

TOWNSHIP OF BRICK



Flood Warning and Response Plan

March 2016-1





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Purpose

Flood events often occur with very little warning and can produce severe damage. The Flood Warning and Response Plan (FWRP) is designed to maximize the amount of warning time available to residents and businesses at risk of flooding in the Township of Brick. The FWRP is intended to be comprehensive and gives the Township of Brick detailed lists of response actions, resources, and capabilities to ensure a safe and effective process to defend the community against potential flood risks.

This FWRP establishes guidelines for evaluating and presenting the various flood threats to the Township of Brick's Emergency Operations Center (EOC), Township of Brick's emergency staff, and Township residents at risk of flooding and flood-related hazards. Although this plan focuses on flooding, it references other hazards such as coastal storms, urban drainage, or hurricanes that may lead to flooding as a secondary hazard. The FWRP is to be used in conjunction with the Township of Brick's Emergency Operations Plan (EOP) to outline a total response plan to a flooding event within the Township. The response guidelines detailed in this plan are not meant to be exhaustive and may be adapted by the Township of Brick on a situational basis to ensure the most comprehensive flood and disaster response necessary. Additionally, the timeframes provided in this document are recommended guidelines designed to be adjusted during the actual event response, as the Township may delay response actions to confirm the severity of the flood threat.

Attachments to this FWRP include Flood Alert Team and contact procedures in Attachment 1; additional emergency contacts and contact information in Attachment 2; Township of Brick evacuation routes in Attachment 3; authorities and references cited in this plan in Attachment 4; acronyms and abbreviations used in this plan in Attachment 5; flood inundation maps in Attachment 6; and Essential Facility Survey responses in Attachment 7.



Part 1. General Information

The Township of Brick encompasses 26.2 square miles located in northeastern Ocean County, New Jersey. The Township is home to approximately 75,000 residents and 40,000 structures— 7,488 of which are located within the floodplain. Additionally, the Township contains 20 critical facilities, one of which is located in the floodplain (critical facilities are described in more detail in Part 4 of this FWRP).

The Township of Brick lies in proximity to major transportation corridors including Route 70, Route 88 (from Point Pleasant to Route 70), Brick Boulevard, Chambers Bridge Road, and the Garden State Parkway (Township of Brick Master Plan 2007). Of these freeways and principal arterials, the following are at least partially located in the floodplain:

- Garden State Parkway
- Route 88 (very small section in floodplain; majority of road not in floodplain)
- Route 70 (a portion of the road immediately south of the Metedeconk River)
- Route 35¹

Increased land development in the Township of Brick followed the construction of the Garden State Parkway. The local development followed a traditional suburban auto-oriented pattern; that is, the Township includes a central commercial core with relatively higher population densities, and additional commercial development that is focused primarily along major transportation corridors extending outward. Residential neighborhoods are primarily located along smaller roads and behind commercial development in the commercial core. The commercial core is a loosely defined central area, whose borders include Route 70, Brick Boulevard, Chambers Bridge Road, and Cedar Bridge Avenue. It also includes linear development along commercial corridors, such as Brick Boulevard, Route 70, Route 88, and Chambers Bridge Road (Brick Township, 2007).

The Township of Brick is also largely defined by its coastal and waterfront landscapes including a barrier island. The Township of Brick's 53.2 miles of privately owned waterfront property is the most of any municipality in New Jersey. Waterfront property in the Township includes 1.79 miles along the barrier island, 39.50 miles of riverfront property, and 11.93 miles of bay-front property (Township of Brick Master Plan 2007).

This section describes the location, and the hydrography and hydrology of the Township of Brick.

1.1 Location

The Township of Brick is one of 33 municipalities that comprise Ocean County, New Jersey. Ocean County is located in central New Jersey and covers a total area of 636.28 square miles, making it the second-largest county in the State. Ocean County is bordered to the north by Monmouth County, to the east by the Atlantic Ocean, to the southeast by Atlantic County, and to the south and west by Burlington County.

¹ The Township Master Plan did not identify Route 35 or other barrier island roads; however, this road serves as the major traffic route on the barrier island.



Figure 1 illustrates the location of the Township of Brick within Ocean County.

Figure 1. Overview Map of the Township of Brick, New Jersey





The Township of Brick is located in the northeastern portion of Ocean County and is bordered by Point Pleasant Borough, the Township of Wall, and the Township of Howell to the north; the Borough of Mantoloking to the east; the Township of Toms River to the south; and the Township of Lakewood to the west. Additionally, the Township of Brick borders Barnegat Bay and the Atlantic Ocean. The Township includes part of the barrier island; however, access to the Township's portion of the barrier island requires traveling through neighboring municipalities (Mantoloking Borough and Bay Head Borough from the north, or Toms River Township from the south).

1.2 Hydrography and Hydrology

Numerous ponds, lakes, creeks, and rivers make up the waterscape of the Township of Brick. Waterbodies in the Township include the headwaters of the Barnegat Bay, numerous tributaries to the Manasquan River Watershed and the Metedeconk Watershed, Beaver Dam Creek, North Branch Beaver Dam Creek, Kettle Creek, Cedar Bridge Branch, and Long Causeway Branch (Township of Brick Master Plan 2007).

1.2.1 Watersheds

A watershed is the area of land that drains into a body of water such as a river, lake, stream, or bay. Watersheds are separated from other systems by high points in the area such as hills or slopes. A watershed includes not only the waterway itself but also the entire land area that drains to it. For example, the watershed of a lake would include not only the streams entering the lake but also the land area that drains into those streams and eventually the lake. Watersheds come in all shapes and sizes and can cross municipal and county boundaries (New Jersey Department of Environmental Protection [NJDEP], 2012).

The Township of Brick is primarily located within two large watershed areas. The northern portion of the Township drains to the Manasquan River Watershed and the southern portion drains to the Barnegat Bay Watershed (Township of Brick Master Plan 2007). Portions of the Township also span other watershed areas including the Metedeconk River Watershed, Beaver Dam Creek Watershed, Kettle Creek Watershed, and Reedy Creek Watershed. An additional one-mile area of the barrier island drains into Barnegat Bay and the Atlantic Ocean (Township of Brick Strategic Recovery Planning Report [SRPR] 2014). The Township of Brick's 53.2 miles of waterfront represents the largest area of privately owned waterfront property in New Jersey (Township of Brick SRPR 2014).

This section provides details regarding three of the watersheds that affect, and are affected by, the Township of Brick. Figure 2 shows these watershed areas, and Table 1 lists the waterways included in five of the Township's watersheds.

Manasquan River Watershed

The Manasquan River Watershed encompasses approximately 82 square miles and hosts a river that flows for nearly 23 miles to the Atlantic Ocean. The River touches several jurisdictions besides the Township of Brick, including the Townships of Colts Neck, Freehold, Howell, and Wall. This watershed supports numerous rare and endangered plant and animal species, forests, and wetlands, and numerous commercial and recreational finfish and shellfish species (Manasquan Watershed Management Plan



2000). Specifically for the Township of Brick, this watershed is one of two major watersheds in the community; the extreme northern portion of the Township drains to it (Township of Brick Master Plan 2007).

Metedeconk River Watershed

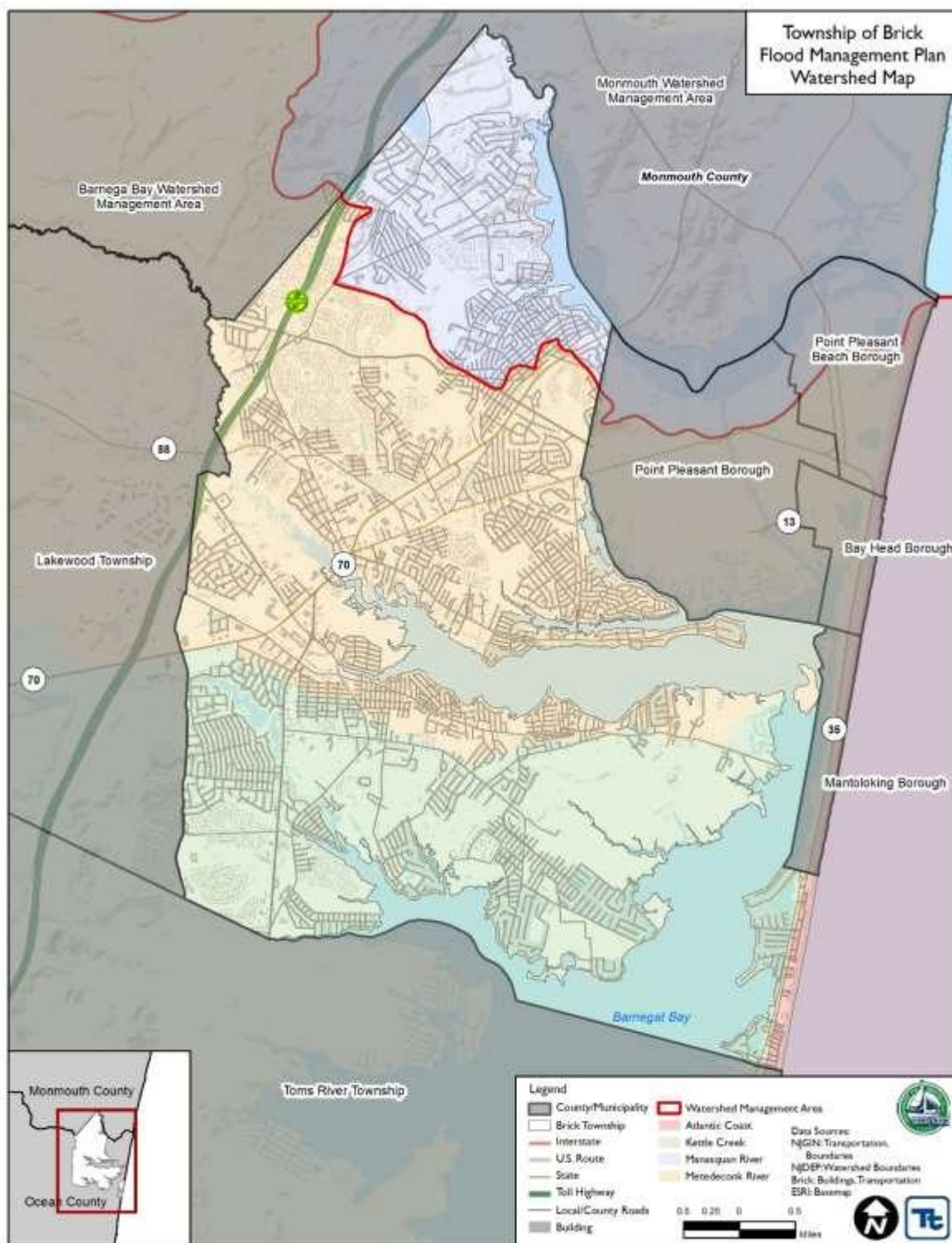
The Metedeconk River Watershed is approximately 90 square miles and drains into the northern Barnegat Bay Watershed. The Metedeconk River flows through nine towns and two counties, and over 40 miles of woodlands, freshwater wetlands, forested wetlands, tidal wetlands, and densely developed areas before emptying into the Barnegat Bay. The river and its watershed provide drinking water from ground and surface water sources to about 100,000 homes in Ocean and Monmouth Counties (Metedeconk River Sub-watershed 2015). In addition to the Metedeconk River, the Metedeconk River Watershed also contains the north branch of Beaver Dam Creek and the Cedar Bridge Branch (Township of Brick SRPR 2014).

Kettle Creek (includes Reedy Creek)

The Kettle Creek Watershed consists of Kettle Creek, Lake Irisado, Tunes Branch, Long Causeway Branch, and Polhemus Branch, all of which drain into the Barnegat Bay (Township of Brick SRPR 2014). Kettle Creek Watershed can be found in three municipalities: the Townships of Brick, Lakewood, and Toms River. The Kettle Creek Watershed is actually a sub-watershed to the Barnegat Bay Watershed and consists mainly of tidal salt marshes, as well as smaller amounts of upland forest, lowland forest, Pine Barrens, cedar swamps, and tidal wetlands. It encompasses approximately 950 acres of land, much of which has been developed for residential and urban uses (Kettle Creek Sub-watershed 2015).



