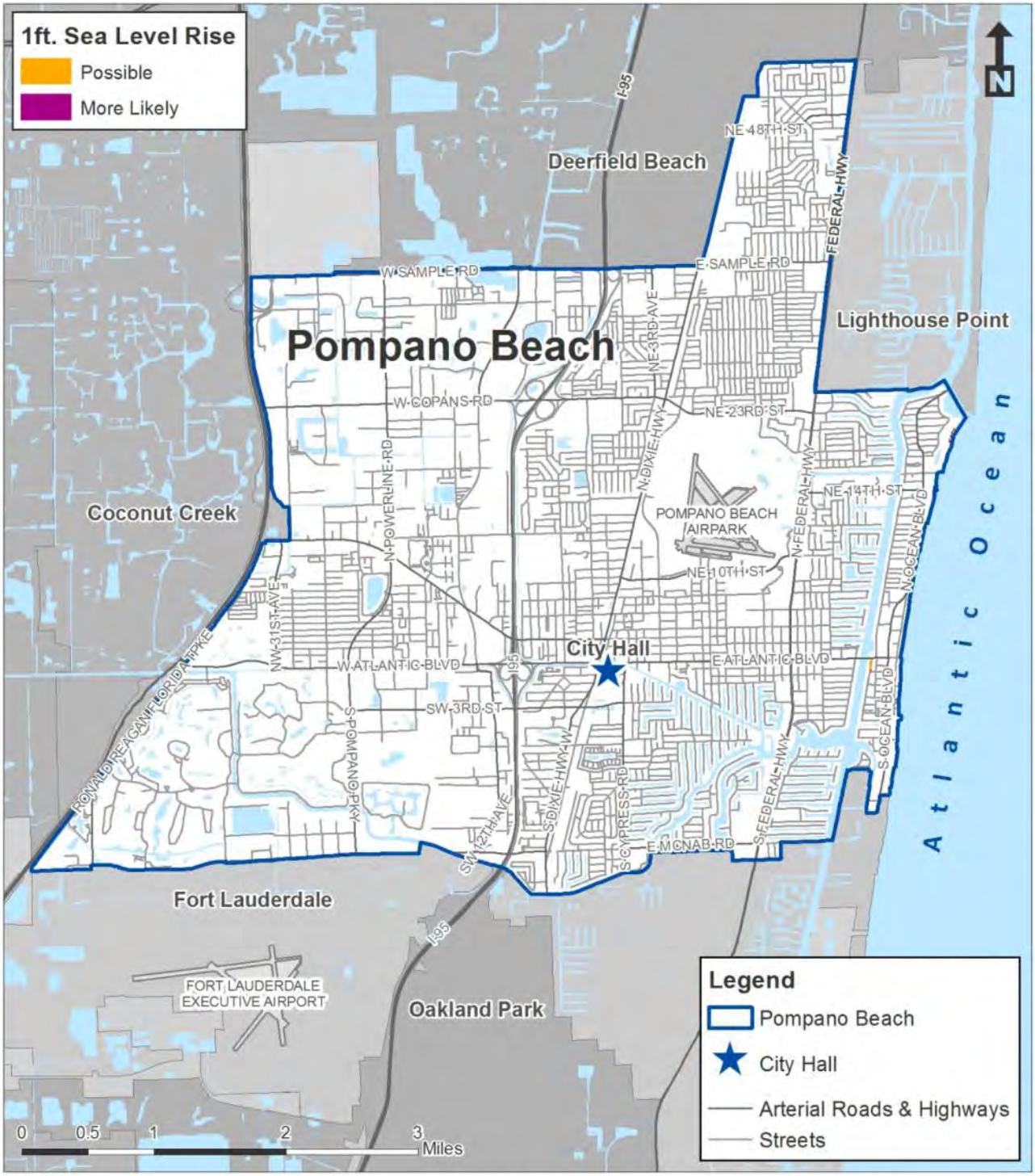
Municipal scale inundation maps provide at-a-glance overviews of areas within the Pompano Beach Municipal boundary that are low lying and likely to be vulnerable to flooding associated with sea level rise. The maps on the following pages show the City of Pompano Beach overlaid with the inundation grid for the one and two foot sea level rise scenarios. These maps primary purpose is to aid in the assessment of vulnerabilities to sea level rise.

The following table summarizes the area of land (in acres) vulnerable during both the one and two foot sea level rise scenarios, as shown in the municipal scale inundation maps. The table breaks down the vulnerable acres for each scenario into "more likely," "possible," and total. Additionally, the table shows the percentage of the total area of the city that is vulnerable. Note that percent values are rounded to the nearest two decimal places.

City of Pompano Beach Vulnerability to Sea Level Rise Table							
City of Pompano Beach	Total Area (Acres)	Area Vulnerable during One (1) Foot Scenario (Acres)		Total Area Vulnerable during One (1) Foot Scenario (Acres)	Acreage Vulnerable during Two (2) Foot Scenario (Acres)		Total Area Vulnerable during Two (2) Foot Scenario (Acres)
		More Likely	Possible		More Likely	Possible	
	15738.91	1.26	1.38	2.64	19.71	38.70	58.42
		0.01%	0.01%	0.02%	0.13%	0.25%	0.37%

CITY OF POMPANO BEACH INUNDATION MAP

One Foot Sea Level Rise



This map is for conceptual purposes only and should not be used for legal boundary determinations.

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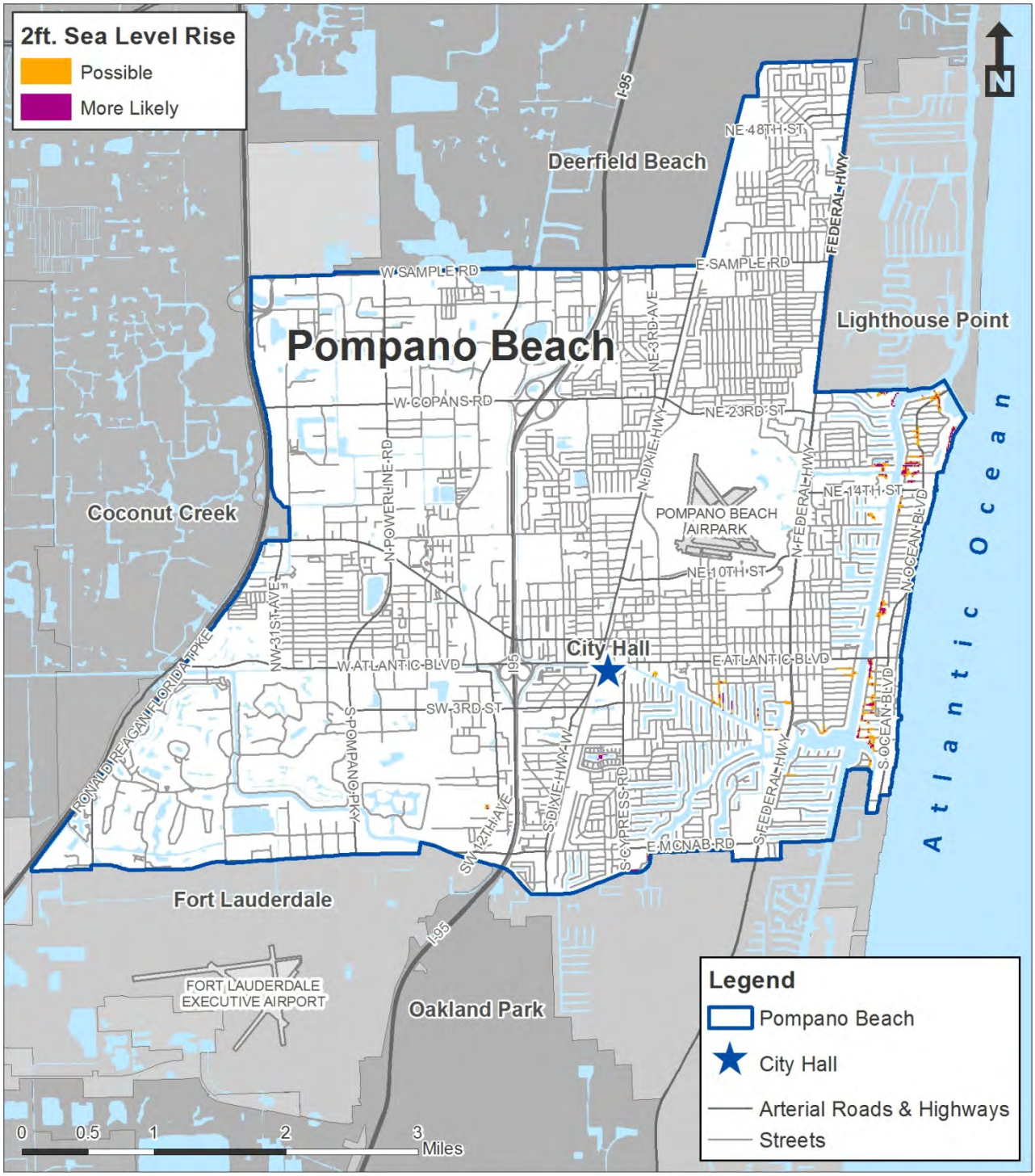
CITY OF POMPANO BEACH INUNDATION MAP

