



**BUILDING ECOLOGICAL SOLUTIONS TO COASTAL COMMUNITY HAZARDS (BESCCH)**

Borough of Avalon

# Getting to Resilience Recommendation Report

January, 2016

Final Report

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for the Borough of Avalon  
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# **“Getting to Resilience” Report**

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# “Getting to Resilience” Report

## 1. Introduction

The Getting to Resilience (GTR) questionnaire was originally developed and piloted by the New Jersey Department of Environmental Protection’s Office of Coastal Management in an effort to foster municipal resiliency in the face of flooding, coastal storms, and sea level rise. The questionnaire was designed to be used by municipalities to assist reduce vulnerability and increase preparedness by linking planning, mitigation, and adaptation. Developed by the State of New Jersey’s Coastal Management Program, the Getting to Resilience process was later adapted by the Coastal Training Program of the Jacques Cousteau National Estuarine Research Reserve (JCNERR), converted into a digital format, and placed on an interactive website. JCNERR further amended the GTR by adding linkages to programs that offer credits or points for conducting some of the activities referenced in the questionnaire, including the National Flood Insurance Program’s (NFIP) Community Rating System (CRS)’s and Sustainable Jersey’s municipal certification program. The GTR is available on a publically accessible website, in which any municipality can complete and create a report based on the results at any time. The GTR has become an important first step towards municipal flood disaster preparedness and resilience in New Jersey.

## 2. Getting to Resilience – Five Topic Areas

The GTR questionnaire includes five separate sections that focus on the various aspects of municipal resilience. The five sections include:

1. Risk & Vulnerability – an assessment of how a community has assessed risk & vulnerability of coastal hazards in the past. It includes a discussion on sea level rise, types of risk & vulnerability assessments completed, and how assessments are shared within the community.
2. Public Engagement – an assessment of how a community communicates with the local residents and businesses about hazards, sea level rise, risk, and vulnerability.
3. Planning Integration – an assessment of how a community integrates hazard mitigation, sea level rise, and resilience into its long-term planning efforts and municipal documents, ordinances and policies. Documents include the: Master Plan, land use ordinances, open space management, All-Hazard Mitigation Plan, Floodplain Management Plan, Stormwater Management Plan, Capital Improvements Plan, Economic Development Strategy, and special area management plans.
4. Disaster Preparedness & Recovery – an assessment of how a community has and continues to prepare for disaster events through community-wide preparation activities. The section also includes discussion of post-disaster recovery planning efforts.
5. Hazard Mitigation Implementation – an assessment of how a community participated in and implements respective County-Wide All-Hazard Mitigation plans within the community.

## What is Resilience?

Municipal resilience is defined by Sustainable Jersey as the ability of a community to adapt and thrive in the face of extreme events and stresses. The Municipal Resilience Cycle (Figure 1 below) illustrates a strategic process for local governments to build and strengthen resilience. The cycle begins with encouraging municipal leaders to achieve early “wins” by shoring up the internal systems that increase their readiness to respond – and bounce back from – disasters of all kinds. The following four steps outline a traditional planning process, accentuating the importance of effective planning for the localized impacts of climate change. The cycle ends with a phase focused on iterative, data-driven management and emphasizes the importance of building a culture of learning in the face of uncertainty. The GTR rests with in step 2 of the Municipal Resilience Cycle, Risk & Vulnerability Assessments. The GTR helps municipalities start the discussion of risk and vulnerability in relation to future sea level rise, flooding, and storm events.



**Figure 1. Municipal Resilience Cycle Diagram**

In addition to being a starting point to discussing Municipal Resilience, the GTR report is eligible for points in the Sustainable Jersey’s Municipal Certification Program under the Flood Risk Action. Sustainable Jersey certification is a prestigious designation for municipal governments in New Jersey. Municipalities that achieve the certification are considered by their peers, by state government and by the experts and civic organizations in New Jersey, to be among the leading municipalities insustainability.