Figure 2. Watersheds of Township of Brick, New Jersey



Source: NJDEP 2015, NJGN 2015



Table 1. Watersheds and Waterways of the Township of Brick

Watershed	Waterways
Barnegat Bay	Barnegat Bay and tributaries
Manasquan River	Sawmill Creek
	Godfrey Lake
	Multiple unnamed tributaries
Metedeconk River	Main Branch of the Metedeconk River
	North Branch of the Metedeconk River
	Beaver Dam Creek
	North Branch of the Beaver Dam Creek
	Cedar Bridge Branch
Kettle Creek	Kettle Creek
	Polhemus Branch
	Lake Irisado
	Tunes Branch
	Long Causeway Branch
Reedy Creek	Reedy Creek
	Multiple lagoons and unnamed tributaries

Source: Township of Brick SRPR 2014

Watershed Management Areas

In 1996, NJDEP began implementing a watershed management approach to maintaining the physical, chemical, and biological integrity of the State's waters. This approach concentrates on managing individual watershed areas by defining the physical geographic boundaries of the watersheds, basing water policy on sound scientific principles, and developing partnerships with the public. The NJDEP divided New Jersey into five water regions: the Northeast, Raritan, Northwest, Lower Delaware, and Atlantic Coastal. Each water region is then divided into three to five watershed management areas (WMA), for a total of 20 WMAs in the State. Each WMA encompasses a particular group of major rivers and each consists of numerous smaller watersheds (U.S. Geological Survey [USGS] 2000). The Township of Brick is located within the Monmouth and Barnegat Bay WMAs, which are described below (NJDEP 2007).

WMA 12: Monmouth

WMA 12 extends from Perth Amboy to Point Pleasant Beach. WMA 12 is comprised of an assemblage of coastal sub-watersheds, all or a portion of which fall into 56 municipalities in the Raritan Bay and Atlantic Coastal drainage basins. Although the majority of impacted municipalities are in Monmouth County, several lie within the boundaries of Middlesex and Ocean Counties (NJDEP 2012). The northern portion of the Township of Brick, those lands located in the Manasquan Watershed, are located within the WMA 12.

WMA 13: Barnegat Bay

WMA 13 includes watersheds that drain into the central Atlantic drainage of New Jersey. The Barnegat Bay Watershed is a 660-square mile area encompassing all of the land and water in Ocean County, as well as parts of Monmouth County. The area lies mostly in Ocean County and includes Barnegat Bay as



well as the following sub-watersheds: Metedeconk River, Toms River, Forked River, and Cedar Creek (NJDEP 2015). Much of the southern portion of the Township of Brick is located within the Barnegat Bay Watershed and Metedeconk River Watershed which are part of WMA 13.

Barnegat Bay is separated from the Atlantic Ocean by the barrier island. The watershed area is recognized for its important biological and natural resources. Wetland forests comprise 25% of the total watershed. The watershed's land usage is split between forested (45.9%), tidal and freshwater wetlands (25.2%), urban/residential areas (19.5%), agricultural/grasslands (6.6%), barren lands (1.9%), and water bodies (0.9%) [Barnegat Bay Comprehensive Conservation and Management Plan (CCMP) 2002].



Part 2. Flood Response Factors

This section describes general and specific factors affecting a response to flood events in the Township of Brick.

2.1 General Factors in Responding to Flood Events

Floods are the most destructive natural disaster in the United States in terms of loss of life and property. They can develop slowly over a period of days or develop quickly, with disastrous effects that can have local (impacting a neighborhood or community) or regional (affecting entire river basins, coastlines, and multiple counties or states) impacts [Federal Emergency Management Agency (FEMA) 2008].

Most communities in the United States have experienced some kind of flooding after spring rains, heavy thunderstorms, coastal storms, or winter snow thaws (George Washington University 2002). In the Township of Brick, floods are most often tidal in nature and a result of coastal storms or hurricanes. Less frequently, the Township will experience riverine flooding, particularly from the Metedeconk River, again as a result of severe storms. Township residents also note that inadequate drainage and road elevations will lead to stormwater flooding. While this type of flooding is not severe, stormwater flooding does prevent residential access to homes and causes expensive personal damage to vehicles. Floods are frequent and costly natural hazards in New Jersey in terms of human hardship and economic loss, particularly to communities that lie within flood-prone areas or floodplains of a major water source.

This section describes riverine flooding, coastal flooding, and typical warning times for each. The Township is at risk of flooding due to its proximity to both the Atlantic Ocean as well as inland waterways. Coastal storm surge flooding, caused by an abnormal rise of the ocean preceding and during a storm, interior flooding, caused when stormwater drainage systems are overwhelmed during high tide and large precipitation events, and riverine flooding, caused when excessive river water flows into a floodplain areas.

Specifically, low-lying areas of the Township are near sea level and are subject to hurricane storm surge floods from ocean, riverine and interior floods. The effects of climate change, sea-level rise and more intense and frequent storm surges are expected to increase flooding in vulnerable areas of the Township.

2.1.1 Riverine Flooding

Riverine floods are the most common flood type for most communities in the United States, although this is not the case for the Township of Brick. They occur along a channel and include overbank and flash flooding. Channels are defined as ground features that carry water through and out of a watershed, and may be called rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas (FEMA 2008; Illinois Association for Floodplain and Stormwater Management 2006).

Riverine floods can generally be classed as either slow-rise or flash floods. Slow-rise floods may be preceded by warning times ranging from several hours, to days, to possibly weeks. Evacuation and sandbagging for a slow-rise flood may lessen flood-related damage. Conversely, flash floods are the most



difficult to prepare for because of their extremely short warning time, if any is given at all. Flash flood warnings usually require immediate evacuation within the hour.

2.1.2 Coastal Flooding

Coastal flooding occurs along the coasts of oceans, bays, estuaries, coastal rivers, and large lakes. Coastal floods are defined as the submersion of land areas along the ocean coast and other inland waters caused by seawater over and above normal tide action. Coastal flooding is a result of a storm surge where the rise in local sea levels results in weakened or destroyed coastal structures. Hurricanes and tropical storms, severe storms, and Nor'easters cause most of the coastal flooding in New Jersey. Coastal flooding is the more frequent type of flooding that occurs in Brick Township. Coastal flooding has many of the same problems identified for riverine flooding but also has additional problems such as beach erosion; loss or submergence of wetlands and other coastal ecosystems; saltwater intrusion; high water tables; loss of coastal recreation areas, beaches, protective sand dunes, parks, and open space; and loss of coastal structures. Coastal structures can include sea walls, piers, bulkheads, bridges, or buildings (FEMA 2011). In the Township of Brick, the barrier island and the western portion of the mainland (particularly in the southwest area of the Township) are more prone to coastal flood events due to the densely developed nature of the area and the prevalence of bulkheads along the shorelines of the Metedeconk River, Kettle Creek and Barnegat Bay.

2.1.3 Warning Time

Every watershed has unique qualities that affect its response to rainfall. A hydrograph—which is a graph or chart illustrating stream flow in relation to time (Figures 3 and 4)—is a useful tool for examining a stream's response to rainfall. Once rainfall starts falling over a watershed, runoff begins, and the stream begins to rise. Water depth in the stream channel (stage of flow) will continue to rise in response to runoff even after rainfall ends. Eventually, the runoff will reach a peak and the stage of flow will crest. It is at this point that the stream stage will remain the most stable, exhibiting little change over time until it begins to fall and eventually subside to a level below flooding stage.

The potential warning time that a community has to respond to a flooding threat is a function of the time between the first measurable rainfall to the first occurrence of flooding. The time it takes to recognize a flooding threat reduces the potential warning time to the actual warning time a community has to take appropriate actions to protect lives and property. Another element that characterizes a community's flood threat is the length of time flood waters remain above flood stage.

The Township monitors flood threats in several ways. One of its strongest resources is the ability to monitor and report water levels through precipitation gages. A network of precipitation gages exist in Ocean County and are located throughout the watersheds; these include tide gages along the coastline and stream gages at strategic locations. Information from the gages is fed into a USGS forecasting program, which assesses the flood threat based on the amount of flow in the stream (measured in cubic feet per second). Because coastal flooding is the community's most significant concern, the Township supports the placement of tide gages in or near corporate limits. The closest tide gage to the Township is the Barnegat Bay at Mantoloking, NJ. This gage is maintained by the USGS and has the site number of

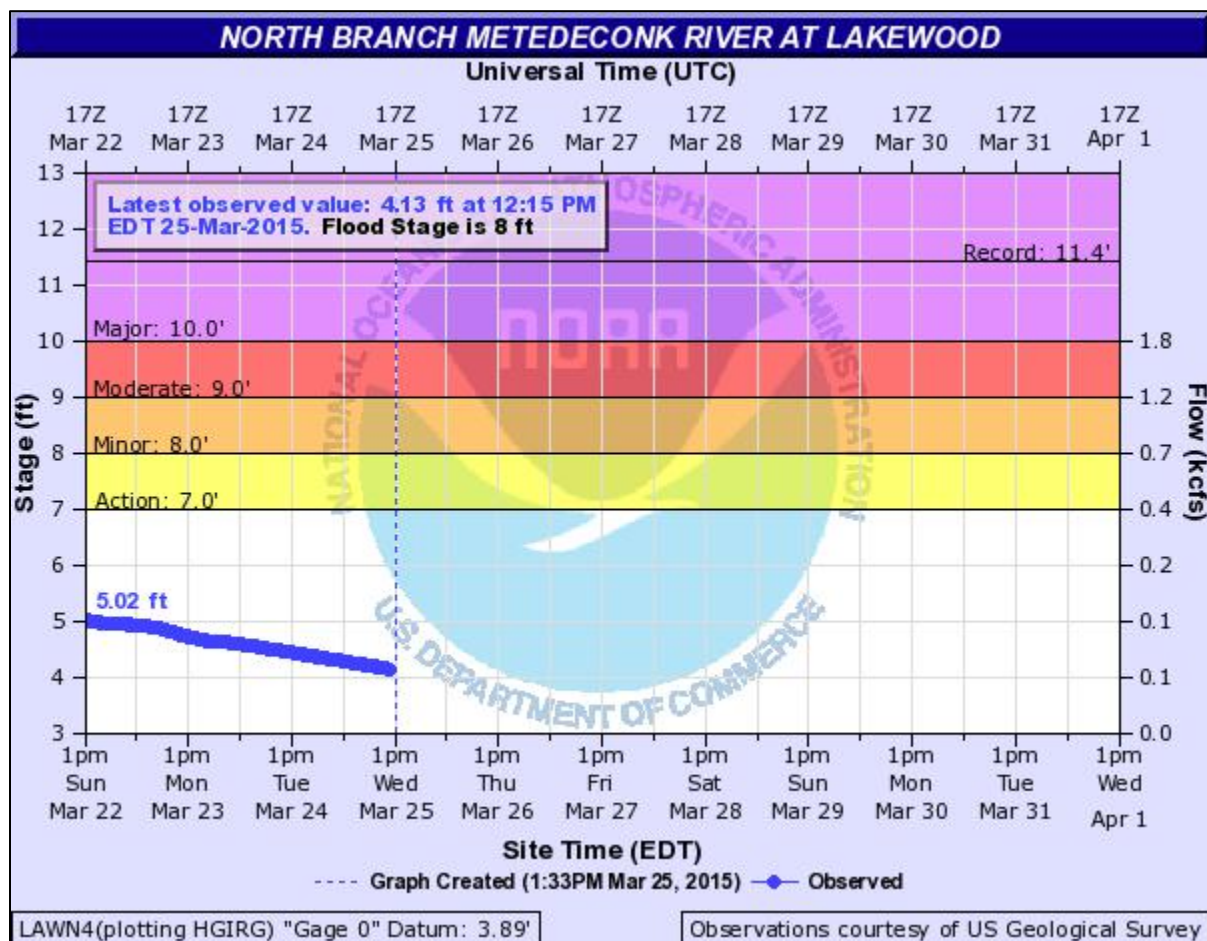


01408168. In addition to this program, data and flood information is provided by the NWS. All of this information is analyzed to evaluate the flood threat and possible evacuation needs.

