Brief coastal vulnerability assessment for the City of Cocoa Beach, conducted utilizing available NOAA and UF GeoPlan tools.

Vulnerability Assessment

City of Cocoa Beach

East Central Florida Regional Planning Council

Tampa Bay Regional Planning Council

Asssistance provided by Brevard UF IFAS

Funded by Florida Department of Economic Opportunity

Fall 2016 – Coastal Resiliency Tools Buffet

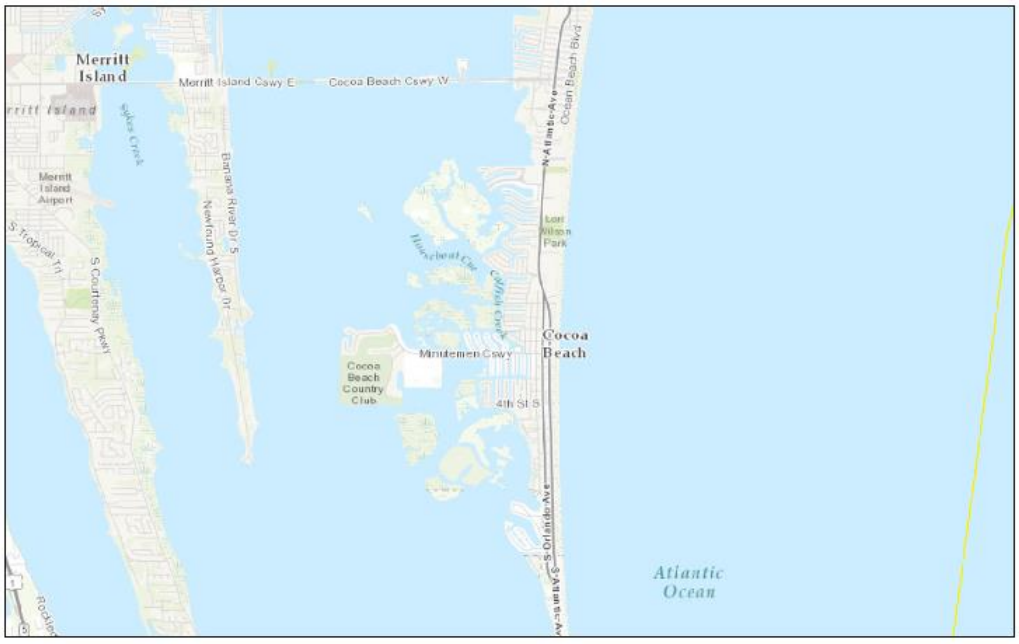
Vulnerability Assessment – City of Cocoa Beach

Background

The East Central Florida and Tampa Bay Regional Planning Councils participated in a statewide Train the Trainer program funded by the Florida Department of Economic Opportunity. The purpose of the program was to engage local coastal planners, engineers and other sectors in the discussion of resiliency and provide them with a hands on training of various NOAA Digital Coast platforms as well as the UF Geoplan Sea Level Scenario Sketch Planning Tool and provide training on the development of vulnerability assessments, utilizing a pilot area. The City of Cocoa Beach was chosen as the pilot area for a preliminary vulnerability assessment. The training was held on October 26, 2016 at the Volusia County Emergency Operations Center. Originally, the NOAA Coastal Flood Exposure Mapper was to be utilized as the main tool to conduct the vulnerability assessment, thus providing an overview of social, economic and natural vulnerabilities to coastal flooding and sea level rise. However, as the training was approaching the vulnerability assessment portion, a technical issue occurred at the NOAA Offices in Charleston and access to the NOAA Digital Coast Tools was cut for the remainder of the training. As a result, the vulnerability analysis switched to focus on the UF Geoplan Sea Level Scenario Sketch Planning Tool, a more transportation oriented analysis program. The information provided in this assessment reflect the exercise conducted by the workshop attendees utilizing the sketch planning tool, local knowledge and other resources available on the internet. Additionally, the Brevard County UF IFAS Extension Services provided additional review and development of the assessment.