## **3. Borough of Avalon - Background**

Avalon is located on the Seven Mile Island, a barrier island along the Atlantic coast in the central portion of Cape May County. The borough encompasses 4.9 square miles with over 50 miles of shoreline within the back bays of the island and along the Atlantic Ocean. Avalon has a year-round population of 1,334 residents according to the 2010 census, swelling to a peak population of 36,000 in the summer season. Avalon has an older permanent population, with a median age of 61.8, and 75.5% of the population being over age 45. The borough’s dominant building type is residential, with the majority of the housing being single family homes. As of 2010, there were 5,434 residential units in Avalon, of which only 692 homes (12.7%) are occupied year-round.

## Avalon Getting to Resilience Process

The Getting to Resilience tool is a municipal self-assessment process that helps communities identify vulnerabilities and increase preparedness by linking planning and mitigation efforts. The resiliency team at Sustainable Jersey facilitated the GTR process for Avalon in September 2015. The process started with the convening of a working group of municipal officials and community members (see Table 1, below, for a list of participants) to represent the borough throughout the GTR process.

**Table 1. Municipal Officials and Process Participants**

Participant	Title	Affiliation
Marty Pagliughi	Mayor	Borough of Avalon
Michele Petrucci	Green Team Member	Avalon Green Team
C.L. Hensel	Green Team Member	Avalon Green Team
Harrold de Butts	Emergency Manager	Avalon Office of Emergency Management
Scott Walker	Business Administrator	Borough of Avalon
Bill Macomber	Director of Public Works	Borough of Avalon
Tom Thornton	Avalon Borough Engineer	Hatch Mott MacDonald
Bill Burns	Councilmen	Borough of Avalon
Ed Dean	Office of Emergency Management / Fire Department	Borough of Avalon
Jeff Hesley	Tax Assessor / Zoning Officer	Borough of Avalon
Bill Purdie	Planner	NJ Department of Environmental Protection
Jack Heide	Resiliency Manager	Sustainable Jersey
Emma Melvin	Green Infrastructure Coordinator	Sustainable Jersey

In addition to convening a working group, Avalon was asked to provide and familiarize themselves with multiple official municipal plans, ordinances, and policies (see Table 2, below). The various documents (i.e. Master Plan, All-Hazard Mitigation Plan, Floodplain Management Plan, etc.) form the backbone of the community governance with which the GTR assessment will review municipality's current state of policies, ordinances and plans and future needs for these documents to evolve. Working Group members and facilitators reviewed the municipal documents prior to the GTR meeting.

**Table 2. Avalon Municipal documents used in GTR process**

Plans, Ordinances, and Codes	Y	N	Adoption Year	Notes
Municipal Master Plan	X		2007	Reexamination
All-Hazards Mitigation Plan	X		Updating	Cape May County Plan
Floodplain Management Plan		X		
Evacuation Plan		X	N/A	
Emergency Operations Plan	X		Updating	
Continuity of Operations Plans		X		
Post-Disaster Recovery Plan		X		
Capital Improvements Plan	X		2015-2020	Borough Budget
Economic Development Plan	X		2007	Master Plan Element

Coastal Plan or Element		X		
Open Space Plan	X		2007	Conservation Element
Stormwater Management Plan	X		N/A	Ordinance
Historic Preservation Plan	X		2007	Master Plan Element

The Getting to Resilience (GTR) process was facilitated on July 21, 2015 in the Avalon Borough Hall. The meeting was attended by representatives of Avalon, Sustainable Jersey, and NJ Department of Environmental Protection (DEP) (See Table 1 above).