The following figures consist of hydrographs for major waterways near the Township of Brick (as gages inside the Township were not available, the nearest gages outside corporate limits were used for graphing). The hydrographs provide real-time data with action levels, minor, moderate, and major flood stages in relation to current river heights.



Figure 3. North Branch of the Metedeconk River Hydrograph near Lakewood, New Jersey



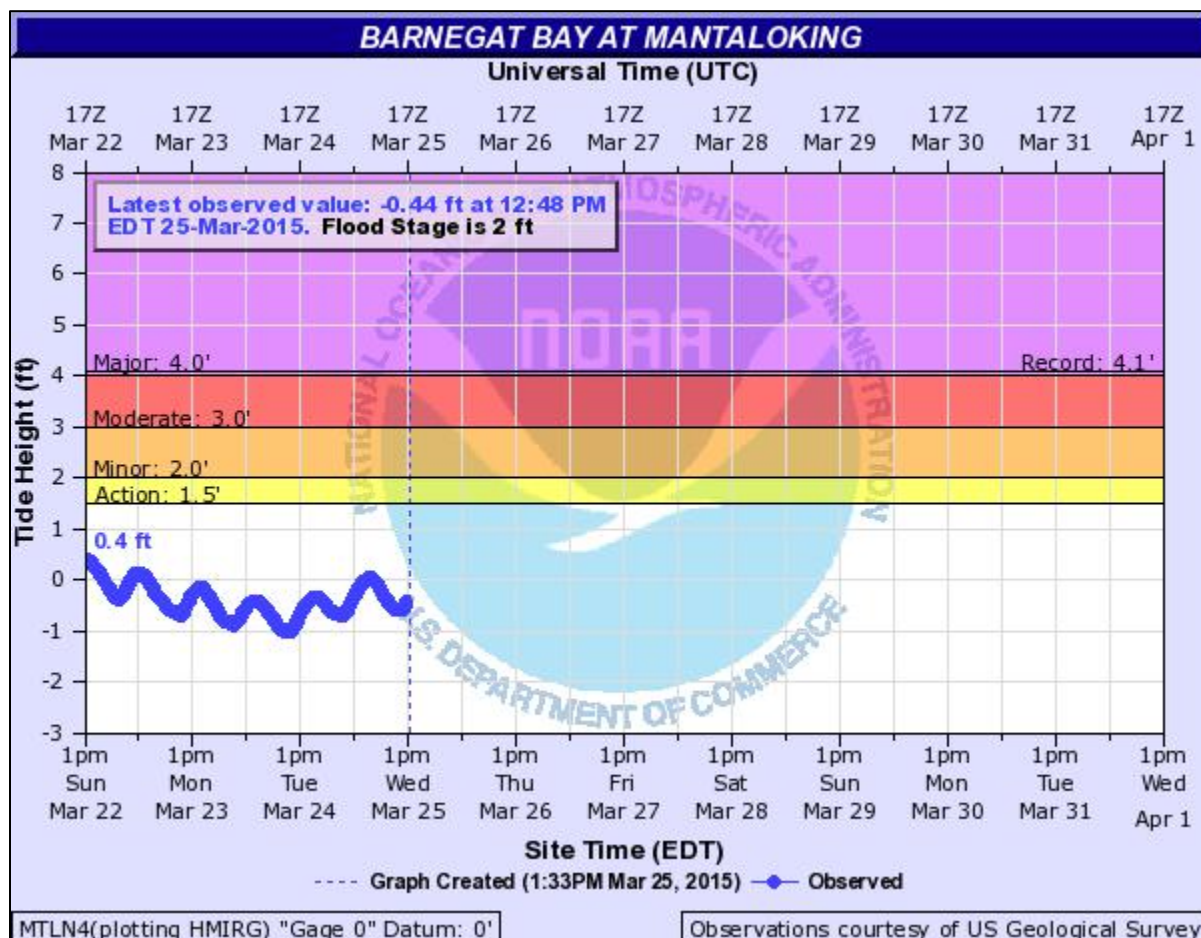
Source: National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) 2015

Notes:

EDT Eastern Daylight Time
ft Feet
kcfs Kilo cubic feet per second



Figure 4. Barnegat Bay Hydrograph near Mantoloking, New Jersey



Source: NOAA NWS 2015

Notes:

EDT Eastern Daylight Time

ft Feet

2.2 Specific Factors in the Township of Brick's Flood Events

Flooding in New Jersey, including the Township of Brick, is often the direct result of frequent weather events such as coastal storms, Nor'easters, heavy rains, tropical storms, and hurricanes. Floods are the most frequent natural hazards in New Jersey and the Township, and they can occur any time of the year. Areas of greatest risk in the Township occur in known floodplains where intense rainfall occurs over a short period of time; prolonged rains fall over several days; winds that reach sustained speeds of between 20-25 mph or more in conjunction with a storm event or high tide; and/or inadequate drainage capacity exacerbates stormwater flooding.

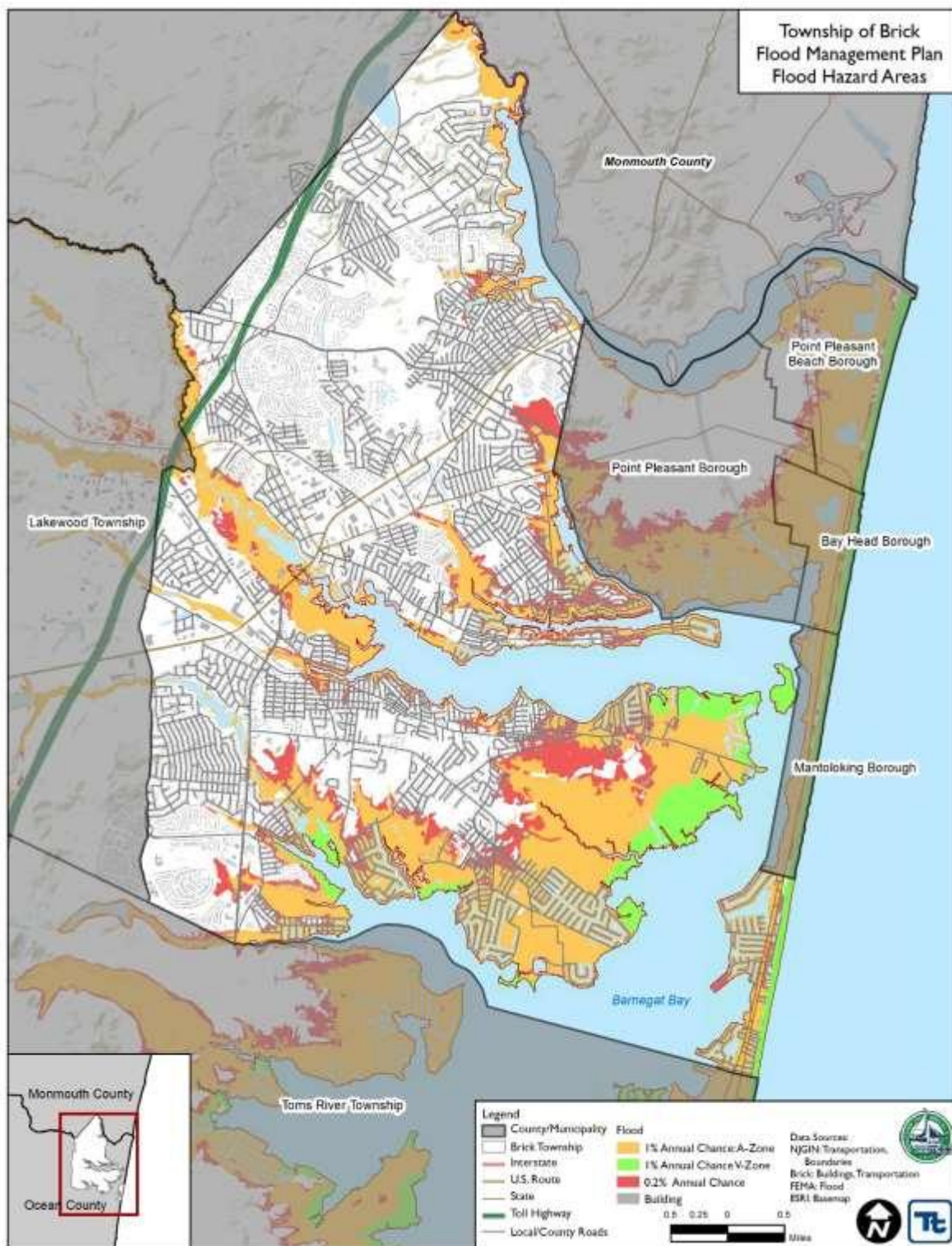
Areas within a floodplain become inundated during a flooding event. The areas within the 1% annual chance flood areas have a higher chance of becoming inundated during storm events. The 1% annual chance of flood hazard zones (both A and V zones) and 0.2% annual chance flood zone throughout the Township of Brick are identified in Figure 5. Figure 6 provides a visual of only the coastal flood zones for the Township of Brick, and Figure 7 shows the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) modeling for the Township. SLOSH modeling estimates storm surge heights and impacts from



hypothetical hurricanes through the consideration of atmospheric pressure, size, forward speed, and track data (National Weather Service [NWS] 2015).



Figure 5. FEMA Flood Hazard Areas in the Township of Brick



Source: FEMA 2015; NJGIN 2015

Notes: FEMA Federal Emergency Management Agency
NJGIN New Jersey Geographic Information Network



Figure 5 provides a visual reference of the locations most likely to flood in the Township of Brick, both during a normal flooding event (indicated in orange) and during flooding events that specifically tie to coastal/wave action (indicated in green). The recommended standard for identifying flood-prone areas is the 1% annual chance flood; however, the Township also considers the impact that a 0.2% annual chance flood might have on the community.

2.2.1 Township Neighborhoods and Associated Flood Locations

Brick Township is composed of many neighborhoods, some of which have extensive vulnerability to flooding. Four major neighborhoods in the Township include Cherry Quay-Bay Harbor, Princeton-Midstreams, Shore Acres, and Barrier Island.

Cherry Quay-Bay Harbor Neighborhood

Cherry Quay and Bay Harbor specifically refer to individual sub-neighborhoods; however, the Cherry Quay-Bay Harbor names refer to the whole geographic area between the two. This area includes the sub-neighborhoods of Cherry Quay, Bay Harbor Estates, Sailors Quay, Mallard Point, and Seaview Village. The Cherry Quay-Bay Harbor Neighborhood is the second most densely populated neighborhood in Brick Township and is entirely residential. Much of the neighborhood was built on former marshes and therefore, is very low to sea level and subject to flooding (although several sub-neighborhoods have a buffer of wetlands and marshes).

The neighborhood's location slightly more inland from Barnegat Bay and the barrier island is more sheltered from storm events and flooding than Shore Acres or the Brick Barrier Island/Beaches. However, as was the case with Superstorm Sandy, rising flood levels can easily overflow the streams and marshes in the low-lying area. With the breach of the barrier island near the Mantoloking Bridge to the east, coupled with heavy rain, the water level in Barnegat Bay quickly rose as it filtered inland from the ocean and further upstream. Cherry Quay, which is the furthest east, has the most direct frontage on Kettle Creek, and has the largest canal network of the sub-neighborhoods, also had the greatest number of properties that experienced substantial damage, followed by Bay Harbor Estates, which is most exposed on its southern side. Drainage issues, impact on wetlands, low-lying/flood-prone properties, and a lack of connectivity could prove to be the biggest issues that this community is facing.

Princeton-Midstreams Neighborhood

Princeton-Midstreams is located in the eastern central portion of Brick Township, and it borders the Metedeconk River to the south, Bricktown to the west, and Point Pleasant Borough to the north and east, separated by the North Branch Beaver Dam Creek. Princeton and Midstreams both specifically refer to the individual sub-neighborhoods, as well as the major access roads (Princeton Avenue and Midstreams Road) that connect them, but the names are also used to describe the total geographic area. Princeton-Midstreams is unique as a neighborhood compared to Shore Acres, Cherry Quay-Bay Harbor, and the Barrier Island due to its sheer size. It encompasses the entire area southeast of New Jersey State Highway 88 from the border of the Borough of Point Pleasant to the east to where it meets Route 70 to the west.