Location

The City of Cocoa Beach is located in Brevard County, along the Atlantic Coast of Florida. The City is located on a barrier island with the Banana River Lagoon on its west side and the Atlantic Ocean on its east. A major causeway connecting Cocoa Beach to Merritt Island is in the northern portion of the City.



(dark green) and high projection rate curve (light green).

Socio-Economic

- 11,595 population
- 8,866 housing units
- $51,866 median income
- 28% persons without health insurance

Population growth in coastal areas indicates the importance of planning and preparedness for areas that are vulnerable to sea level rise.

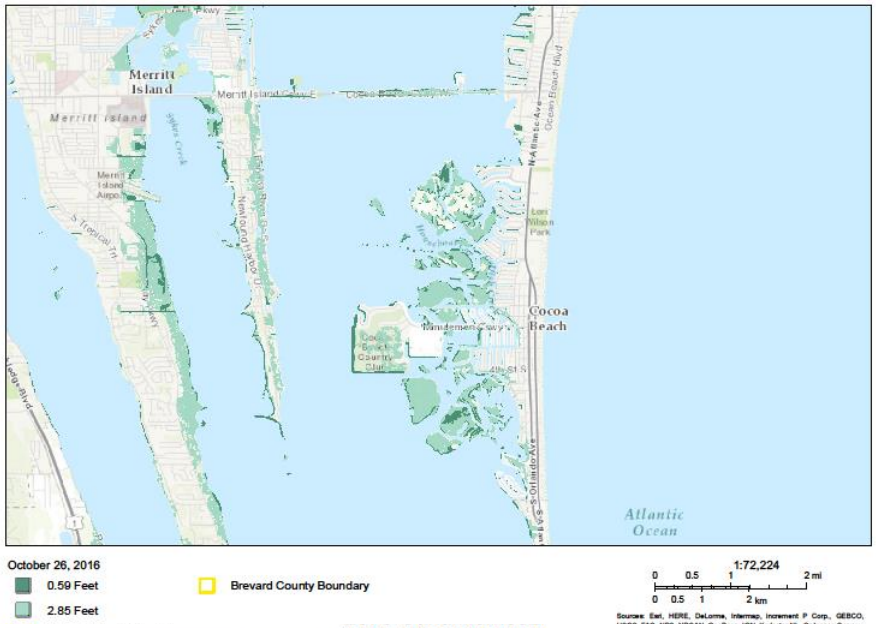
Key Assets

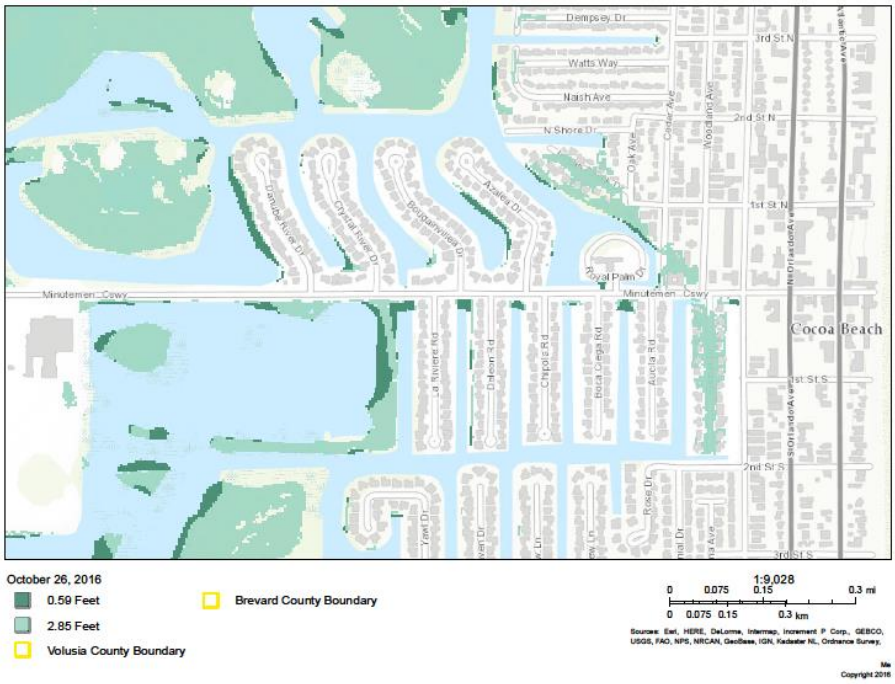
The City of Cocoa Beach is a world beach destination and has numerous hotels and motels to house tourists. The City also has 3 schools (2 Elementary and 1 Junior/Senior High School), a local hospital, and a wastewater treatment plant. It is also home to the world famous "One of a Kind" Ron Jon Surf Shop and Cocoa Beach Pier. The Thousand Islands area of Cocoa Beach is a group of natural, modified, and spoil islands that were reshaped by development and efforts to control mosquitoes. In recent years, the south Thousand Islands have been managed by the Brevard County Environmentally Endangered Lands (EEL) Program and is considered a conservation area. The north Thousand Islands is managed by the City of Cocoa Beach and is also conservation and recreation managed lands. Restoration efforts include removing invasive plants such as Brazilian pepper and Australian pine, and restoring habitat. The City of Cocoa Beach is dredging muck from the channel and canal waterways.