The remainder of this report summarizes the GTR process and the discussions and recommendations that followed. These steps included:

- Review of flood hazard maps and potential impacts on selected community assets
- The Getting to Resilience (GTR) questionnaire
- Summary of the Borough’s resiliency initiatives
- Recommendations to increase preparedness for disaster and strengthen resiliency based upon responses to the questionnaire

#### 4. Avalon Flood Hazards and Impacts

The GTR process began with a review of flood hazard maps, visualizing the potential future storm and flooding risks while setting the context for the GTR questionnaire for Borough officials. For this mapping exercise, Sustainable Jersey used NJ Flood Mapper, an interactive mapping website designed and created by the NOAA Coastal Services Center and Rutgers University. The potential impact from flood hazard on select community assets were identified. The following data layers were viewed as part of this discussion:

- 1) FEMA Preliminary Flood Insurance Rate Maps (PFIRM) - This includes the high risk flood zones, known as the 1% flood event or 100 year floodplain, of the FEMA Special Flood Hazard Area
- 2) FEMA Special Flood Hazard Area and sea level rise projected at 2050 – This includes both the (1%) and (.02%) storms, also known as the 100 year and 500 year floods, respectively, and sea level rise
- 3) SLOSH Model CAT 1 Storm Surge data derived from storm surge inundation data created by the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model. This model uses historic data to project the increased storm surge heights and the extents of inundation for hurricane category 1 created by sea level rise.
- 4) Projected sea level rise inundation extent at one foot increasing intervals to a maximum of six feet, and inundation impacts on wetlands located within the municipality. The model looks at where marshes are located and how sea level rise will impact marsh lands. Potential impacts include marsh retreat, marsh impediments, and marsh conversion.
- 5) Locations of community assets defined as important and/or critical to the community.

Four community assets were chosen for this assessment because they represented the most significant civic buildings, emergency facilities, civic and ecosystem locations found within borough limits. The four assets, listed below, were evaluated for potential flood or sea level rise impacts.

1. Avalon municipal block (borough hall, fire station, police station, library, and elementary school)
2. Avalon evacuation route
3. Beaches & dunes complex
4. Salt marsh complex

A review of the flood hazard maps and the potential flooding impact on the critical assets follows. Note that while this mapping exercise provides an important overview of the potential impacts of flood hazard and sea level rise, it is limited in scope. The sea level rise maps are not associated with any given time horizon, the maps may not account for possible mitigation activities practiced by the community, and the visible community assets shown on the maps are few.

#### **4.1 FEMA PFIRM Flood Risk Data Layer**

The FEMA Preliminary Flood Insurance Rate Maps (PFIRM) Flood Risk data is a data layer derived from the official preliminary FEMA Flood Insurance Rate Maps and provide maps of the currently accepted flood risk data for the community. The data is depicted in Map 1 and include A zones (shown in blue) representing the 100 year flood zone, the 500 year floodplain (shown in beige), and the V or velocity action zone (shown in pink) representing areas at risk from wave forces and flooding near the coastline.

The Special Flood Hazard Area (SFHA) covers almost the entire Borough, and only a few small areas are elevated high enough along the dunes to escape this designation. The SFHA, also referred to as the 100 year floodplain, is an area that has a 1-percent annual chance of a storm to produce storm surge, stream flood stages or flows to particular extent based upon historical records. According to the map, the VE zone is located along the Avalon ocean beach front and dune area, as well as several areas in the salt marsh located in the back bays. The V areas are a subset of the SFHA with additional hazards due to storm-induced velocity wave action. A few residential properties are located within the V zone in the back bays, however no residential or commercial properties are located within the V zone located along the Atlantic Ocean because of the dunes. All the identified community assets are located entirely within the SFHA, or 100 year floodplain.

Projected delineations of FEMA Special Flood Hazard Area (SFHA) (see Map 2) and sea level rise projections for 2050 were viewed to facilitate the discussion of flood risk under a range of sea level rise scenarios ranging from lowest or most conservative (0.3 ft.) to highest or most pronounced (2.0 ft.) sea level rise increments. This mapping layer, created by FEMA, is color-coded according to a range of projected increases in sea level: orange is Lowest (SFHA + 0.3 ft.), light-purple is Intermediate-Low (SFHA + 0.7 ft.), dark purple is Intermediate High (SFHA + 1.3 ft.), and red is Highest (SFHA + 2.0 ft.).