Two Foot Sea Level Rise



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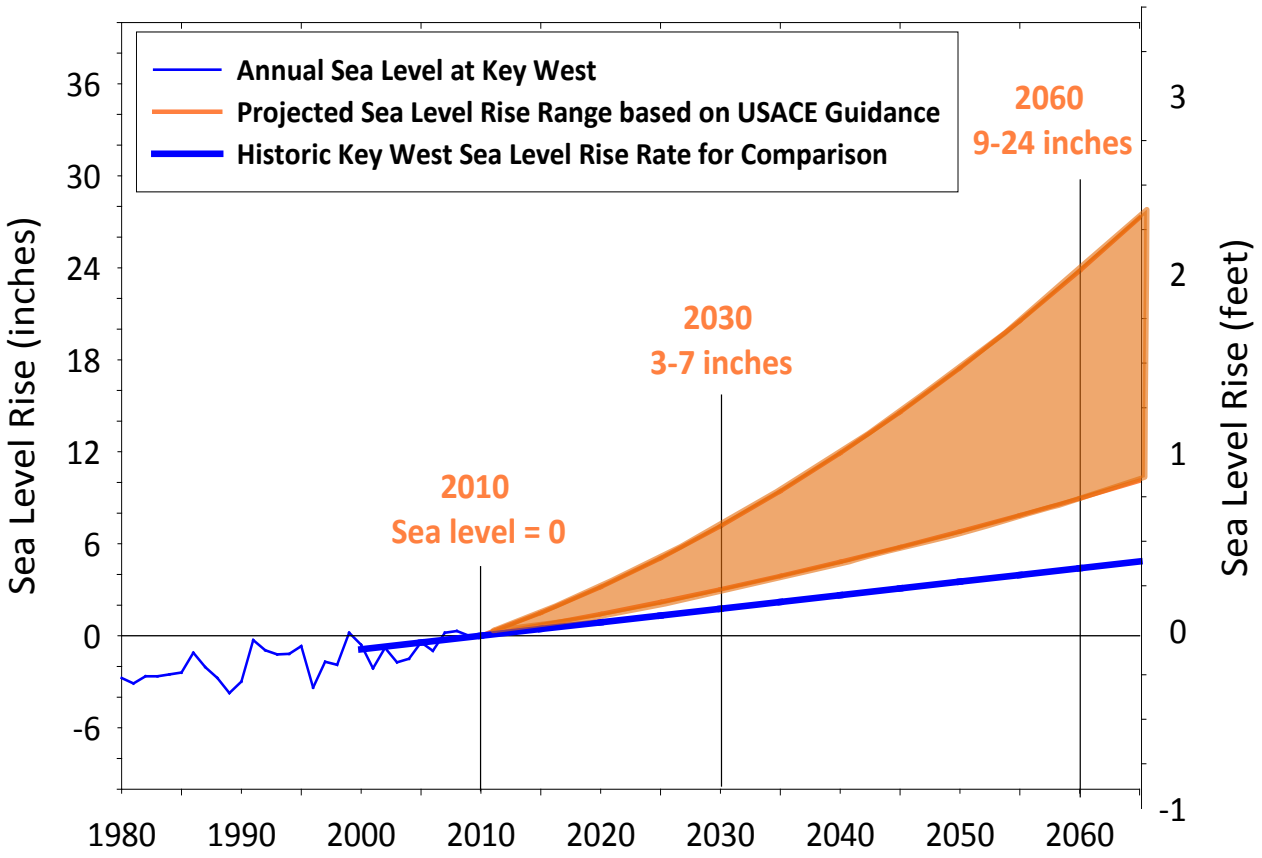
Unified Sea Level Rise Projection

The Southeast Florida Regional Climate Change Compact, collaboration among Monroe, Miami-Dade, Broward and Palm Beach Counties, convened a group of scientists and local experts to develop the Unified Southeast Florida Sea Level Rise Projection. This projection allows us to assign timeframes to the given sea level rise scenarios with a one foot sea level rise projected to occur between 2040-2070 and a two foot rise likely to occur between 2060 – 2115.



Unified Southeast Florida Sea Level Rise Projection for Regional Planning Purposes - This projection uses historic tidal information from Key West and was calculated by Kristopher Esterson from the United States Army Corps of Engineers using USACE Guidance (USACE 2009) intermediate and high curves to represent the lower and upper bound for projected sea level rise in Southeast Florida. Sea level measured in Key West over the past several decades is shown. The rate of sea level rise from Key West over the period of 1913 to 1999 is extrapolated to show how the historic rate compares to projected rates.

Vulnerability Assessment Methodology

Municipal infrastructure (fire rescue stations, schools, city owned arterial roads, etc.) was overlaid with the sea level rise inundation grid to review which infrastructure may be located at or below projected sea levels during the one or two foot scenarios. This process was expedited with the creation of a python script that quickly locates infrastructure which may be vulnerable during a given sea level rise scenario. Each location was reviewed visually for confirmation. The report uses inundation maps developed in collaboration with the Southeast Florida Regional Climate Change Compact with vulnerability methods and oversight by the GIS Section of the Planning and Redevelopment Division. All measurements of area and length are based on GIS datasets of the county and depend on these for accuracy. Additionally, measurements and percent values given in this report are rounded, which may contribute to minor inconsistencies.

Results

The following findings pertain to the vulnerability assessments performed for each of the City of Pompano Beach municipal infrastructure in the list. Detailed maps and tables follow.

1. Airports:
   The Pompano Beach Airpark (Airport) is not vulnerable up to a two foot sea level rise scenario.

2. Bridges:
   Included is a graphic that provides the location of all 32 bridges located in the City of Pompano Beach overlaid by the inundation grid. The idea is to provide an at-a-glance overview of the vulnerability of bridges with the understanding that most navigable bridges are located on tidally-influenced water bodies. Sea level will reduce the clearance under these bridges, thereby reducing the number and size of craft that can pass under them.

3. City Arterial Roads:
   No city maintained arterial roads in the City of Pompano Beach showed potential vulnerability to sea level rise during the one or two foot scenarios.