Much of the neighborhood has frontage on the water, whether Barnegat Bay or one of the branches of Beaver Dam Creek. Midstreams has a few natural canals on the South Branch Beaver Dam Creek formed by a series of small barrier islands, which help to protect the neighborhood somewhat from



overexposure to flooding and wave action. Other than the small islands, there is minimal natural or man-made buffer from a rise in sea level. Additionally, much of the neighborhood was built on or adjacent to former wetlands or sandy beaches and, therefore, is subject to flooding because it is low to sea level and the water cannot be absorbed. The neighborhood is protected from intense ocean wave action by the barrier island to the east. However, as was the case with Superstorm Sandy, heavy rain and rising flood levels can easily overflow the surrounding streams, rivers, and marshes in the low-lying area. Drainage issues, impact on wetlands, low-lying/flood-prone properties, and a lack of public neighborhood spaces and design standards could prove to be the biggest issues that this community faces.

Shore Acres Neighborhood

The Shore Acres neighborhood is generally located where Kettle Creek meets Barnegat Bay off of Drum Point Road and east of the Cherry Quay neighborhood in the eastern portion of Brick Township. It includes five sub-neighborhoods, specifically, Shore Acres, Waterside Gardens, Baywood, Mandalay Park, and Seawood Harbor.

Shore Acres is protected from direct ocean access by the barrier island to the east, but is located directly on Barnegat Bay (part of the eastern intercoastal waterway) at the northern side of the mouth of Kettle Creek, with Reedy Creek and Havens Cove to the north. This neighborhood is only accessible via Drum Point Road, which runs east from Hooper Avenue and Brick Boulevard in the west. Much of the neighborhood was built on former wetlands or marshes and therefore, is very low to sea level and subject to habitual flooding. Mandalay Park and Seawood Harbor sub-neighborhoods, which are the most isolated of the sub-neighborhoods, are particularly problematic because the homes and roads regularly experience flooding, which cuts off access to Mandalay Road and the rest of the Township.

The densely developed and mostly impervious neighborhood's location on the bay and river makes it particularly vulnerable to water damage from storm events and increased water levels, as well as erosion from wave action and wind.

Barrier Island Neighborhood

The Brick Barrier Island neighborhood is found, as the name suggests, on the barrier island separating the Atlantic Ocean from Barnegat Bay. The Barrier Island Neighborhood is both the smallest and least densely populated of the Brick neighborhoods, although it is still very densely populated. The area contains both year-round residents and part-time residents who live on the island during the summer.

The location of the neighborhood between the bay and the ocean makes it particularly vulnerable to water damage from storm events and increased water levels, as well as beach erosion from wave action and wind. The beaches in Brick are replenished every year after winter and there is currently a revetment in process along the stretch of beach from The Ocean Club to 8th Avenue. Most of the island, except between Route 35 North and the property lines on the ocean side, experienced storm surge during Hurricane Sandy from the ocean or flooding from Barnegat Bay. This was due to the slightly higher elevation of the original sand dune line along the eastern shore. The area that was spared from the storm surge was even narrower south of The Ocean Club.

Since the storm, many remaining homes have either been demolished and rebuilt or renovated. A large number of buildings have also been raised to meet BFE requirements in order to qualify for flood



insurance or FEMA grant money. This has caused some additional issues with the developable land and bulk standards as homes are being raised exceptionally high or taking up more lot coverage in an already compact area to justify the loss of developable ground floor or to receive more funding. Nearly all substantially damaged properties from Superstorm Sandy in 2012 are located in areas directly on the canals and on the tips of the peninsulas.

Locations Most Prone to Flooding

Figures 5a – 5d correspond with the areas indicated by Township public safety officials as the locations in the Township most prone to flood issues.

Figure 5a-Shore Acres Neighborhood Map

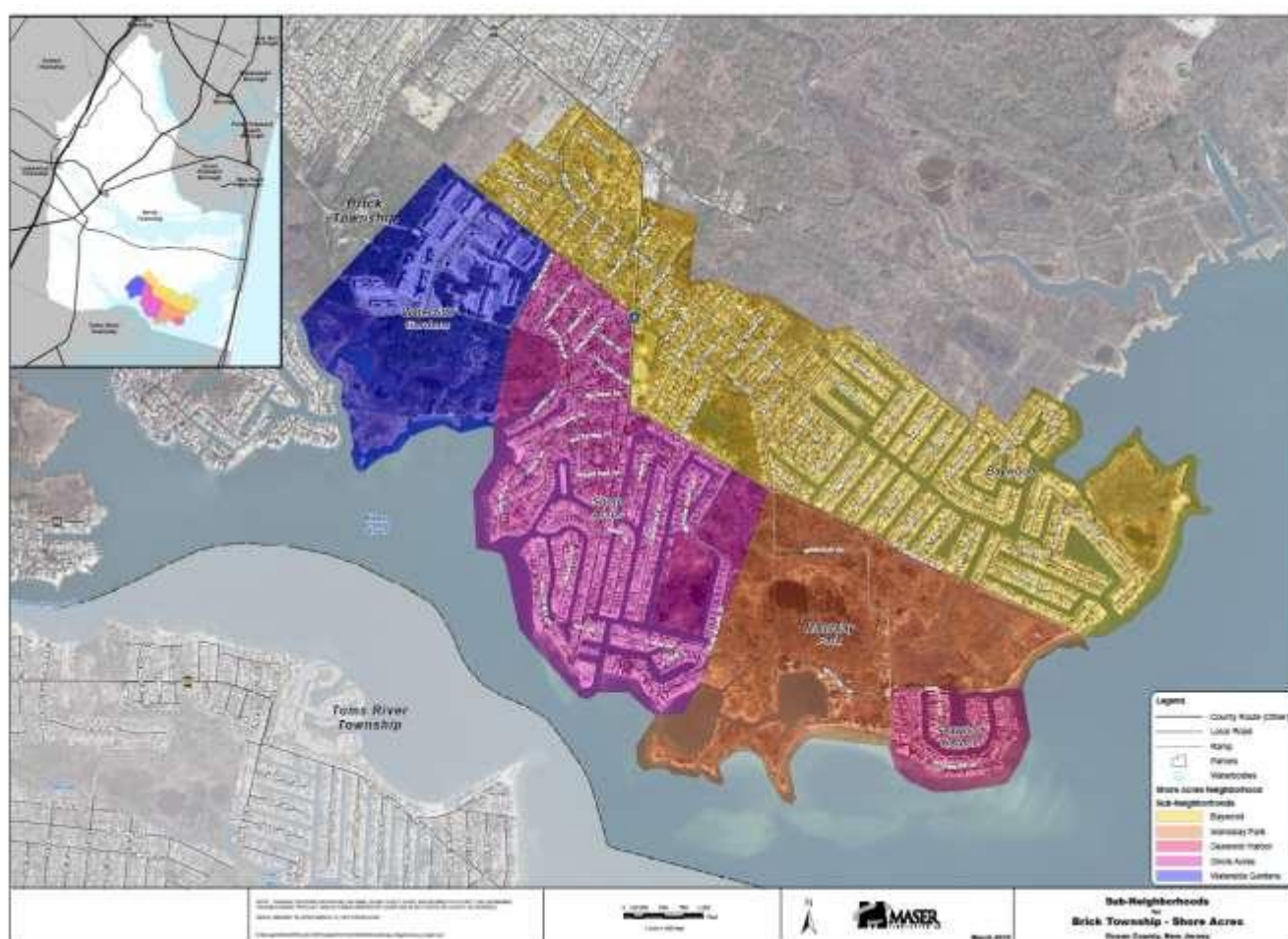




Figure 5b-Barrier Island Neighborhood Map



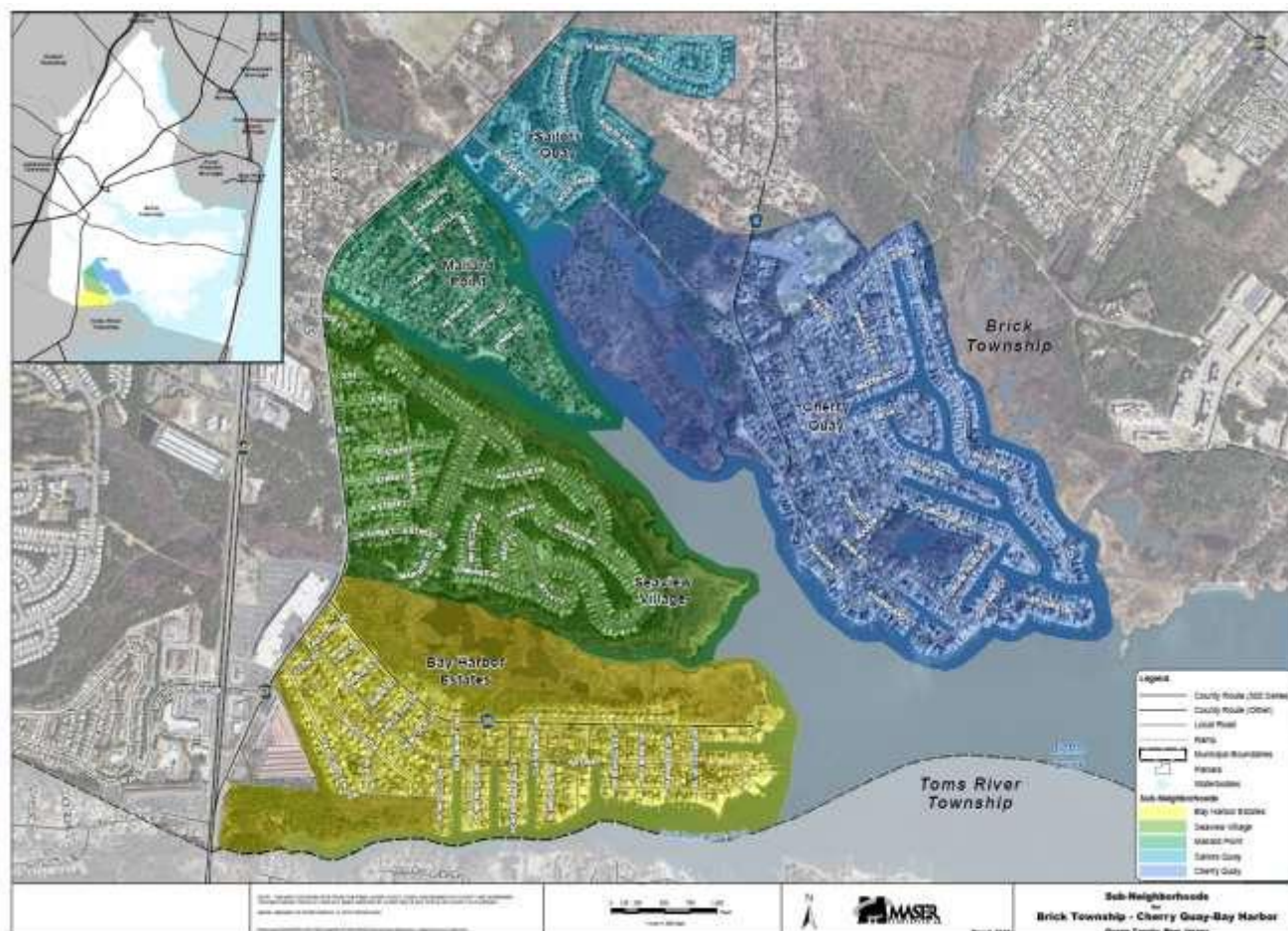


Figure 5c-Princeton/Midstreams Neighborhood Map





Figure 5d-Cherry Quay/Bay Harbor Neighborhood Map



Although all of the areas indicated on Figures 5a – 5 d have heightened flood vulnerability, the areas noted specifically by the Township include:

- South/Southwestern portion of Township, which is bordered by Barnegat Bay
 - Shore Acres: During lunar tides and high tides a number of local, low-lying roads flood.
 - Seawood Harbor: The one route of ingress and egress from the area (Snake Rd. through Mandalay Rd.) floods during heavy rains and strong storms.
 - Cherry Quay: The community contains a large lake in its center. During high tide and periods of heavy rainfall, this lake over tops its banks and leads to flooded streets.
 - Baywood – Most of the area has been built on fill. Flooding occurs primarily during high tides in areas of the back bay, where dead end streets meet the bay.
 - Mallard Point: Low lying areas of Tunes Brook Rd. floods from Kettle Creek during high tides and storms.
 - Bay Harbor (to some degree)