At the lowest or most conservative estimate of sea level rise, 0.3 feet, the entire municipality of Avalon would be inundated during a 1% flooding event by 2050. The projections indicate that all properties would be located within the 1% annual chance floodplain by 2050.



# Map 1. FEMA Preliminary Flood Insurance Rate Map



**Map 2. FEMA Special Flood Hazard Area and Sea Level Rise projected for 2050**



#### **4.2 Sea Level Rise Layer at one foot increments**

This data represents the extent of inundation due to sea level rise during mean higher high water (MHHW) tide at one foot increments. There are no timeframes associated with these maps. (Note that they do not include the 1% storm as in the previous map.) Areas described as “hydrologically connected” in NJ Flood Mapper (e.g., part of an existing water body such as the ocean, river, creek, or bay) are shown in shades of blue (darker blue = greater depth). Low-lying areas described as “hydrologically unconnected” in NJ Flood Mapper are areas not connected to a water body (e.g., low lying depressions or low elevation urban areas) that may flood more often under future sea level rise conditions. It should be noted that these are estimated. For more accurate projections additional analysis of these areas is required to determine the actual susceptibility to flooding at a neighborhood level scale.

Even at 1 foot of sea level rise, Avalon see the impacts of sea level rise. Potential inundation comes from the back bays and salt marshes of Avalon. The borough may begin to see high tide levels reaching Ocean Drive every day. Map 3 indicates the area of Avalon most likely to be affected by a 3 ft. sea level rise. With the exception of the salt marshes, community assets may not be affected by 1-2 ft. sea level rise; however, all the identified community assets will be affected by inundation from a 3 ft. sea level rise.

Sea level rise (SLR) also poses a problem for Avalon and its wetlands with 1-6 foot scenarios. Map 3 shows sea level rise at 6 ft. and how it affects the marshes in the back bays. The green areas indicate current marsh areas, the purple shows unimpeded marsh areas that can retreat further inland, the pink shows impeded marsh retreat inland, the blue represents salt marsh conversation to open water, and the light green represents conversations to sand/mud flat areas. With rise of sea level by 6 ft. the map shows large areas of wetlands retreating, converting to mudflats, or disappearing. The wetlands provide essential natural protection through flood water storage and mitigation through storm surge attenuation. A decrease in wetlands that help protect the community will cause greater impacts to Avalon from flooding events.

It is important to note that the sea level rise maps reviewed in this exercise are not associated with a specific time horizon. However, a leading publication describing future flood risks across the Mid-Atlantic (a 2013 study prepared by Rutgers climate scientists Kenneth Miller, Robert Kopp et al in an effort to “down-scale” global sea level rise prediction models)<sup>1,2</sup> provides a strong scientific basis for municipal officials to plan for future sea level rise impacts to their community in the very near future. The publication suggests that “relative sea level will rise at bedrock locations like the Battery by 22 cm [8.7 inches] by 2030, 40 cm [16 inches] by 2050, and 96 cm [38 inches] by 2100.” Estimates provided for sites along the New Jersey’s coastal plains are even high, given localized subsidence (land sinking) due to ground water extraction and compaction.

All of the above projected flood hazard maps are intended to be a high-level screening-level tool to introduce the magnitude and extent of flood hazard events and sea level rise to the community. However, to fully understand the impacts of these flood hazards, a more detailed mapping analysis is necessary to determine the potential impacts on specific community assets. Given the extent of current and projected flooding shown on these maps, the City is advised to conduct this more detailed analysis through a coastal vulnerability assessment, as described later in this report.

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<sup>1</sup> <http://onlinelibrary.wiley.com/doi/10.1002/2013EF000135/full>

<sup>2</sup> Note: this study is being updated, new sea level rise projections are expected in 2016.