4. City Hall:
   The City of Pompano Beach city hall showed no vulnerability to sea level rise during the one or two foot scenarios.

5. City Parks:
   A total of eight city parks in the City of Pompano Beach were found to be potentially vulnerable to sea level rise under the two foot scenario. No parks were found to be vulnerable during the one foot scenario. Included in this report is an overview map of the City of Pompano Beach with the locations of all eight vulnerable city parks up to a two foot scenario, a table to assess each vulnerable park expressed in percent, and large-scale maps of selected vulnerable parks.

6. Regional Parks:
   No regional parks in the City of Pompano Beach showed potential vulnerability to sea level rise during the one or two foot scenarios.

7. Community Redevelopment Areas (CRA)
   Within the Pompano Beach East District CRA, a section of Riverside Drive has elevations at or below projected sea level during the one and two foot scenarios.

8. Evacuation Routes:
   No evacuation routes in the City of Pompano Beach showed potential vulnerability to sea level rise during the one and two foot scenarios.

9. Fire Rescue Stations:
   Fire Rescue Stations and streets within a 1000-foot radius of aforementioned stations were analyzed for potential vulnerability during the one and two foot sea level rise scenarios. Inundated streets are likely to cause access issues. Of the seven fire rescue stations maintained by the City of Pompano Beach, fire rescue station 11 was found to have potential vulnerability to sea level rise. Included is an overview map of the City of Pompano Beach with the location of the vulnerable fire rescue station, a table to express vulnerability during the one and two foot scenarios, and a large-scale map of the vulnerable station during the two foot scenario.

10. Hospitals:
    There are no hospitals located in the City of Pompano Beach.

11. Law Enforcement Assets:
    No law enforcement assets maintained by the City of Pompano Beach showed potential vulnerability to sea level rise during the one and two foot scenarios.

12. Schools:
    No school building footprints in the City of Pompano Beach showed potential vulnerability to sea level rise during the one and two foot scenarios.

13. Potable Water Treatment:
    No potable water treatment plants in the City of Pompano Beach showed potential vulnerability to sea level rise during the one and two foot scenarios.

14. Waste Water Treatment:
    No waste water treatment plants in the City of Pompano Beach showed potential vulnerability to sea level rise during the one and two foot scenarios.

Conclusion

The information contained in this report is intended to be used for planning purposes to begin to identify and address municipal infrastructure at risk. Understanding that a one foot rise could occur in the next 30 years, adaptation strategies should be developed for locations identified as vulnerable in the first scenario. In addition to the vulnerability of infrastructure identified to lie at or below projected sea levels up to a two foot scenario; the municipality may also be at risk due to secondary threats such as flooding events and ponding, storm drainage, erosion, bridge clearance, etc. Sea level may continue to rise beyond two feet. The Pompano Beach municipal authorities should begin the development of policies to address these risks and institutionalize the consideration of climate issues for adaptation strategies.

Definitions

ArcGIS: Software for working with maps and geographic information.

Arterial Roads: A major or main road, but not a highway.

DEM: Digital Elevation Model – A digital model or 3D representation of a terrain's surface using topographic information.

Geographic Information Systems (GIS): A system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data.

LiDAR: A remote sensing technology whereby elevation is measured by illuminating a target with a laser and analyzing the reflected light.

PPA: Priority Planning Areas – Identifies areas influenced by tidal water bodies at increased risk of inundation under a 2 foot sea level rise scenario, projected to occur as soon as 2060.

Python Script: A widely-used general purpose programming language. It is used in ArcGIS to automate processes whereby new geographic information is created from existing data.

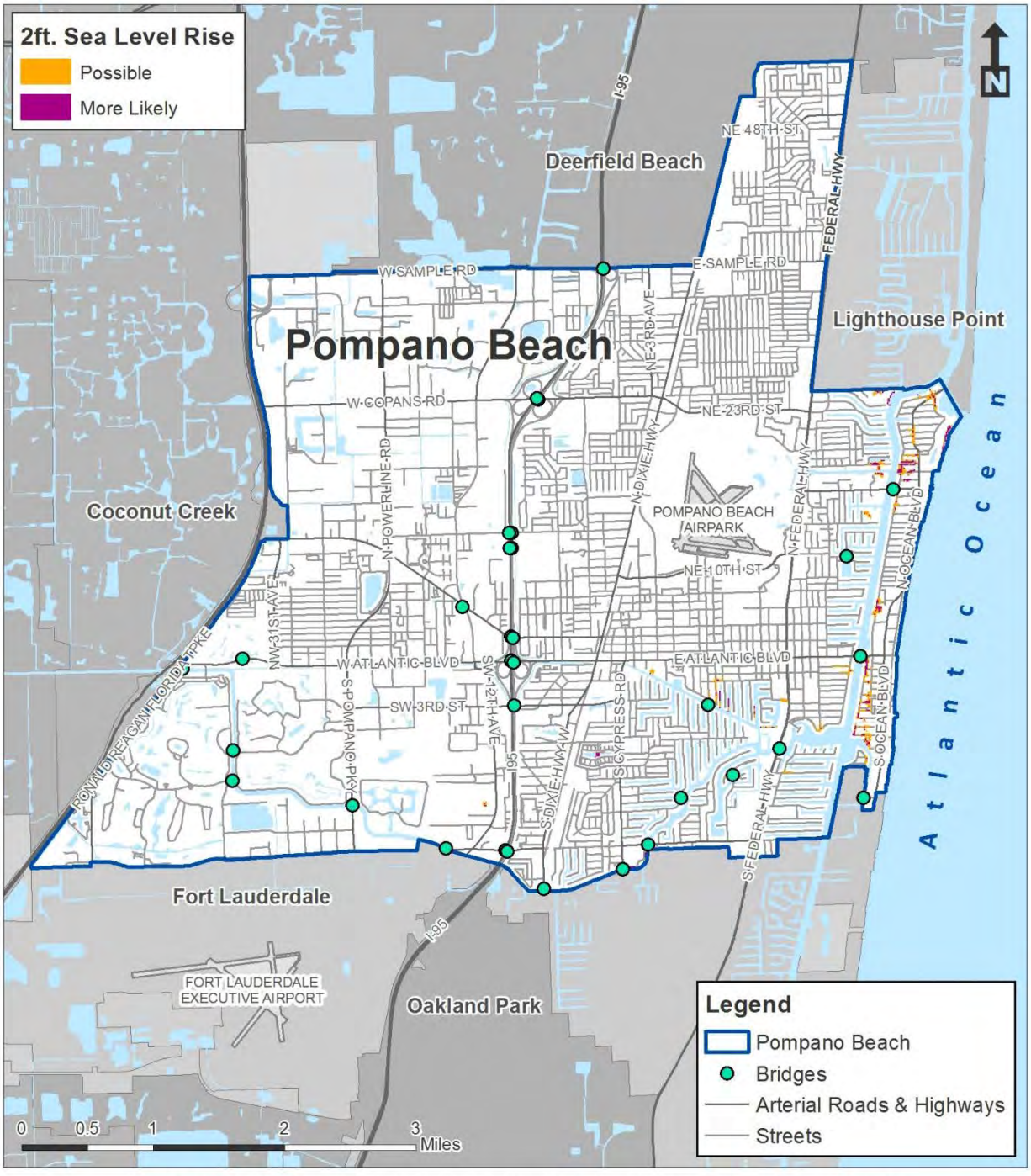
SLR: sea level rise grid

- "More Likely": areas that have a 75-100% certainty of identifying elevations below the high tide and therefore are "More likely" to be vulnerable
- "Possible": Orange areas have a 25-74% certainty of being at elevations below the hide tide and represent areas of "Possible" vulnerability.