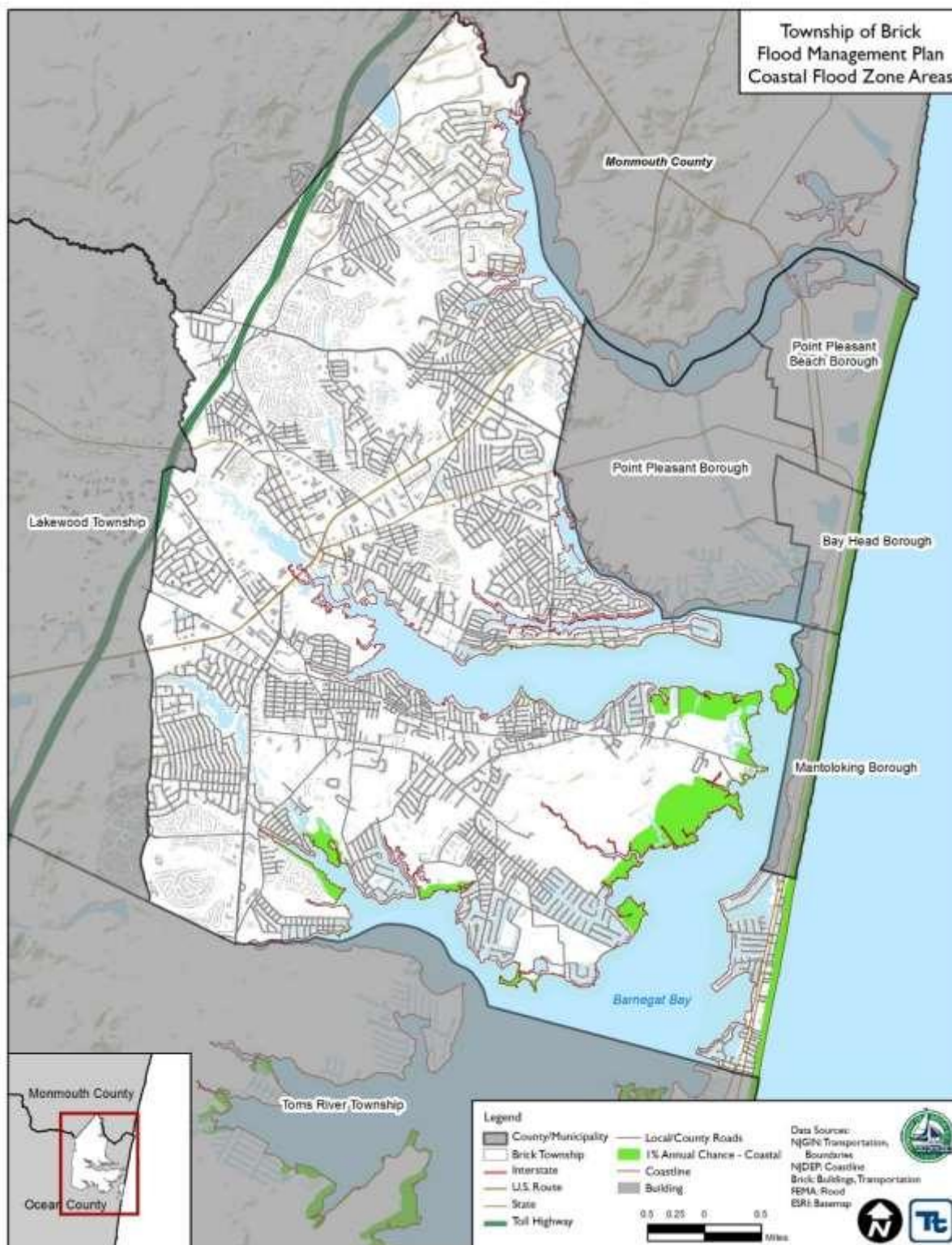


- Barrier island
 - Journey's End: The bayside of Route 35 in the Journey's End area of the Normandy Beach section floods several times a year during high tides. Lunar tides and storms tracking out of the south contribute to this frequent flooding. In addition to Route 35, 6th, 7th and 8th Avenue flood during strong storms due to the narrow
- Adjacent to the Metedeconk River
 - Sandy Point: This is a low lying area with roads approximately 1 foot above bay. Flooding is frequent during high tides and storm swells.
 - South Drive: This area consists of marsh land, and roadways flood primary due to stormwater. Most flooding is located along the eastern edge of Princeton Ave.
- Confluence of the Metedeconk River and Barnegat Bay
 - Swan Point: this location has the lowest elevation in Brick Township. Houses are elevated in the area, but flood frequently during lunar tides and strong storms. In this area, Gale Road, which is surrounded by wetlands, floods every high tide.

All locations listed are also subject to drainage issues and stormwater flooding.



Figure 6. The Township of Brick Coastal Flood Zone Areas



Source: NJDEP 2015; NJGIN 2015



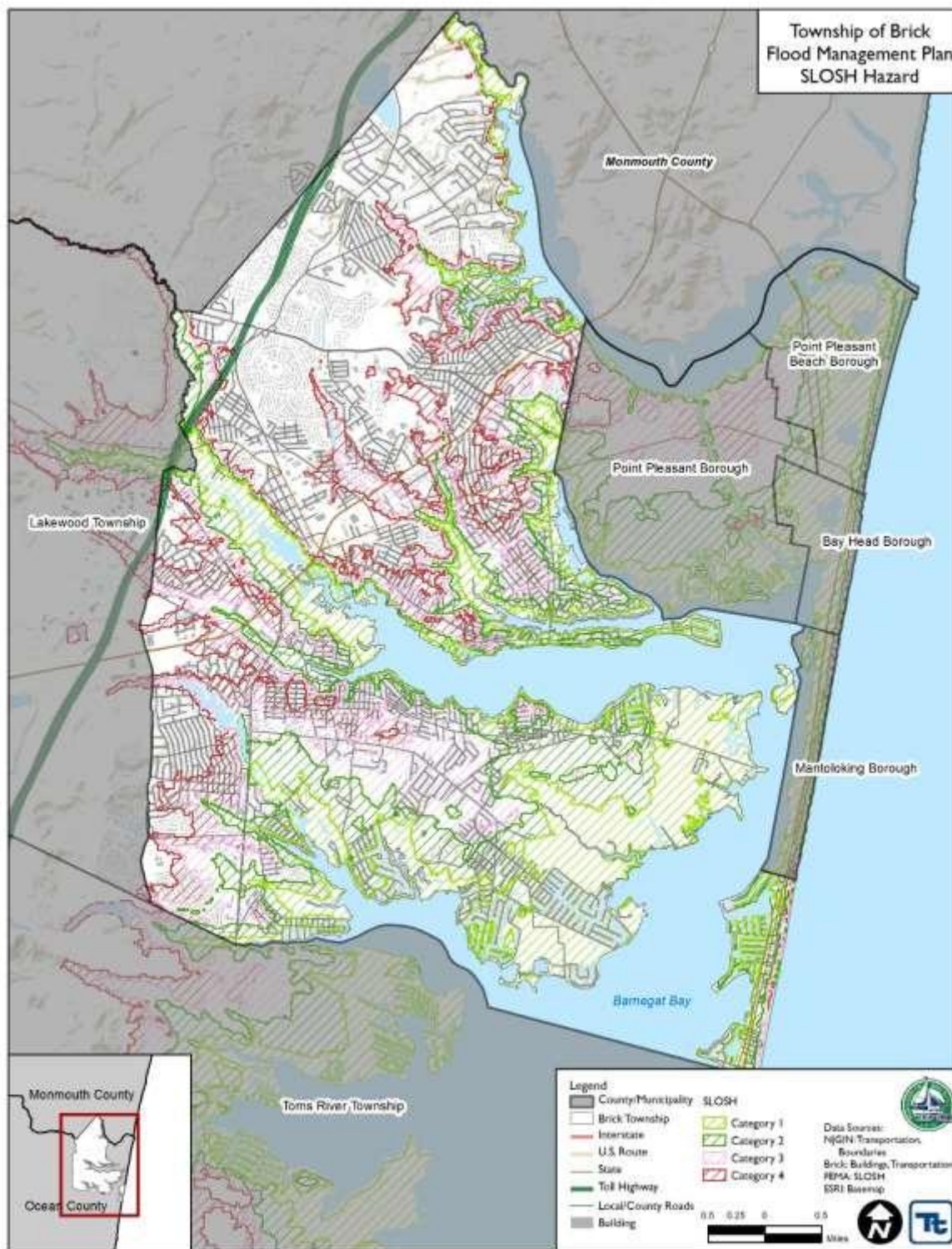
Although Figure 5 illustrated hazard areas for both general flooding and coastal flooding, Figure 6 specifically focuses on areas with coastal flood vulnerability (i.e., areas vulnerable to the 1% annual chance V-zone flooding) to highlight the impact that coastal flooding may have on the Township. Of the areas specifically noted by the Township as being highly vulnerable to flooding, most fall under the V-zone vulnerability type. These areas include:

- South/Southwestern portion of Township, which is bordered by Barnegat Bay
 - Shore Acres
 - Cherry Quay
 - Bay Harbor (possibly, to a small degree)
- Barrier island
 - Journey's End
- Confluence of the Metedeconk River and Barnegat Bay
 - Swan Point

Figure 7 illustrates SLOSH modeling for the Township of Brick.



Figure 7. The Township of Brick SLOSH Modeling



Source: NJDEP 2015; NGIN 2015



The Township of Brick acknowledges that most flood events are tied to other hazard events, such as coastal storms, severe rain storms, or hurricanes. These storms typically cause non-flood-related damage as well, including property and infrastructure damage from strong winds, storm surge, and heavy rains. The SLOSH modeling, depicted in Figure 7, is one tool the Township has utilized to try to identify vulnerable areas for associated impacts. This model evaluated vulnerability for hurricane-level storms from Categories 1 to 4. All specific locations and streets identified by the Township as more vulnerable to flooding would be impacted by even a Category 1 storm. Township vulnerability continues to increase with each category level, culminating with the majority of the community falling in the impacted zone for a Category 4 storm. Only the northeast sector of the Township and very small portions of the eastern border of the Township fall outside the estimated impact ranges; however, this does not mean these sections of the community would avoid damages from a Category 4 storm.

Although flooding can occur anywhere in the Township of Brick, certain locations are more vulnerable or more likely to experience flooding than others. In addition to the specific neighborhoods and streets the Township has noted for higher flood risk, certain water bodies provide general indicators of areas likely to flood. The Metedeconk River is the most frequent source of riverine flooding in the Township, based on previous occurrences and storm events. Other main bodies of water (and sources of flooding) in the Township include the Manasquan River, Sawmill Creek, Beaver Dam Creek, Cedar Bridge Branch, and Kettle Creek. Additionally, Barnegat Bay makes up the eastern border of the Township, and the Township is located in Watershed Management Area (WMA) #13m Barnegat Bay.

Brick Township's vulnerability to coastal flooding, as well as the vulnerability of its home county of Ocean County, is exacerbated by the County having the longest shoreline of any county in New Jersey. As noted earlier in this plan, the Township contains 53.2 miles of privately owned waterfront property, including 1.79 miles along the barrier island, 39.5 miles of riverfront property and 11.93 miles of bay front property (Township of Brick Master Plan 2007). It is important to note, that these miles of privately owned waterfront lands are not natural shorelines that can absorb some flooding. These shorelines have been altered by the installation of bulkheads. Attachment 6 provides additional supplementary maps to aid Township responders in identifying flood-prone and vulnerable areas.