Sea Level Rise Scenarios

Utilizing the UF Sea Level Sketch Planning Tool, sea level rise scenarios were assessed for the City of Cocoa Beach. The map below illustrates both the US Army Corps of Engineers (USACE) low and high projection rate curves for the year 2070. It is projected that by 2070 under the low scenario, the City will experience approximately 0.59 feet of sea level rise. The high scenario analysis estimates 2.85 feet of sea level rise in some areas of the City. Much of these potential impacts are in the low-lying areas along the Indian River Lagoon, the Cocoa Beach Country Club, as well as areas along the main causeway to Merritt Island, and Minutemen Causeway. Some impacts may also be realized along areas of the fingerlings of development that extend into the lagoon.

2070 Both





Vulnerable Assets

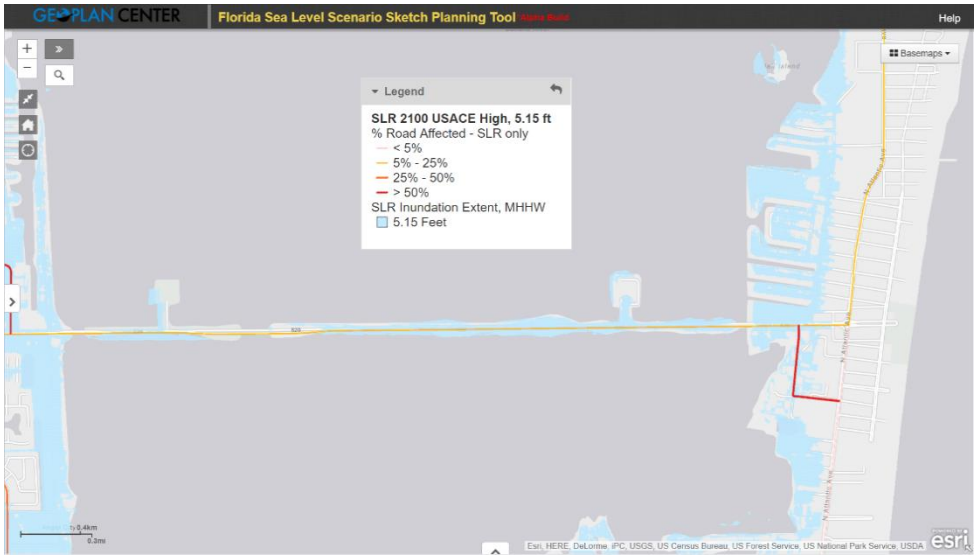
By 2070, under the USACE high projection rate curve, the following assets have been determined to be vulnerable. This would include the asset site itself, access to the site, or the area surrounding the property.