Vulnerable Area: The phrase "Vulnerable Area" as used in this document refers to land elevation at or below a given sea level rise scenario (one to two foot) as determined by the unified sea level rise projection grid.

Bridges

Vulnerability Assessment



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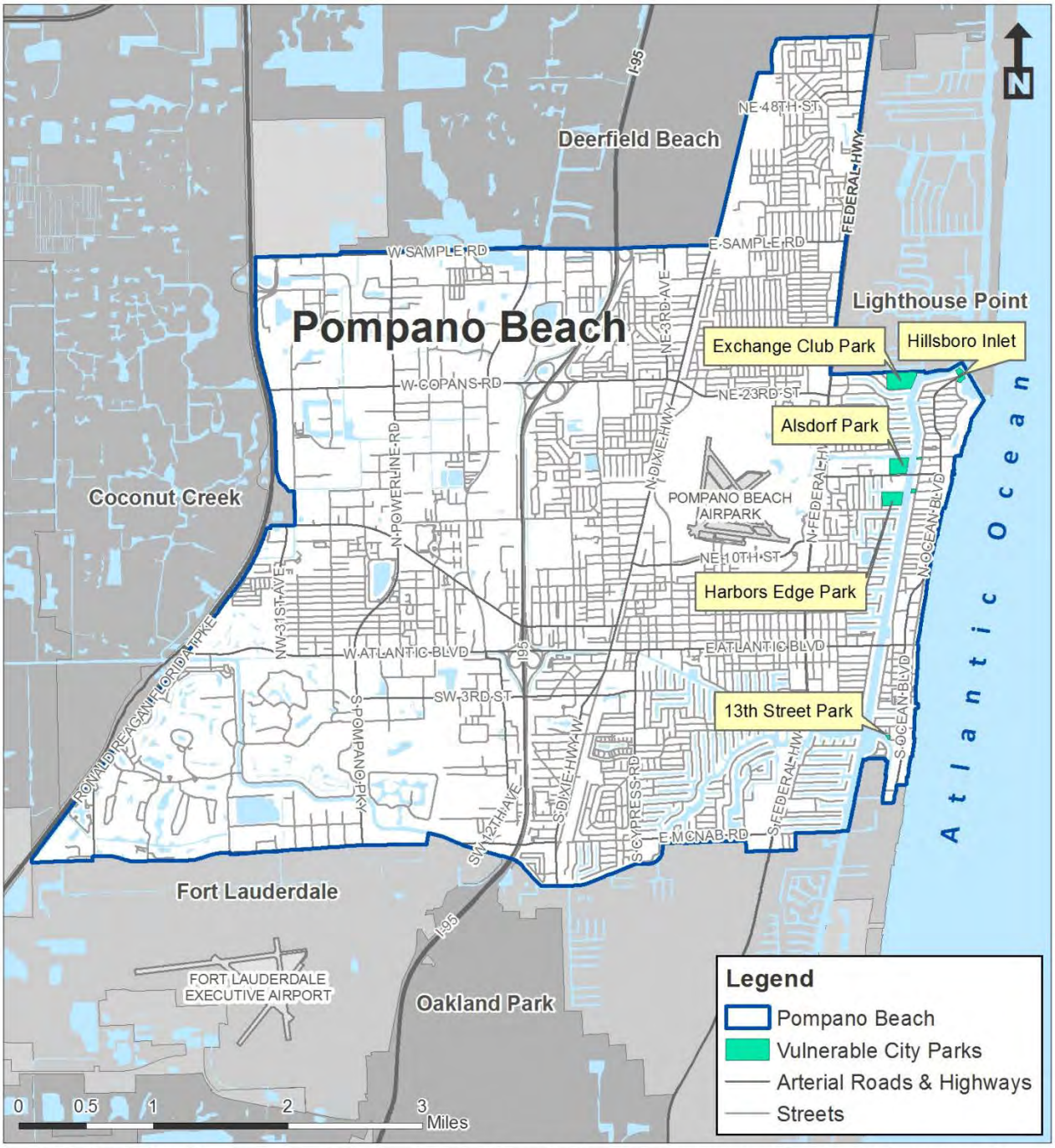
City Parks

Vulnerability Assessment



This Map identifies areas at increased risk of inundation up to a two foot sea level rise scenario, projected to occur as soon as 2060.

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Table of Vulnerable City Parks

The following table lists all eight city parks with vulnerabilities. Each park was assessed for the one and two foot sea level rise scenarios. For each park the table provides the acreage of vulnerable area, and the total area of the park with vulnerability expressed in percent. No city parks have areas located below projected sea levels during the one foot scenario, while eight parks are vulnerable during the two foot scenario. The largest vulnerable park during a two foot scenario, Exchange Club Park, may experience up to 17% inundation. These estimates are based on the area of the entire park and the inundation grid and do not subtract the area of water bodies within the park to determine the percent value.

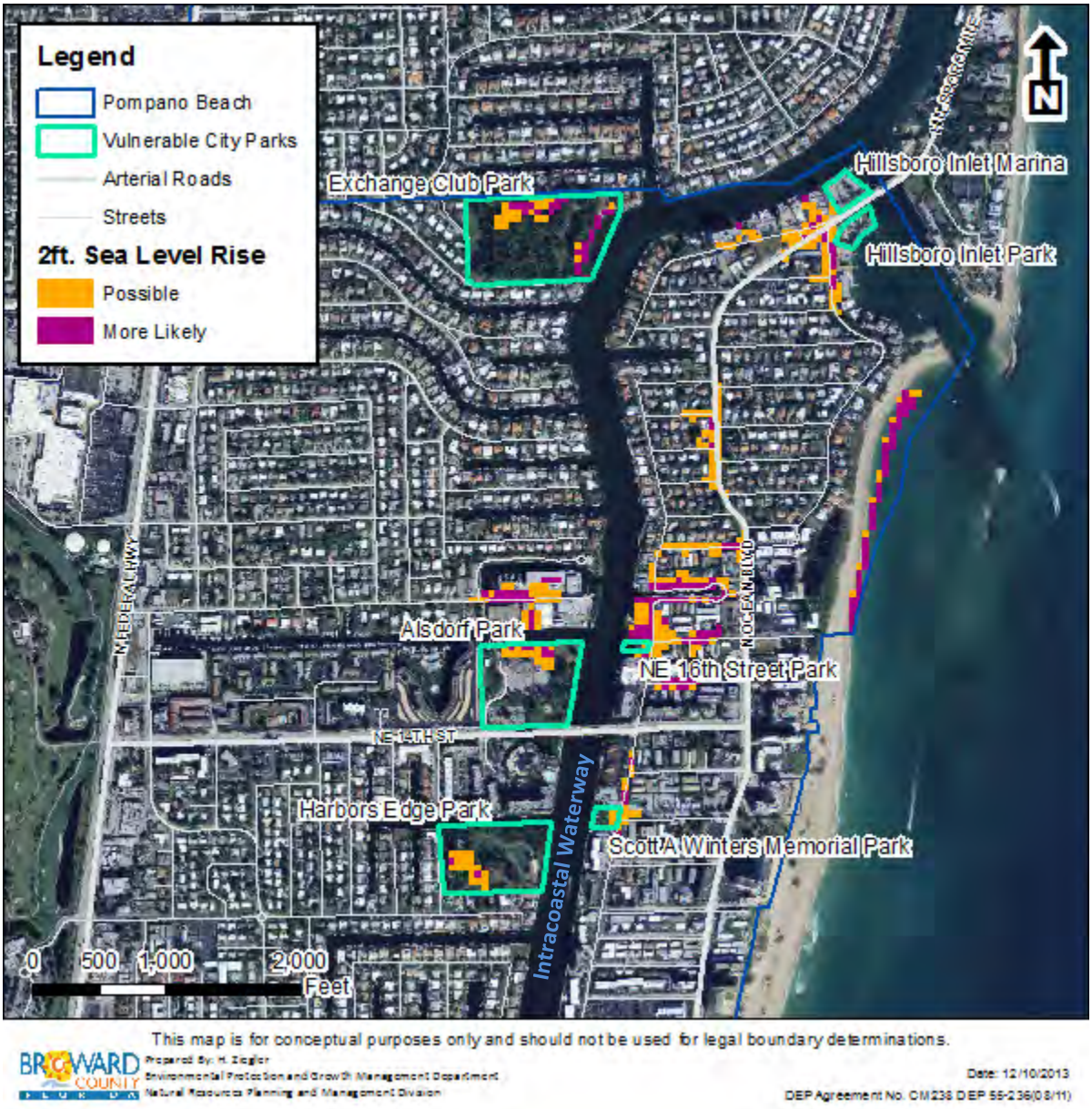
13th Street Park, 2596 SE 13th St.			Total Acres
			0.36
SLR Scenario	Possible	More Likely	Percent Total
1 Foot	0.00	0.00	0%
2 Foot	0.22	0.09	86%
Alsdorf Park, 2974 NE 14th St.			Total Acres
			10.03
SLR Scenario	Possible	More Likely	Percent Total
1 Foot	0.00	0.00	0%
2 Foot	0.86	0.34	12%
Exchange Club Park, 2800 NE 24th St.			Total Acres
			15.60
SLR Scenario	Possible	More Likely	Percent Total
1 Foot	0.00	0.00	0%
2 Foot	1.25	1.36	17%
Harbors Edge Park, 1210 NE 28th Ave.			Total Acres
			9.37
SLR Scenario	Possible	More Likely	Percent Total
1 Foot	0.00	0.00	0%
2 Foot	1.03	0.11	12%
Hillsboro Inlet Marina, 2705 N Riverside Dr.			Total Acres
			1.22
SLR Scenario	Possible	More Likely	Percent Total
1 Foot	0.00	0.00	0%
2 Foot	0.01	0.00	1%