2.2.2 The Flooding Problem

In response to the extensive damage from Superstorm Sandy, the Township and other regional entities have funded and begun investing in a number of flood mitigation and control studies to better evaluate flood vulnerability and potential solutions and flood control actions. Important issues associated with flood hazards in the Township include but are not limited to the following:

- Many developed areas in the Township are located in proximity to tidal bodies of water. This could lead to significant problems in the case of sea level rise.
 - Example: Mantoloking Road runs parallel to the Metedeconk River and over the Barnegat Bay, and Route 35 runs next to the Atlantic Ocean (additionally preventing evacuation through this route during even a Category 1 Hurricane).
 - Example: Even without sea level rise, the proximity to tidal (and riverine) bodies of water leads to repeated damage. (Explanations next to Figures 5 and 6 above discuss specific vulnerable locations.)



- Some evacuation routes are in the floodplain or conflict with response service areas.
 - Example: In addition to the Route 35 concern listed immediately above, two fire stations are in the direct path of an evacuation route. This not only prevents residents from using this route, but also impacts rescue workers who may not be able to assist residents in high vulnerability areas.
- Superstorm Sandy increased the vulnerability of homeowners and businesses in low-lying areas.
- Sewer infrastructure in the Township of Brick is particularly vulnerable to coastal flooding and severe storms. This leads to additional public health and ecosystem concerns about untreated sewage.
 - Township residents note that inadequate/insufficient drainage, sewer infrastructure, and road elevations (including on the barrier island) increase stormwater flooding, drainage backups, and other secondary flood problems.
- Drainage and stormwater flooding prevents some property owners from being able to access or leave their property during a flood event. Standing seawater also causes residents to incur expensive repairs to personal vehicles (as they must cross the water to access their property).
 - These problems can also lead to more severe concerns. During major flood events and storms, residents in the Cherry Quay area and near Drum Point Road are cut off from the community. Township officials provide advance notice to residents to park their vehicles at community buildings (such as schools) so that vehicles do not become waterlogged; however, this adds an increased burden to responders who may have to evacuate or transport isolated residents to their vehicles.
- The Township experiences annual variances in populations from summer tourism, leading to challenges in adequately determining the number of people in need during a hazard event.
- Degraded wetlands in Barnegat Bay may contribute to greater vulnerability to flood events in the Township of Brick.

The Township of Brick experiences most coastal storms and subsequent flooding between October and March of each year. These storms can also result in stormwater flooding, high winds, and various types of heavy precipitation (i.e., snow, freezing rain/ice, and sleet). On average, the Township experiences one significant storm every two to three years. In contrast, most storms that contribute to riverine flooding, flash flooding, and other stormwater flooding occur most often between June through August, during the late afternoon and evening hours. Although those are the times of greatest frequency, these types of thunderstorms can occur any time of the year. The Township of Brick notes an average of 30 thunderstorms per year (Township of Brick EOP 2013).



Part 3. Flood Warning

The Township of Brick has undertaken extensive flood control measures to mitigate the risk in flood-prone areas. A complete description of these mitigation measures is contained in the Township of Brick's "Floodplain Management Plan." Ocean County's "Hazard Mitigation Plan" also serves as a valuable resource for flood mitigation measures.

3.1 Flood Threat Recognition System

The Township of Brick has developed and implemented a Flood Threat Recognition System to provide early notice of floods in the community. The Township utilizes a Level 1 Flood Threat Recognition System, as defined by CRS criteria. Specifically, the Township has instituted a manual flood threat recognition system, wherein the Emergency Management Coordinator or his designee (a member of the Flood Alert Team) regularly checks and reviews multiple data sources to determine the possibility of an inclement flood.

The Township receives radar data, satellite data, and flood alert information from the NWS for large-scale hazardous weather events. The Township of Brick Office of Emergency Management (OEM) has the following resources available for analyzing and evaluating flood threats and the possible evacuation of residents:

- NWS weather and tide information sent by the Ocean County Sheriff's Office
- NWS Conference Calls, in conjunction with Ocean County
- Alert Warning National Oceanic and Atmospheric Administration (NOAA) Weather Radios are located in the following locations:
 - OEM (Deputy Director's Office)
- Commercial radio and television
- DTN Weather Network
- Nixle
- Internet system access

The Township receives some automatic notifications of pending flood events, including ones from the Ocean County Sheriff's Office and from NWS; however, the determination of the threat intensity to the Township is made by the Emergency Management Coordinator and the Flood Alert Team. The Township does not have any tidal or river gages in its corporate limits (see Section 2.1.3 for nearest gage locations and gage monitoring information), and the Emergency Management Coordinator must interpret the data for nearby locations to determine relevancy for the Township.

The Township of Brick has the capability to receive flood warnings on a 24-hour basis from federal, state, and other agencies. The Emergency Management Coordinator or his designee have access to all alerts through cell phones, radios, and e-mail. When the Emergency Management Coordinator receives an alert, he will complete the following actions:

- Review warning information in the notification



- Compare warning information against previous flood events in the Township, the Township SLOSH model (Figure 7), and Township flood inundation maps (Figures 11-14) to determine potential severity and impact
 - Peak tidal flow, accumulating rainfall, storm surge and other technical data; recommendations from the County, State, or other agencies; and local expertise are used to determine which inundation map (10-year, 50-year, 100-year, or 500-year) is most appropriate to review for the situation.
 - While the Emergency Management Coordinator will review the inundation map and flood scenario most likely to occur, based on current information; he will also consider the potential for the next most significant event.
 - Example: When a 10-year flood event is predicted, both the 10-year and 50-year inundation maps will be reviewed.
- Predict or try to discern arrival time and peak flow through further monitoring and outreach to weather officials (this only occurs for riverine flood events).
- Activate the Flood Alert Team and the Flood Alert program if the flood event appears that it will have a potential impact on the community.
 - If the flood event threatens to have a significant impact on the community, the Emergency Management Coordinator or his designee will disseminate a flood forecast notice (see Attachment 8 for sample language)

Additionally, the Township maintains the following equipment for flood-related weather emergencies:

- 150 barricades
- 300 traffic cones
- At least four pumps
- At least eight portable generators (two diesel and the rest gasoline)
- Several small boats (Jon Boats)
- One police boat
- Two fire boats
- Three zodiac inflatable boats
- One jet ski
- Cellular phones and handheld radios²
- Mutual Aid Plan

This section describes the Flood Alert Team, flood alert actions, pre-flood tasks and procedures, and flood alert operations for the Township of Brick.

3.2 Flood Alert Team

The Emergency Management Coordinator has defined certain staff members as the Flood Alert Team. As indicated above, the Emergency Management Coordinator or a member of the Flood Alert Team will

² Radios are available through the Fire Department, OEM, DPW, and Police Department. Hospitals have portable radios also; however, they are not interoperable with OEM radios.



review weather data as inclement weather approaches the Township of Brick and before the onset of significant rainfall or tidal surge could threaten the area. The Flood Alert Team operates and maintains the jurisdiction's flood threat recognition system. The data they gather are supplied to Township officials prior to an event and then to both relevant officials and the EOC during and after the event.

The Township EOC is activated for severe weather events, and staffing is determined based on the type of inclement weather approaching, incident needs, and/or per the Township's EOP.

Additionally, the Flood Alert Team may activate critical stakeholders to assign as "Flood Spotters." Flood Spotters will most frequently be from DPW, Fire Departments, or other emergency response organizations, and the staffing decision will be made according to situational factors. The task of a Flood Spotter is to monitor low-lying and flood-prone areas (including areas with known drainage issues) during rain events and to call in other status information, as required by the EOC.

Flood Alert Team tasks include:

- Review and evaluate the flood threat
- Advise Township officials along with EOC staff of the flood threat
- Confirm with County that the most critical stream and tidal gages are reporting accurately (per the County or neighboring jurisdictions being able to safely field verify this data)
- Monitor weather conditions and gage data (when available) prior to and during flood events
- Coordinate with EOC staff to ensure public alerts and emergency information is issued.

In general, the following flow of information should occur whenever possible. This information should be modified appropriately to fit the Township's response. Table 2 provides the order in which information will typically be disseminated. Each level will alert the next level to provide a continuous transfer of information.

Table 2. Flood Event Response Information Flow

Notification Order	Flood Alert Team Information Flow ³	EOC Information Flow
1	Emergency Management Coordinator	Emergency Operations Center (EOC)
2	Flood Alert Team	Leadership, Field Responders, and Public Information Officer (PIO)
3	Leadership, Critical Stakeholders, and Critical Facilities	Media/Public (Media/Public will be notified by the PIO.)
4	Township Departments (Township Departments will be notified by Critical Stakeholders or Flood Alert Team members, as appropriate)	
5	Media/Public (Media/Public will be notified by the appropriate Township Department)	

³ Information flow will follow the Flood Alert Team layout until the EOC activates. At this point, the information flow will adjust to EOC procedures. For full EOC information and communications protocols, refer to the Brick Township EOP (Brick Township EOP 2013). Additional stakeholders, not listed in the table, may be contacted based on the direction of the Emergency Management Director.



3.3 Flood Alert Actions

To facilitate an orderly and consistent approach to reacting to a possible flood threat, the Township of Brick adheres to a five-tier “Flood Alert” program. The following five flood alert levels are associated with the NWS alert levels. The function of each level is discussed below.

3.3.1 Flood Advisory

The Flood Advisory stage alerts officials to weather conditions that may result in areas within the Township being flooded. This level will put appropriate emergency response personnel on standby, providing enough lead time to enact pre-flood actions by various departments to reduce flooding damage and prepare for possible evacuation of threatened areas.

Based on standard NWS guidance, a Flood Advisory is for an “imminent” weather hazard that will cause a significant inconvenience but is not life threatening if proper precautions are taken.

3.3.2 Flood Watch

The Flood Watch stage consists of communication to Township staff and residents the possibility of flooding in certain areas, given the current weather and stream flow conditions. The Township also recommends to residents that they remain informed on changing weather conditions by monitoring the following sources:

- NWS website updates and radio alerts
- Township website
- Township social media (Facebook and Twitter)
- Local news

Based on standard NWS guidance, a Flood Watch is for the “possibility” of a serious weather hazard that could become life threatening or could cause property damage if proper precautions are not taken. They are issued for small-scale events like severe thunderstorms. Flood Watches are issued only up to a few hours before the event is expected. For large-scale events like coastal storms, they may be issued up to 48 hours before the event.

3.3.3 Flood Warning

The Flood Warning stage alerts Township staff and residents that current weather and basin conditions have worsened and will likely result in areas of the Township being flooded, and that evacuation is a possibility. This warning level is designed to provide enough lead time for residents to prepare for evacuation and to perform available flood-proofing actions to protect their personal property. Staff will activate the EOC, to the necessary level, and follow the pre-flood and evacuation procedures laid out in the Flood Warning and Response Plan (FWRP).

Based on standard NWS guidance, a Flood Warning is released for the “imminent” occurrence of a serious flood hazard, which could become life threatening or could cause property damage if proper precautions are not taken. For fast-onset events, warnings may be issued only up to 5 minutes before the event is



expected to make landfall. For large-scale or slow-onset events, they may be issued up to 36 hours before the event.

3.3.4 Critical Flooding

The Critical Flooding stage encompasses evacuation notices and instructions to Township residents and staff that current stream flow, tide levels, and weather conditions will result in flooding conditions. Evacuation of designated areas in the Township will be strongly encouraged. This level will initiate the evacuation and sheltering of people whose homes and businesses are forecasted to be impacted by flooding. If weather conditions become unsafe, the Township will notify residents in the recommended evacuation zones that emergency responders will not deploy until safer conditions resume.

Attachment 3 contains a map illustrating the recommended Township evacuation routes.

3.3.5 Re-Entry

During the Re-Entry stage, authorities will provide notice that areas evacuated during flood events are now acceptable for re-entry. Although these areas are cleared for re-entry, it is possible that some structures and/or transportation routes are still unsafe and unusable within those areas.

3.4 Pre-Flood Tasks and Procedures

Each year, prior to the beginning of the severe weather season (starting April 1) and hurricane season (starting June 1), the Emergency Management Coordinator distributes general preparedness information to residents in the community. The notice indicates the beginning of the severe weather season, points out which residents reside in a flood risk area, and explains that residents may be asked to evacuate during periods of heavy rain or high tides. The notice also recommends that residents check non-perishable food stocks, supplies from their disaster kits, portable generators, flash light batteries and other emergency equipment. The notice will also explain the various levels of flood alerts and how residents may be notified of possible flooding.