**Map 3. 3 Feet of Sea Level Rise**



**Map 4. 6 Feet of Sea Level Rise and the Impacts on Marshes**



### 4.3 Summary of Flood Hazard Mapping

Key findings from the discussion surrounding this mapping exercise of flood and sea level rise inundation are:

1. The four community assets are located entirely within either the 100 year or 500 year floodplains of FEMA’s Special Flood Hazard Zone.
2. During past flooding and storm surge events the borough’s dunes located along the beach front mitigated flooding from the V zone.
3. The back bay of Avalon is the major source of flooding in the community.

The table below summarizes the results of community assets that are potentially in harm’s way in the selected flood events and future sea level rise. Table 3 (X indicates not affected and O as affected).

**Table 3. Critical facilities and potential inundation from flooding and sea level rise.**

Community Asset	100 year	500 year	1 ft. SLR	2 ft. SLR	3 ft. SLR	4 ft. SLR
Avalon Municipal Block	o	o	x	o	o	o
Avalon Evacuation Route	o	o	x	o	o	o
Beaches & Dunes	o	o	o	o	o	o
Marshes	o	o	o	o	o	o

## 5. Avalon’s GTR Responses and Resiliency Initiatives

After a thorough review and discussion of the mapping exercise, the Avalon working group started the GTR online questionnaire. Questions are of a ‘yes’ or ‘no’ format and were asked one by one. Clarification of questions and answers were facilitated through group discussion led by Sustainable Jersey members. The questionnaire relies on a wide-range of municipal officials and municipal knowledge. The Avalon working group comprised several decades of local knowledge and borough administration and activities.

### Avalon’s Resiliency Initiatives

Avalon answered ‘yes’ to the majority of questions in the GTR questionnaire. Several questions were not applicable to the borough. As a self-assessment, the borough’s response of ‘yes’ to most questions reflects Avalon’s commitment and activities demonstrate a community which is committed to building resilience. Through the questionnaire and subsequent discussions, the following three areas of effective resilience planning were identified by the Avalon group:

1. Avalon has addressed hazards mitigation planning over many years and has benefited from the consistent leadership of Avalon elected officials, staff, and engaged citizens. Some examples of resilience planning actions are a community-wide level of accepted risk, the sharing of FEMA flood risk mapping with the public, efforts to reduce repetitive flood loss properties, and a wide range of communication efforts aimed at ensuring safety prior to, during, and after storm and flooding events.

2. Planning efforts have enabled effective mitigation measures to be into place over a multiyear time period. Avalon continues to focus efforts on the beach front and dune system that mitigates and protects the borough from storm and flooding events, through beach nourishment and dune protection ordinances.
3. Avalon's CRS rating of 5 indicates a strong commitment to mitigating flood risk and sharing as much information on risks from flooding and hurricanes with both full time and seasonal residents.

## 6. Recommendations to Improve Disaster Preparedness and Resiliency

This section offers recommended actions, policies and strategies that can help strengthen North Bergen's overall resilience to the risks of future sea level rise and coastal storm events.

Recommendations are based upon the township's responses to the GTR questionnaire, a review of North Bergen's municipal documents, and the discussion at the facilitated meeting. The key recommendations include critical next steps towards resiliency either by virtue of their importance, available funding or ease of implementation. Other recommendations are provided for the township's consideration, though are considered equally important for coastal resiliency.

### Key Recommendations

#### 1. Complete a Coastal Vulnerability Assessment

Avalon should follow up the Getting to Resilience process with a coastal vulnerability assessment (CVA). A comprehensive risk and vulnerability assessment analyzes the potential impact of future flood hazards on community assets, and the consequences they pose to the entire community. The assessment includes not only the depth and extent of flooding, but the impact of flooding on the function and services of the built, social and natural environment. Flood hazards should include both sea level rise and future episodic flood events, e.g. the 1% storm, hurricane storm surge. If data is available, precipitation and 10% flood events should also be included.