Hillsboro Inlet Park, 2700 N Ocean Blvd.			Total Acres
			1.07
SLR Scenario	Possible	More Likely	Percent Total
No inundation during a one foot scenario, less than one percent of the area affected during a two foot scenario. (0.003 Acres)			
NE 16th Street Park, NE 16th St.			Total Acres
			0.29
SLR Scenario	Possible	More Likely	Percent Total
1 Foot	0.00	0.00	0%
2 Foot	0.05	0.07	40%
Scott A Winters Memorial Park, 1199 N Riverside Drive			Total Acres
			0.65
SLR Scenario	Possible	More Likely	Percent Total
1 Foot	0.00	0.00	0%
2 Foot	0.19	0.00	29%

Pompano Beach City Parks

Hillsboro Inlet Marina & Park, Exchange Club Park, Alsdorf Park, NE 15th St. Park, Harbors Edge Park, Scott A. Winters Memorial Park

Two Foot Sea Level Rise Scenario

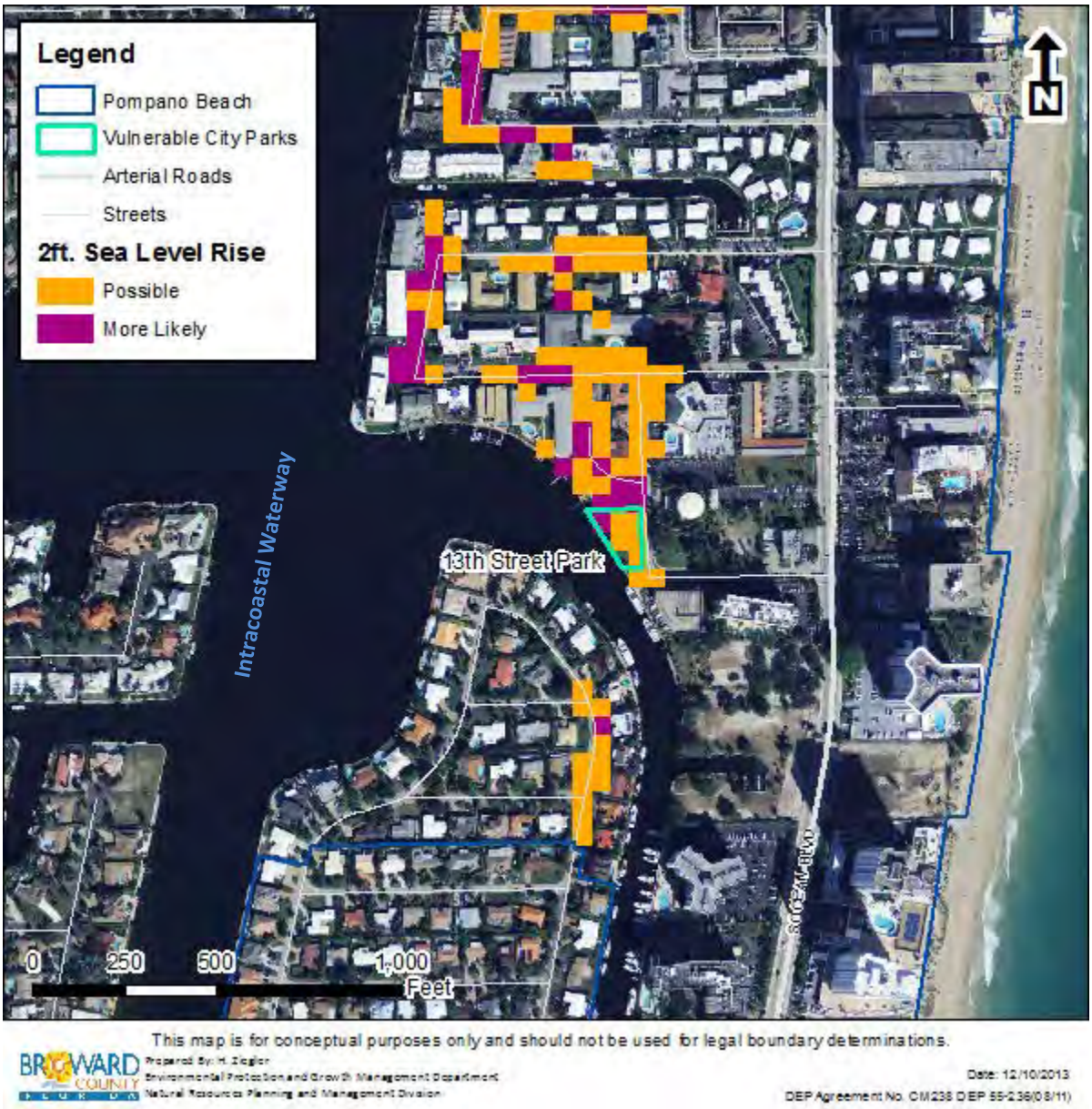


This map provides a view of city parks near the Hillsboro Inlet along A1A (Ocean Blvd) and NE 14th St during the two foot sea level rise scenario. This area of Pompano Beach has a large number of parks and a large amount of low-lying land. Note that this area is near the tidally influenced Intracoastal Waterway and the beach. All parks displayed in the map are vulnerable during the two foot sea level rise scenario. Among the vulnerable parks in this area are Exchange Club Park (17%), Asldorf Park (12%), and Harbors Edge Park (12%). No parks are vulnerable during the one foot scenario.