Freedom 7 Elementary	Cocoa Beach High School
Theodore Roosevelt Elementary	Waste water treatment plant
Cocoa Beach Golf Course	Canal homes
Health First Cape Canaveral Hospital	Parks
Roads	

Roadway impacts by 2070 and 2100 under USACE High Scenario

Roadways

The Sea Level Sketch Planning Tool provides an analysis of the percentage of roadway within surge zones and floodplains.



Per the table on page 4, the evacuation routes for Cocoa Beach, AIA and the Cocoa Beach Causeway (SR 520), will be impacted by inundation, as well as storm surge, in the future. For storm surge, it appears that Category 3 could be considered the tipping point. With a Cat 3 and higher storm, over 27% of SR 520 segment and over 55% of A1A segment is impacted. These are an increase in road segments impacted from 17% and 9%, respectively. Interestingly, because of the lower elevation of SR 520 crossing the lagoon, this route is more susceptible to sea level rise than A1A. The graphic shows the extent of inundation of the base of the land around the road under the 2070 high scenario (2.85 ft.). But by the year 2100, under the high scenario, it is estimated that 14.5% of the 2.4-mile segment of SR 520 will be inundated, compared to 4.5% of the 36-mile segment of A1A. Even if sections of the roadway are not inundated, the inundation of the surrounding land and potential impacts from wave energy may compromise the road bed.

These hazards will not only influence the roadway infrastructure of major roads but also secondary roads. The ability of residents to access the mainland, hospital, schools and other areas, will also be impacted especially as the potential for nuisance flooding begins to impact the City prior to constant inundation.

Vulnerability summary to SR A1A and SR 520 within the vicinity of the City of Cocoa Beach, including flood zones, storm surge and sea level rise.

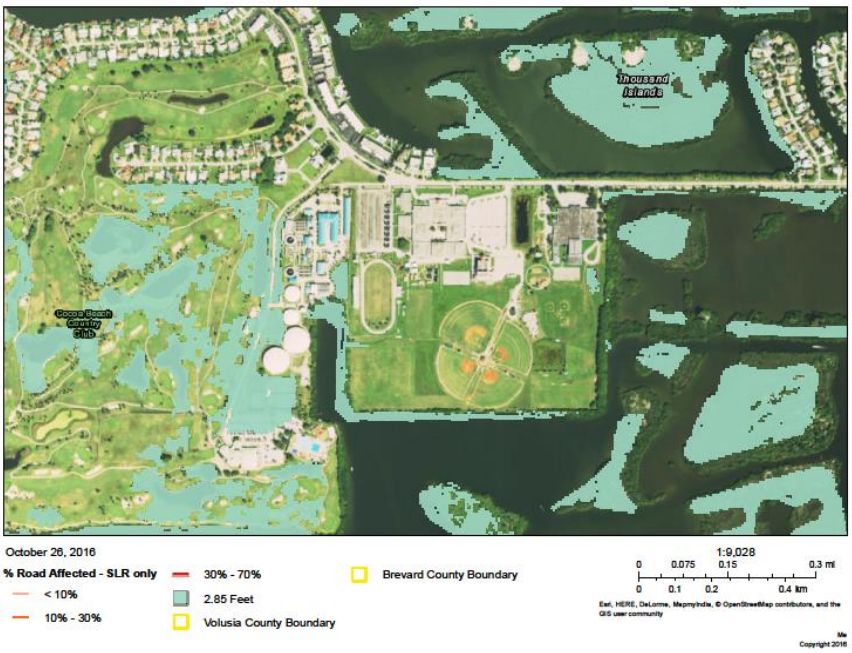
NAME	SR-A1A	SR-520
TYPE	RCI ON	RCI ON
COUNTY	BREVARD	BREVARD
FUNCLASSD	URBAN: MINOR ARTERIAL	RURAL: PRINCIPAL ARTERIAL - OTHER
FED AID	SURFACE TRANSPORTATION PROGRAM (STP)	NATIONAL HIGHWAY SYSTEM (NHS)
EVAC	YES	YES
DFIRMSFHAF	52999.07641	12089.3
DFIRMSFHAP	0.277005	0.14053
DFIRM100FT	52999.07641	12085.2
100-year PCT road	0.277005	0.14048
DFIRM500FT	4104.448776	12537.7
DFIRM500PC	0.021452	0.14574
CAT T FT	Null	Null
CAT T PC	Null	Null
CAT 1 FT	Null	46.8887
CAT 1 PC	Null	0.00055
CAT 2 FT	18245.31923	14628.5
CAT 2 PC	0.095361	0.17005
CAT 3 FT	106619.2242	23814.3
CAT 3 PC	0.557255	0.27682
CAT 4 FT	188595.482	24181.9
CAT 4 PC	0.985712	0.2811
CAT 5 FT	191329.2696	24460
CAT 5 PC	1	0.28433
LEN FT	191329.2696	86027.4
HIGH 2100 MHHW FT	8676.015328	12503.8
HIGH 2100 MHHW PCT	0.045346	0.14535