Notices regarding the beginning of severe weather and hurricane season are also disseminated to Township staff. In addition to the standard preparedness information provided to residents, Township departments are directed to inspect equipment and vehicles prior to the start of severe weather/hurricane season. This includes confirming generators are functional and radios have battery backups. Township departments are also directed to fuel vehicles prior to the arrival of severe weather, especially coastal storms and hurricanes.

The DPW will routinely conduct debris removal to keep roads and transportation coordinators safe for travel. This task is done throughout the year, not just prior to the start of severe weather or hurricane season. Additionally, the Township will annually exercise and evaluate the effectiveness of the FWRP to ensure familiarity and accuracy of the plan. Following the completion of an exercise, a Homeland Security Exercise Evaluation Program (HSEEP)-compliant After Action Report (AAR) and Improvement Plan (IP) will be developed. The AAR/IP will include the basic exercise information, such as the exercise name, type of exercise, dates, location, participating organizations, mission area(s), specific threat or hazard addressed, a brief scenario description, and the name of the exercise sponsor, and point(s) of contact. The AAR/IP



will also include an overview of participant performance related to each exercise objective and associated core capabilities, while highlighting strengths and areas for improvement. Findings from real-world flood responses will also be documented in the AAR/IP. A sample AAR format is provided as Attachment 10 to this plan for use in documenting the exercises.

If a **Flood Advisory** is issued, the Flood Alert Team will collect data and monitor the flood threat. The Emergency Management Coordinator will alert appropriate officials to weather conditions that may result in areas of the Township of Brick being flooded, and notify other departments to be on standby for pre-flood actions.

3.5 Flood Alert Operations

The Emergency Management Coordinator or designee will be responsible for implementing appropriate response actions when the NWS issues a **Flood Advisory**, **Flood Watch**, or **Flood Warning**. Additionally, the Emergency Management Coordinator is responsible for appropriate response actions when the situation approaches **Critical Flooding** and for **Re-Entry** upon conclusion of the hazard event. When the NWS initiates a **Flood Advisory**, the Flood Alert Team will continue to collect data and monitor the flood threat continually. As conditions change, the Flood Alert Team will advise the Emergency Management Coordinator if the level of alert should be changed. The Flood Alert Team may also notify relevant departments and critical stakeholders, conduct an initial briefing, and consult subject matter experts to facilitate any decision-making processes during this time.

As each Flood Alert Level is declared, the Emergency Management Coordinator will advise the local staff and the OEM for Ocean County that the following actions (described in the sections below) will be taken.

3.5.1 Flood Watch

The NWS issues a **Flood Watch** notification. The Emergency Management Coordinator or designee take appropriate response actions, including posting notifications to media outlets, social media networks, and the Township website. The Flood Watch notification process includes the following three steps:

Warning Dissemination

- Those residents in affected areas (considered high-priority areas) are contacted directly and indirectly through various means, including mass notification systems and door-knocking.
 - Door-knocking is reserved for residents in the highest risk areas (e.g., residents who live on the strip during a coastal storm).
 - Information releases are tailored to each individual event and notifications can be limited to appropriate higher-risk geographic areas.
- Various media outlets (social and news) are notified to issue **Flood Watch** for impacted areas, and both the County and the Township's websites are updated.

Staff Mobilization

- All department heads and critical stakeholders that have not yet been alerted are notified. This may include EOC staff from the Township of Brick; Brick Police; Fire Chiefs from Breton Woods,



Pioneer Hose, Laurelton, and Herbertsville Stations; the Township of Brick Volunteer First Aid Squad Leaders; the Ocean Medical Center; and the Township of Brick School District.

- EOC staff is notified to prepare to assume responsibilities. Field staff is notified to prepare to assume responsibilities.
- Those staff assigned to prepare and inventory flood-fighting equipment is instructed to do so and report back to the Emergency Management Coordinator or DPW Director.

Flood Alert Team Tasks

- Determine emergency staffing needs, and assess volunteer availability, and begin drafting schedules to facilitate staff mobilization (conducted in coordination with critical stakeholders that may not be part of the Flood Alert Team).
- Evaluate need for evacuation and shelter/reception center activation.
- Monitor staff mobilization and the warning dissemination process to residents and agencies.
- Monitor equipment preparation and review with department supervisors the procedures to retain services in affected areas.

3.5.2 Flood Warning

The NWS issues a **Flood Warning**, and the Emergency Management Coordinator or designee takes appropriate response actions, including posting notifications to media outlets, social media networks, and the Township website. The Flood Warning notification process includes the following three steps:

Warning Dissemination

- Those residents in affected areas are directly contacted through various means. Staff personnel also may be deployed to give in-person warnings.
 - **Flood Evacuation Notice** is issued, if needed.
- Emergency Management Coordinator is notified to issue a **Flood Warning** on the website.
- Notify the American Red Cross, hospitals, transportation, and sheltering/reception center services (unless they have already been involved in strategic response meetings).

Staff Mobilization

- EOC staff is instructed to open the EOC for a partial activation as soon as possible.
- Field staff is instructed to assemble at certain locations to assist in flood fighting tasks.
 - DPW staff begins road clearing efforts.
 - Fire Department and Emergency Services pre-stage response equipment and personnel as needed.
 - Shelter/reception center activation begins if needed.
- Those staff members assigned to notify residents and agencies are instructed to do so and report back to EOC on their progress.
- Department Supervisors enact their individual departmental responsibilities and report back to the Emergency Management Coordinator/EOC on their progress.

Flood Alert Team Tasks

- Monitor staff mobilization and warning dissemination to residents and agencies (Conducted in conjunction with critical stakeholders).





- Evaluation of transportation routes that will be impacted are made.
- Monitor evacuation needs, if applicable.
 - Evacuation area and number of residents are determined, shelter needs are then communicated to the Red Cross and other agencies involved in housing those people to be evacuated.
 - Evacuation procedures are reviewed and priorities are established regarding which areas will be evacuated first.
 - Transportation services used to assist in the evacuation are mobilized.
 - Field staff and transportation services are instructed to evacuate handicapped residents.
 - Police, fire, hospital, and ambulance services are notified regarding which transportation routes will likely be affected.
- Monitor equipment preparation and review with Department Supervisors procedures to retain services in affected areas.
- Identify potential sandbagging locations, based on current storm/weather estimates.
- Address any potential deficiencies identified during the Flood Alert Warning period.
- Notify local television stations that a **Flood Warning** for affected areas has been issued

3.5.3 Critical Flooding

The Incident Commander makes the determination that the situation will reach **Critical Flooding** and posts notifications to media outlets, social media networks, and on the Township website. The Critical Flooding notification process includes the following three steps:

Warning Dissemination

- Those residents in affected areas are directly contacted and staff person(s) are deployed to give warning in person.
 - Warnings include notification that response personnel may stop deploying in high-risk locations (e.g., the strip during a coastal storm) for safety concerns.
- Media outlets continue to update the **Flood Evacuation Notice** and both the County and the Township's websites are updated.
- Notify the Ocean County EOC that the Township of Brick EOC has been activated, as well as other significant situational and response factors.
- Notify the American Red Cross, hospital, transportation, and shelter services of current proceedings.

Staff Mobilization

- EOC staff is instructed to fully activate the EOC, with the necessary annexes, and to meet their responsibilities involved in a Flood Emergency and Evacuation Notice.
 - Additional staff for EOC, departmental, and other administrative areas are requested to report for duty assignments in a Flood Emergency declaration. Additional staff members are available from Ocean County Sheriff's Office; State Police; Ocean County DPW; State Department of Transportation (DOT); and multiple neighboring ambulance, fire, and police agencies, as needed.
- Field staff members that have specific assignments for assistance in evacuation procedures are instructed to do so. Those personnel currently performing another flood fighting tasks will be





reassigned to the evacuation efforts and be replaced by other staff members that are mobilized for the Flood Emergency declaration.

- Those staff members assigned to notify residents and agencies are instructed to do so and report back to the EOC on their progress.

Emergency Operations Center / Flood Alert Team Tasks

- Monitor evacuation of affected areas and the additional staff mobilization.
- Review evaluation of impacted transportation routes, alter it if necessary, and immediately disseminate information to those staff and agencies involved in the evacuation. Police, fire, hospital and ambulance services are notified of the transportation routes that will be affected.
- Area and number of residents to be evacuated is reevaluated and that information is disseminated to the American Red Cross and other agencies involved in providing temporary shelter/reception center services.
- Information on areas determined to be at risk of flooding first is disseminated to staff and agencies involved in evacuation and sheltering.
- Monitor flood fighting equipment deployment and flood fighting procedures.
- Coordinate with Department Supervisors on their respective tasks during the evacuation and flood fighting procedures.
- Notify local television stations that a **Flood Evacuation Notice** for affected areas of the Township has been issued.

The formula **TD + TA + TM + TT = TN** can be used to estimate the time needed to evacuate a threatened area:

- TD = Time from response to decision to evacuate.
- TA = Time needed to alert and instruct the public, usually estimated to be from 15-60 minutes, depending upon the time of day, etc.
- TM = Time needed to mobilize the population once warned. Under ideal circumstances, 500 vehicles can pass a single point in one hour on urban streets and 850 vehicles can pass a single point in one hour on two-lane rural roads. Estimate four persons per vehicle. Adjust accordingly for rain, snow, and poor road conditions.
- TT = Time required to leave the hazard area.
- TN = Total time required to evacuate.

For example:

- It takes incident personnel 15 minutes to make the decision that evacuation is the appropriate protective action. TD=15.
- Once a decision has been made, it takes 25 minutes to activate the Emergency Alert System (EAS), and to complete the door-to-door contact in the immediate risk area. TA=25
- Once notified, it takes 30 minutes for the population to leave their homes and enter the evacuation route system, using one major route west out of the area, and one major route east. TM=30
- Once on the road, it takes each vehicle 15 minutes to clear the hazard area. TT=15

To compute total evacuation time (estimated): **15 (TD) + 25 (TA) + 30 (TM) + 15 (TT) = 1 hour, 25 minutes (TN) total evacuation time**



3.5.4 Re-Entry Notice and Post Flood Procedures

Once evacuation procedures are underway, continuous monitoring of the flood threat and the flood fight activities will dominate decisions and procedures. The EOC, with recommendation from the Flood Alert Team, will designate a task of developing criteria to establish a Re-Entry notice to the flooded areas when all of the following criteria have been met:

- ✓ The flooded areas have been evacuated and secured.
- ✓ Transportation routes have been established to circumvent the flooded areas.
- ✓ Critical facilities have been secured and flood fight procedures at those facilities are underway.

This notice will be phased as areas that are impacted begin to meet site-specific conditions. Therefore, the Re-Entry notice dissemination will be explicitly worded to avoid confusion. The Re-Entry Notice and Post Flood notification process includes the following three steps:

Warning Dissemination

- Notify media and social media networks issue a Re-Entry Notice with instructions to residents in affected areas.
- Notify American Red Cross, hospital, transportation, and shelter/reception center services to begin Re-entry Notice procedures.

Staff Mobilization

- Review field staff assignments for the evacuation and reassign to assist in determination and execution of re-entry notification.
- Field staff (DPW staff) will perform safety inspections of bridges, structures, utilities, and streets in areas impacted by flooding.

Emergency Operations Center / Flood Alert Team Tasks

- Review latest NWS data and advisories.
- Review latest radar/satellite and ALERT system data and forecasts.
- Request and review reports on safety inspections of bridges, structures, and streets in areas impacted by flooding.
- Construct a summary report outlining flood threat and safety inspections. Update this report on an hourly or as-needed basis.

Table 3 and Table 4 below provide a summary of Flood Alert Levels, flooding indicators, and associated response actions for coastal storms and flooding (Table 3) and riverine flooding (Table 4). Although not as comprehensive as the responsibilities outlined above, each of these tables may serve as a stand-alone resource for the Flood Alert Team during a hazard event.



This table provides guidelines and recommended actions for the Flood Alert Team when current weather conditions match the appropriate Flood Alert Level. This table focuses specifically on conditions that may lead to coastal flooding, and includes both coastal storm and flood information.