13th Street Park

2596 SE 13th St.

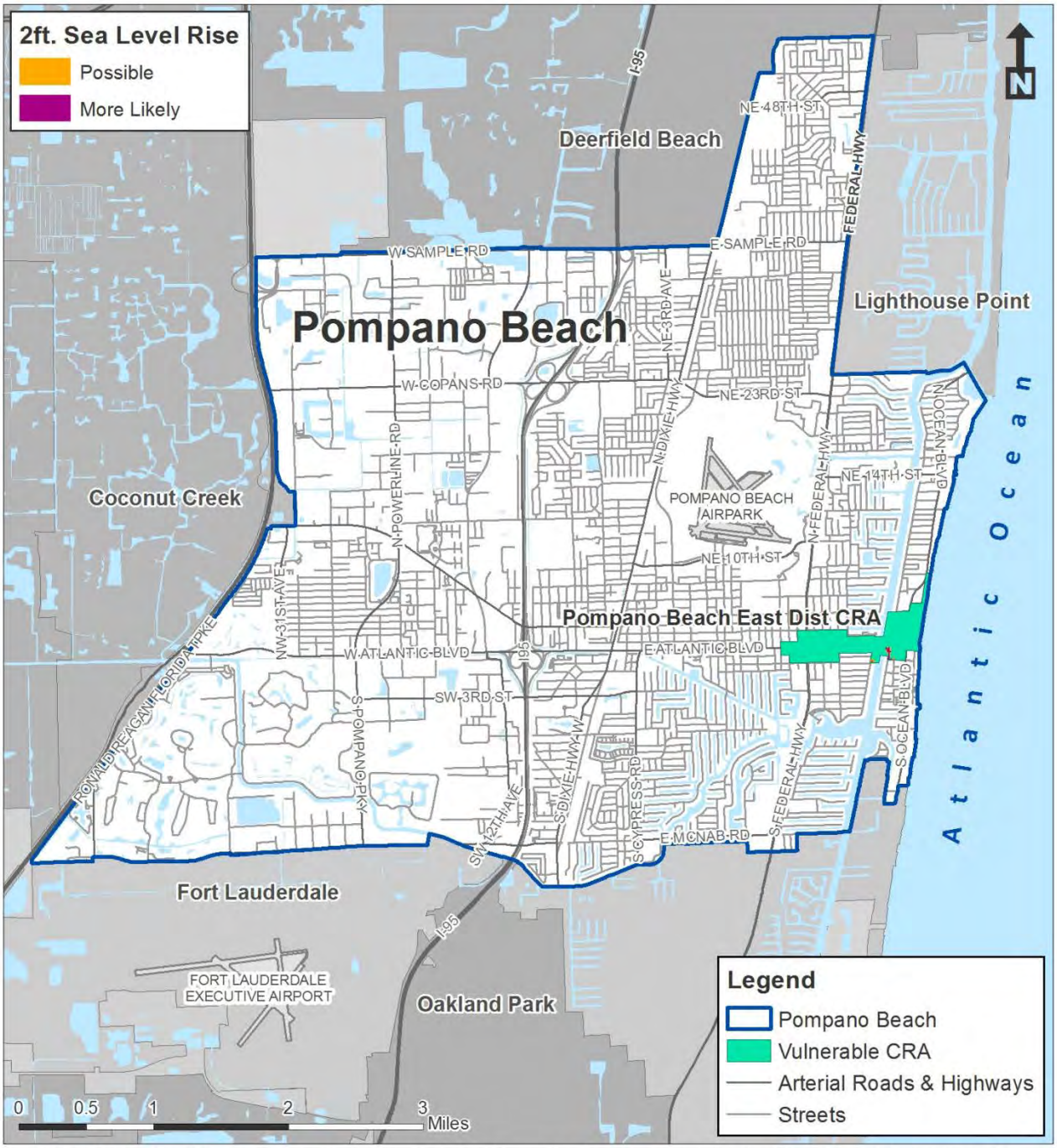
Two Foot Sea Level Rise Scenario



This map provides a view of 13th Street Park during the two foot sea level rise scenario. This park may have as much as 86% of area located at or below projected sea levels during the two foot scenario. Note that the park is located adjacent to the tidally influenced Intracoastal Waterway. The park is not vulnerable during the one foot sea level rise scenario.

Community Redevelopment Areas (CRA)

Vulnerability Assessment



This Map identifies areas at increased risk of inundation up to a two foot sea level rise scenario, projected to occur as soon as 2060.

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Table of Vulnerable Community Redevelopment Areas (CRA)

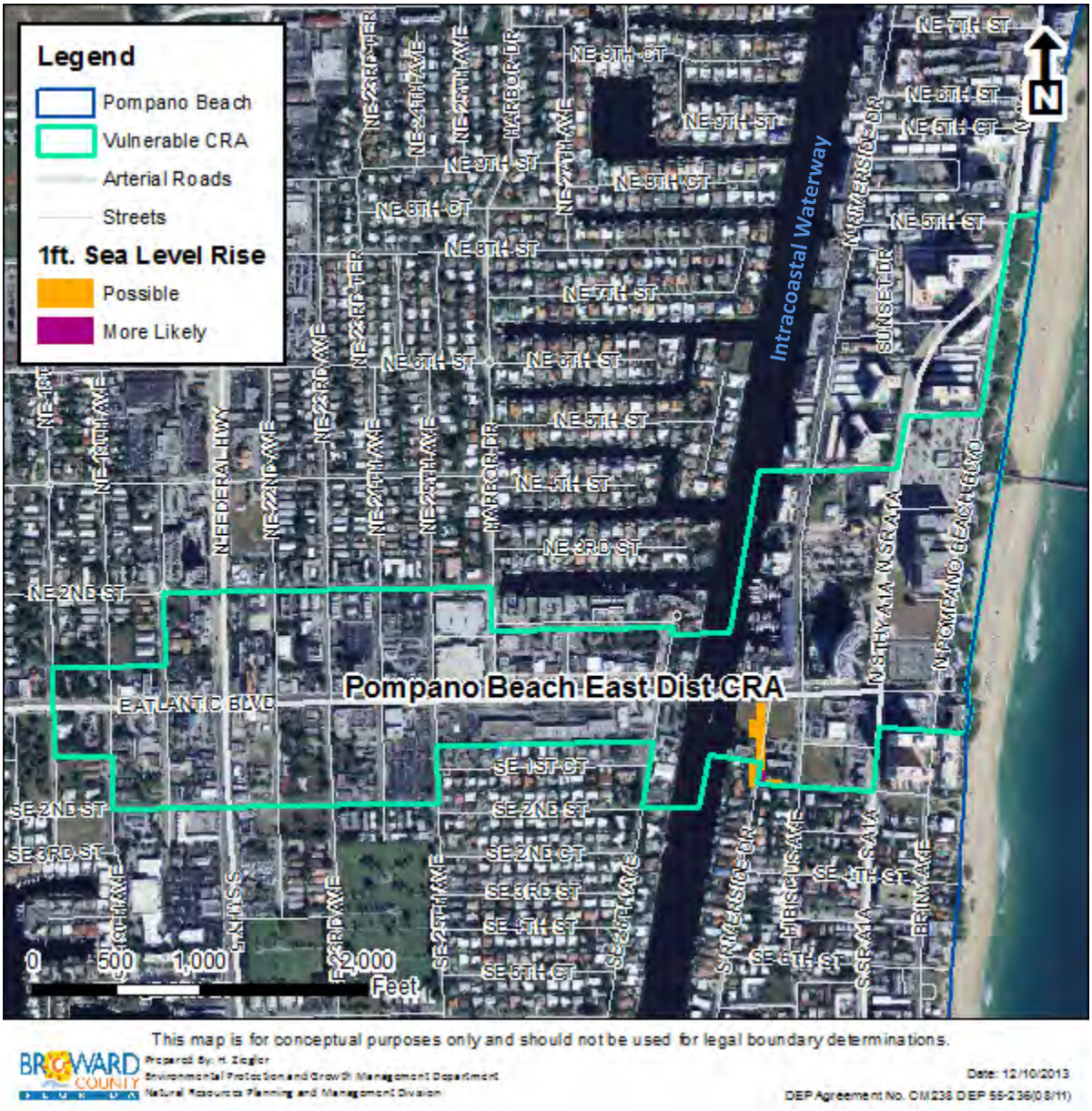
The following table lists CRAs within the City of Pompano Beach that have vulnerable areas during the one and two foot sea level rise scenarios. The Pompano Beach East District CRA is vulnerable during both the one and two foot scenarios, as detailed in the table below.