*Communities can receive CRS points under section 410 by completing this activity.*

#### Resources

- Municipal Coastal Vulnerability Assessment. A flyer and facilitator's guidance document is available from Sustainable Jersey upon request. Please email [info@njresiliency.com](mailto:info@njresiliency.com) for more information. (Note: Avalon has since initiated the coastal vulnerability assessment after the Getting to Resilience process was completed.)

*2. Include future flood hazard scenarios in the municipal master plan with short-term and long-term strategies for protecting these areas.* As the primary planning policy document for the community, the master plan should identify areas in the community that will likely be impacted by future flood hazards, and offer measures to mitigate damages and protect the community's assets and properties.

#### Suggestions

- Include maps of projected sea level rise and future storm events in the land use plan and

- conservation plan elements of the municipal master plan.
- Identify natural resources that serve as protective flood mitigation measures (e.g. wetlands), and provide recommendations for maintenance and management in the conservation plan element.
- Identify planning policies to mitigate flood damage and protect properties from future flooding, including sea level rise and extreme storm events, in the land use plan element.

### *3. Plan for Maintaining and Improving Current CRS Rating*

The Community Rating System is a vital component of the National Flood Insurance Program (NFIP) and saves residents on the costs of flood insurance premiums. Currently, Avalon has a rating of 5 which saves residents 25% on their premiums. Avalon could improve their rating to a 4, a rating no municipality has reached in New Jersey, with a few additions to their CRS program. Avalon will need to complete a Watershed Management Plan, with an emphasis in stormwater management, for the community, which is a requirement for any community to obtain a Class 4 CRS rating. In addition, Avalon must demonstrate how that it enforces higher regulatory standards to manage new development in the floodplain; and, the community must have adopted and be implementing a floodplain management plan.

#### Resources

- More information on the CRS point system is found at: <http://crsresources.org>.
- Review Activity 450 Stormwater Management, in the CRS program, for development on a watershed management plan.
- Review Activity 430 Higher Regulatory Standards, in the CRS program, for enforcement of higher standards in the floodplain.
- Review Activity 510 Floodplain Management Planning, in the CRS program, for the development and implementation of floodplain management plans.

### *Other Resiliency Measures to Consider*

The following additional recommendations emerged from the borough's GTR process, and are organized according to the GTR section headings and questions

## **A. Risk and Vulnerability Assessment**

### *A1. Complete a Fiscal/Financial Risk Assessment*

A fiscal/financial risk assessment based on future sea level would identify the number and location of potentially impacted community assets and properties and outline a detailed plan for reducing these losses through strategies such as buyout or moving structures. It will also allow the town to see the potential losses in future revenue if these assets are not protected. Avalon could receive additional CRS points under Section 510 by completing this activity. We recommend undertaking this activity after the completion of a vulnerability assessment so that the full range of flood-hazard vulnerabilities is understood.

## **B. Public Engagement**

### *B1. Placing Publicly Visible High Water Mark Signs*



Avalon may want to consider participating in FEMA’s High Water Mark Initiative (HWM). The HWM Initiative was created by FEMA and partner Federal agencies as a community-based awareness initiative to remind residents of major local floods and encourage residents to prepare for the next one. Communities looking to participate in the Initiative, plan and execute a HWM Project. *Completing this activity would provide additional CRS points under Section 330, Outreach Projects.*

Resource



## **C. Planning Integration**

### *C1. Integrate municipal resilience concepts, hazard mitigation, and climate adaptation into the municipal master plan.*

To maximize the compatibility and integration of flood hazard planning and mitigation with land use policies, flood hazard and mitigation plans should be referenced and integrated into the master plan. Background information on natural hazards, including historic and future events and impacts should be included, as well as maps of existing and future flood hazards, include future sea level rise and storm events. Information should be included from the County All Hazards Mitigation Plan, climate adaptation plans, and any vulnerability assessments completed for the municipality, including the Getting to Resilience Report.