Wastewater Treatment Plant

It is evident from the analysis of sea level rise scenarios, that not only will access to the schools and waste water treatment plant (WWTP) be compromised, but the sites themselves as well. Of most concern is the WWTP, especially due the environmental hazard this poses. Per the modeling, the plant may be impacted as early as 2070 under the USACE high scenario. The images below illustrate the impacts to the area under the High Curve (2.85 feet) by 2070 and show complete inundation by 2100. This area, which includes Cocoa Beach Junior/Senior High School, Theodore Roosevelt Elementary School, and Cocoa Beach Country Club, should be considered for life expectancy of these areas in the future and environmental sensitivity to the surrounding waters when this area becomes inundated. It is reasonable to view the high scenario for this type of asset and site since the WWTP can't easily be moved or rebuild due to risk of inundation.

Sewage Treatment Plants 2100

Sewage Treatment Plants 2070



Recommendations

Since most vulnerable areas in Cocoa Beach are located along the Banana River Lagoon, these are the areas that are recommended to be reviewed first for future planning.

It is recommended that discussions and plans begin, if they haven't already, on the potential relocation of the hospital and waste water treatment plant. Discussions should include where the relocation would occur, by what timeframe, as well as how to efficiently and environmentally soundly, remove the existing infrastructure. Additionally, the future use of this property should also be discussed to continue a revenue for the City from the properties.

Analysis into the raising of the causeway should occur and consider bridging the causeway for its entirety, raising the run ups as these are also vulnerable on both sides of the lagoon. Another option could be to remove the SR 520 causeway and reroute traffic to SR 528. Short term shoreline restoration and reinforcement could be implemented to help extend the life the causeway. The Causeway Vulnerability Study from the early 2000s should be readdressed with the newest data available.

Other recommendations include the incorporation of living shorelines where feasible and as a first line of defense. Proving that a living shoreline would not be efficient should be the only mechanism for allowing an armoring structure. However, the structure must have a living shore seaward of the structure. With the passing of the Save Our Lagoon sales tax, there's a potential to work with Brevard County on living shoreline restoration projects along the causeway and in other areas of Cocoa Beach. All new or rebuilt homes should be built on stilts especially in the most vulnerable areas. Incentives could be provided to elevate homes prior to being damaged. Roadways may be elevated; however, a detailed drainage study would need to be conducted to ensure flooding would not occur onto private property as a result of mitigation. Satellite Beach is currently undergoing a drainage study, which could be used as an example for such a study in Cocoa Beach. Finally, the canals could be blocked off to help create a constant area of land. This could potentially serve as a buffer to the mainland to protect from erosion, storm surge, and mitigate sea level rise. Additional studies on the feasibility of this strategy, as well as the economic impacts and return on investment, would need to be conducted.