Vulnerable Community Redevelopment Areas (CRA) City of Pompano Beach		
CRA	One Foot Scenario(Y/N)	Two Foot Scenario (Y/N)
Pompano Beach East District	**Y**	**Y**

Key: For Y/N, Y = Yes, N = No

Pompano Beach East District Community Redevelopment Areas (CRA)

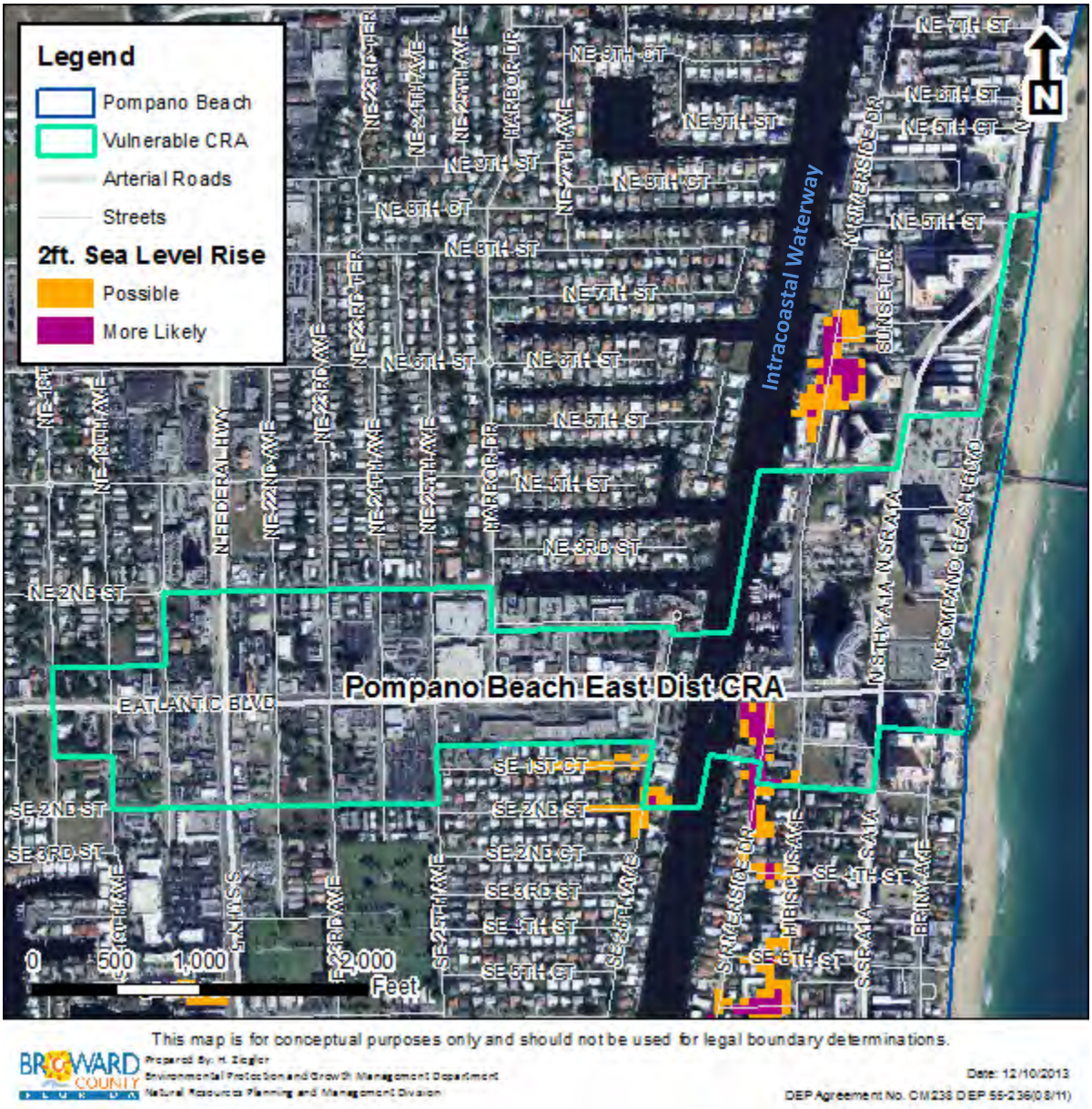
One Foot Sea Level Rise Scenario



This map provides a view of the Pompano Beach East District Community Redevelopment Area (CRA) boundary overlaid by the one foot sea level rise scenario. A section of Riverside Drive near Atlantic Blvd has areas that lie at or below projected sea levels during the one foot scenario. Note that the vulnerable area is located adjacent to the tidally influenced Intracoastal Waterway.

Pompano Beach East District Community Redevelopment Areas (CRA)

Two Foot Sea Level Rise Scenario



This map provides a view of the Pompano Beach East District Community Redevelopment Area (CRA) boundary overlaid by the two foot sea level rise scenario. A section of Riverside Drive near Atlantic Blvd has areas that lie at or below projected sea levels during the two foot scenario. Note that the vulnerable area is located adjacent to the tidally influenced Intracoastal Waterway. Nearby neighborhood streets are also vulnerable.