Resource

- Integrating Hazard Mitigation Into Local Planning, Case Studies and Tools for Community Officials, FEMA, 2013

### *C2. Complete a Watershed Master Plan*

Future sea level rise and intensifying storms may put stress on the current grey stormwater infrastructure and exacerbate current flooding and water quality problems in Avalon. A watershed master plan assess the impacts of current and future development on stormwater runoff (both water quality and quantity and flooding) throughout the community. The primary purpose of a watershed management plan is to guide communities on how to lower development impacts on surrounding waterways and reduce flooding. The tool provides specific recommendations on strategies or practices to reduce or manage stormwater runoff which could include the use of green stormwater infrastructure (GSI) and low impact development (LID). In partnership with the watershed master plan, an expansion and update to the stormwater related ordinances encouraging the infiltration of stormwater using GSI on small redevelopment and municipal redevelopment, development and property improvements is encouraged.

Communities can receive CRS points under Section 452.b by completing this activity. (One of the prerequisites for a CRS Class 4 (see Section 211.c) is that the community receive credit for watershed master planning based on the 100-year storm.)

## **D. Disaster Preparedness and Recovery**

The Borough of Avalon is a leader in municipal emergency management and response. The borough has taken multiple steps towards disaster preparedness and recovery and therefore no recommendations are offered at this time.

## **E. Hazard Mitigation Implementation**

### *E1. Enhance wetland protection via local ordinance and management plan*

The expansive wetland complex encompassing over half of the land mass of Avalon is a valuable community asset for both wildlife habitat but more critically in the face of sea level rise flood water storage and wave attenuation. A salt marsh is a complex system consistently adapting or degrading to the changes to the water quality and quantity. Providing water filtration and pollution removal, and habitat benefit to the community, wetlands play a critical role in both day to day life of the community and during coastal flooding events. The municipality needs to set a standard for management and practice that ensures the continued health of both the wetland flora and fauna but also its capacity to function as a coastal flood hazard mitigation. This can be completed by creating a protection ordinance and a management plan for the wetland complex and associated back bays. CRS credits are given to natural function of open space protection. More information on the CRS point for natural flood storage areas are found within Section 422.c. Open space corridors or networks of wetlands (NSP).

### *E2. Document community assets subject to impacts from future flood hazards in the multi-jurisdictional hazard mitigation plan.*

Identifying vulnerable assets in the multi-jurisdictional hazard mitigation plan can encourage regional cooperation in addressing future, projected coastal flood hazards, such as sea level rise and increase coastal storm impacts, while also identifying specific municipal projects worthy of future funding opportunities. The borough should work with the county to ensure this information is incorporated into the next version of the hazard mitigation plan.

## **7. Conclusions**

Increasing resilience to flood hazards is a long term process that involves moving through multiple phases ranging from assessing hazards to implementing strategies. The Municipal Resilience Cycle encourages communities to move throughout all phases of resilience beginning with emergency preparedness, and moving through phases of risk and vulnerability assessment, identifying local solutions, implementing adaptation strategies, and engaging in monitoring and evaluation to close the loop.

The results of the process presented here represent the first few stages of this cycle as the preliminary assessment of risk provided by the GTR process leads to the identification of recommendations that can be implemented over the short and long term. A challenging long term goal would be to increase the integration of flood risk discussion into the Avalon's next master plan. Of particular difficulty is planning for sea level rise as it is an area that requires educating residents on the potential impacts over the next 25 to 30 years. Avalon should take into consideration the impacts of sea level rise when revising its Master Plan and its Capital Improvements Budget.

Overall, the Borough of Avalon is a leader in flood risk mitigation and the municipal resilience activities the borough currently engages in could provide a useful model for other municipalities to follow. The recommended next steps for Avalon are to: 1) circulate this summary report to the Town Planning Board and Environmental Commission for their review and commentary, 2) to provide a more comprehensive risk analysis conduct a formal Coastal Vulnerability Assessment (CVA), 3) address some of the recommendations provided in this summary report, and 4) continue to integrate information provided on flood hazards and sea level rise into all planning processes.



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