Fire Rescue Stations

Vulnerability Assessment

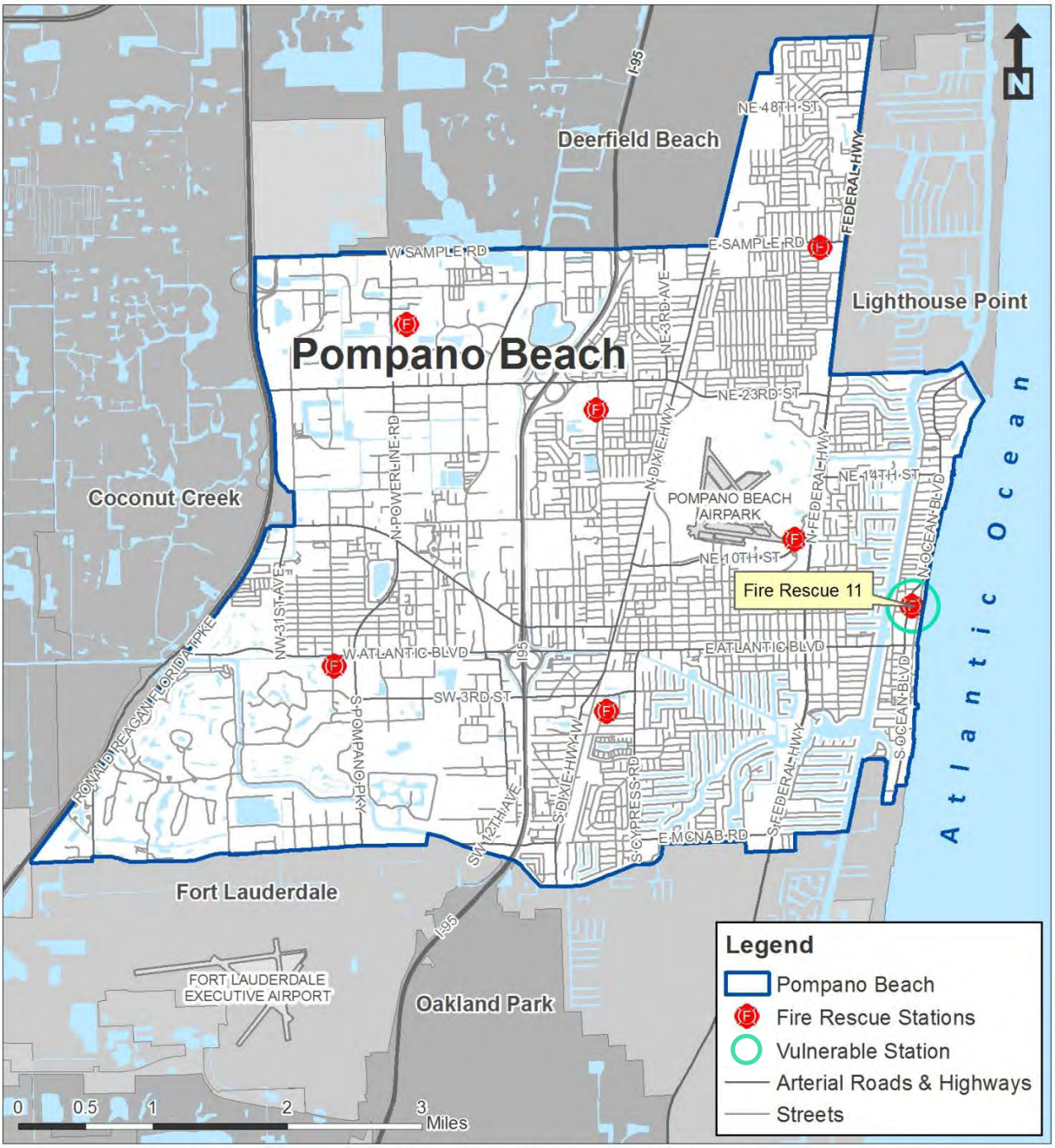


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Table of Vulnerable Fire Rescue Stations

The following table provides information on Fire Rescue Stations in the City of Pompano Beach which may have street inundation and access issues within a 1000-foot radius during either the one or two foot sea level rise scenarios. Out of the seven stations in the City of Pompano Beach, Fire Rescue 11 may have street access issues during a two foot scenario. No stations were found to be vulnerable during the one foot scenario.

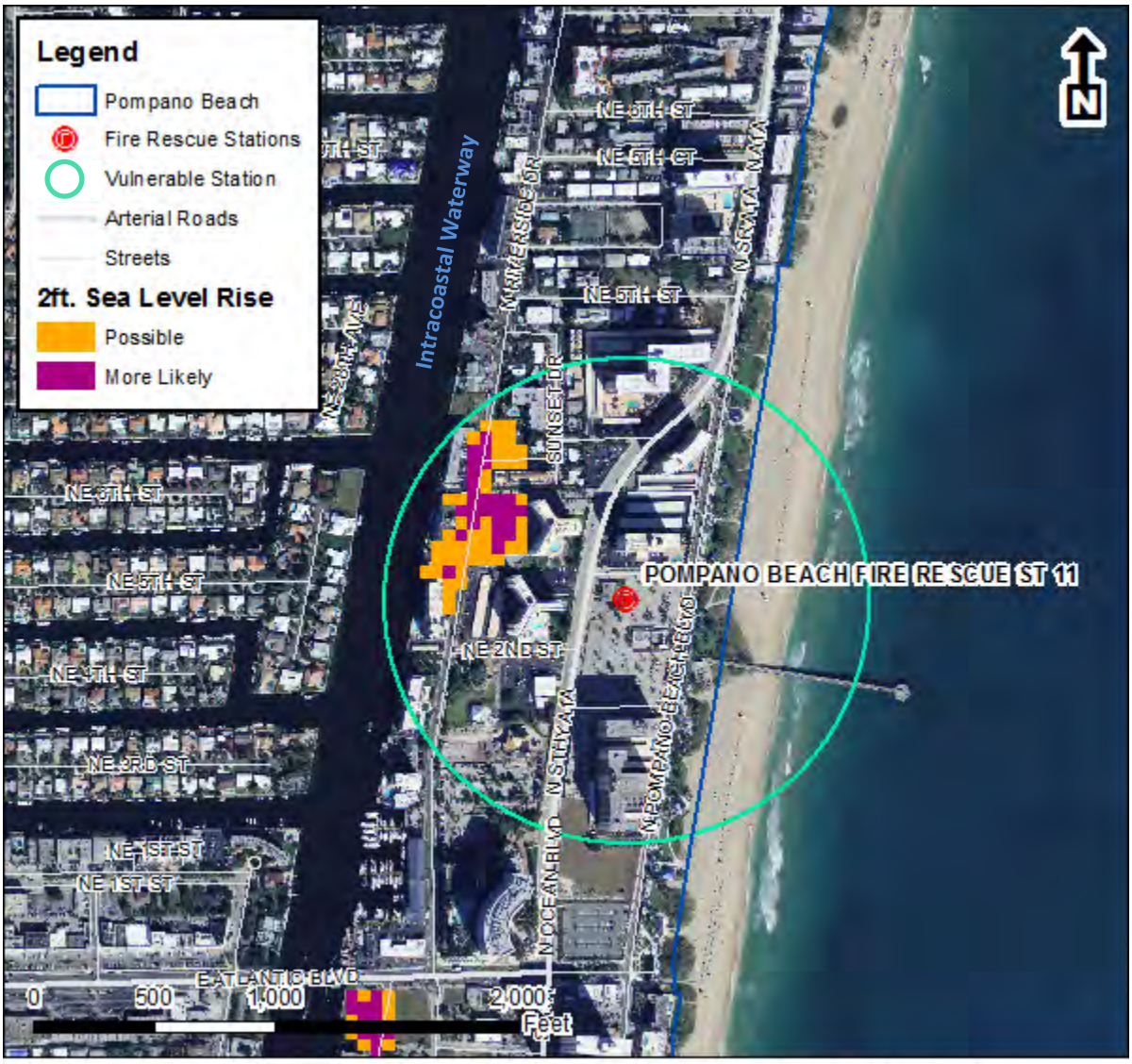
Vulnerable Fire Rescue Stations City of Pompano Beach		
Station	One Foot Scenario (Y/N)	Two Foot Scenario (Y/N)
Fire Rescue 11	**N**	**Y**

Key: For Y/N, Y = Yes, N = No

Pompano Beach Fire Rescue Station 11

Two Foot Sea Level Rise Scenario

3264 NE 3rd St.



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This map provides a view of Pompano Beach fire rescue station 11 during the two foot sea level rise scenario. The fire rescue station footprint is not vulnerable; however, there are streets within a 1000-foot radius that lie at or below projected sea levels during the two foot scenario. The vulnerable streets are an approximately 800 foot section of Riverside Dr and an approximately 200 foot section of 4th St Inundated streets may become access issues during emergencies. Note that the vulnerable area is located adjacent to the tidally influenced Intracoastal Waterway. Roads in the area are not vulnerable during the one foot scenario.