Table 3. Flood Alert Levels and Response Actions for Coastal Storms and Flooding

FLOODING CATEGORY	FLOOD ALERT LEVELS						COMMENTS
	Normal	Flood Advisory	Flood Watch	Flood Warning	Critical Flooding	Re-Entry	
Coastal Flooding							
NWS Statement	None	Flood Advisory, Tropical Storm Watch, or Hurricane Watch for Area	Flood Watch, Tropical Storm Watch, or Hurricane Watch for Area	Flood Warning, Tropical Storm Warning, or Hurricane Warning for Area	Flood Warning, Tropical Storm Warning, Hurricane Warning, or Extreme Wind Warning	None	
Stage (Feet)	Up to 1 feet	1.25 feet (forecast level increasing)	1.5 feet (forecast level increasing)	2 feet	Greater than or equal to 3 feet	Less than 1.5 feet and no precipitation threat in 24 hours	
Timeframe	N/A	Precipitation is forecasted within 24 hours OR Storm force winds ⁴ and precipitation are forecasted within 48 hours	Precipitation is forecasted within 12 hours OR Storm force winds and precipitation are forecasted within 36 hours	Precipitation is forecasted within 6 hours OR Storm force winds and precipitation are forecasted within 15 hours	Precipitation is forecasted within 3 hours OR Storm force winds and precipitation are forecasted within 8 hours		
Severity	N/A	Refer to the Severity Indicators table (Table 5). This table provides FEMA FIS overland wave height model data, FEMA FIS stillwater elevations ⁵ , and NWS action levels and flood stages in relation to standard river heights.					
Impacts	N/A	None	None	Wave height and action increase along shore; Minor flooding near Barnegat Bay and strip; Traffic congestion from Township and neighboring residents presents potential complications	Flooding and drainage issues in the following areas: - Shore Acres - Cherry Quay - Henson Avenue - Elizabeth Avenue 7th Avenue - Baywood - Bay Harbor, to some degree - Cedar Croft - Swan Point - Journey’s End Storm-type impacts: Category 1 – Most areas along Barnegat Bay, the strip, and the Metedeconk River subject to 0.3-foot sea level rise; damage to shingles, roofs, siding, and gutters; trees down; utility outages up to several days Category 2 – Most areas along Barnegat Bay, the strip, and the Metedeconk River subject to 0.7-foot sea level rise; risk of injury and loss of life; major roof and siding damage; some trees down and blocking roads; significant utility outages Category 3 – Most areas along Barnegat Bay, the strip, and the Metedeconk River subject to 1.3-foot sea level rise; risk of	Structures, bridges, utilities, and roads in flooded areas are deemed safe and approved for use.	

⁴ Because response preparedness activities become difficult when winds reach tropical storm force (sustained winds of 39 to 73 miles per hour [mph]), coastal storms require a longer preparedness timeframe.
⁵ Stillwater elevations are the projected elevation of floodwaters in the absence of waves resulting from wind or seismic effects.





FLOODING CATEGORY	FLOOD ALERT LEVELS						COMMENTS
	Normal	Flood Advisory	Flood Watch	Flood Warning	Critical Flooding	Re-Entry	
Coastal Flooding							
					injury and loss of life; major damage or removal of roof decking and gable ends, many trees down and blocking roads, utility and water outages • Category 4 – Most areas along Barnegat Bay, the strip, and the Metedeconk River subject to 2-foot sea level rise; high risk of injury and loss of life; loss of roof and exterior walls to homes; most trees and power poles down; communities isolated by flooding and blocked roads; long-term power outages		
Response Actions	• Monitor weather conditions • Annual/Routine preparatory measures	• Alert the Police Chief of impending weather • Notify relevant departments, agencies, and stakeholders for initial briefing • Conduct initial response briefing to set up chain of command, identify resource needs, determine expectations, etc. • Continue monitoring weather conditions (State, County, gage, tide, and other systems)	• Notify external Critical Facilities • Determine emergency staffing needs and volunteer availability, and begin drafting schedules • Evaluate need for evacuation and shelter/reception center activation • Conduct general equipment preparation (fuel vehicles, confirm all equipment is where needed, etc.) • Continue actions from Flood Advisory	• Fire Department and Emergency Services pre-stage response equipment and personnel, as needed • Begin DPW road clearing • Partial EOC activation • Issue evacuation advisory • Begin shelter/reception center activation, if necessary • Identify potential sandbagging locations based on current storm/weather estimates • Issue public information warnings, especially to at-risk residents • Continue actions from Flood Watch	• Fire Department and other Emergency Response personnel deploy, as appropriate, and respond to escalating conditions. • Full EOC activation • Notify highest-risk residents when response personnel will stop deploying due to safety concerns • Mobilize additional staff • Continue actions from Flood Warning	• Issue re-entry notice via media outlets, American Red Cross, hospital, and shelter services	



This table provides guidelines and recommended actions for the Flood Alert Team when current weather conditions match the appropriate Flood Alert Level. This table focuses specifically on conditions that may lead to riverine flooding from the Metedeconk River.

Table 4. Flood Alert Levels and Response Actions for Riverine Flooding

FLOODING CATEGORY	FLOOD ALERT LEVELS						COMMENTS
	Normal	Flood Advisory	Flood Watch	Flood Warning	Critical Flooding	Re-Entry	
Riverine (Metedeconk River) Flooding							
NWS Statement	None	Flood Advisory for County	Flood Watch for County	Flood Warning	6-hour Flash Flood Guidance > 1-foot/30 minutes	None	
Stage (Feet)	5 feet	Less than 6 feet (forecast level increasing)	7 feet (forecast level increasing)	7.5 feet	Greater than or equal to 8 feet		
Timeframe	N/A	Precipitation is forecasted within 24 hours	Precipitation is forecasted within 12 hours	Precipitation is forecasted within 6 hours	Precipitation is forecasted within 3 hours		
Severity	N/A	Refer to the Severity Indicators table (Table 5). This table provides FEMA FIS overland wave height model data, FEMA FIS stillwater elevations ⁶ , and NWS action levels and flood stages in relation to standard river heights.					
Impacts	N/A	None	None	Metedeconk River is close to bank overflow.	Flooding from Metedeconk may impact Butcher’s Forge, Township of Brick Center, Laurelton Circle, and other areas along river bank.	Structures, bridges, utilities, and roads in flooded areas are deemed safe and approved for use.	
Response Actions	• Monitor weather conditions • Annual/Routine preparatory measures	• Alert the Police Chief of impending weather • Notify relevant departments, agencies, and stakeholders for initial briefing • Conduct initial response briefing to set up chain of command, identify resource needs, determine expectations, etc. • Continue monitoring weather conditions (State, County, gage, tide, and other systems)	• Notify external Critical Facilities • Determine emergency staffing needs and volunteer availability, and begin drafting schedules • Evaluate need for evacuation and shelter/reception center activation • Conduct general equipment preparation (fuel vehicles, confirm all equipment is where needed, etc.) • Continue actions from Flood Advisory	• Fire Department and Emergency Services pre-stage response equipment and personnel, as needed • Begin DPW road clearing • Partial EOC activation • Begin shelter/reception center activation, if necessary • Identify potential sandbagging locations based on current storm/weather estimates • Issue public information warnings, especially to at-risk residents • Continue actions from Flood Watch	• Fire Department and other Emergency Response personnel deploy, as appropriate, and respond to escalating conditions. • Full EOC activation • Issue evacuation advisory • Mobilize additional staff • Continue actions from Flood Warning	• Issue re-entry notice via media outlets, American Red Cross, hospital and shelter services	

⁶ Stillwater elevations are the projected elevation of floodwaters in the absence of waves resulting from wind or seismic effects.



3.5.5 Severity Indicators for Flood-Related Events in the Township of Brick

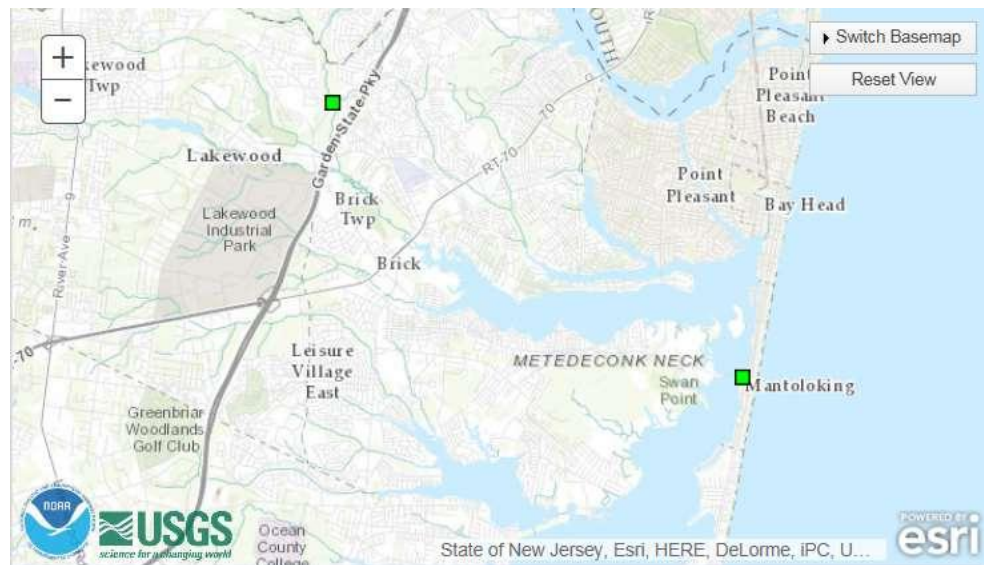
The principal factors affecting flood damage are flood depth and velocity. The deeper and faster flood flows become, the more damage they can cause. One way to consider the severity of flooding is to review the stillwater elevations for a water source. Stillwater elevations are the projected elevation of floodwaters in the absence of waves resulting from wind or seismic effects. FEMA also evaluates the potential impact of a flood event along the coastline through coastal hydraulic analysis, which consists of a combination of transect layout, field reconnaissance, erosion analysis, and overland wave modeling. Transects show the elevation of the ground both on and off shore, and they are the locations where the overland wave height modeling occurs. The information on stillwater elevations and significant wave heights in Table 5 below were taken from the 2014 FEMA Flood Insurance Study (FIS). Because multiple transects were used to evaluate risk, actual wave height or starting stillwater elevation may vary. Where this is the case, the lower number has been used, to promote safe response. The full list of data can be found in the 2014 FEMA FIS or the 2015 Township of Brick Floodplain Management Plan (FMP).

The flood categories are determined by NWS hydrographs. This information provides the parameters used by NWS when issuing flood watches and warnings. The NWS does not maintain any tidal gages in the Atlantic Ocean near the Township of Brick; only information for Barnegat Bay and the Metedeconk River is available. Detailed wave data for the Atlantic Ocean, however, are available through the United States Army Corps of Engineers (USACE) National Data Buoy Center. This wave data can help Township officials determine the potential impact of coastal storms based on wave height and velocity.

For reference purposes, the locations of gages and buoys relevant to the Flood Alert Team are depicted on Figures 8 and 9 below. Severity factors are summarized in Table 5.



Figure 8. Stream and Tide Gauge Locations Relative to the Township of Brick



Source: NWS 2015

Note: Green boxes indicate gage location.

Figure 9. Buoy Location Relative to the Township of Brick



Source: USACE 2015

Note: Yellow diamond indicates buoy location.



Table 5. Severity Indicators for Flood-Related Events in the Township of Brick

FLOOD SOURCE / LOCATION REFERENCE	SIGNIFICANT WAVE HEIGHT ⁷	STARTING STILLWATER ELEVATION (FEET NAVD) ⁸			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
Atlantic Ocean	Starting at 18.92 feet	7.1 feet	9.2 feet	10.0 feet	12.22 feet
Barnegat Bay	Starting at 2.60 feet	3.9 feet	6.3 feet	7.4 feet	9.4 feet
Metedeconk River	Starting at 1.44 and 2.26 feet	3.7 feet	6.0 feet	7.3 feet	10.2 feet
	FLOOD CATEGORIES ⁹				
	Record Flood Stage	Action Stage	Minor Flood Stage	Moderate Flood Stage	Major Flood Stage
Barnegat Bay near Mantaloking Gauge	4.1 feet	1.5 feet	2 feet	3 feet	4 feet
North Branch of the Metedeconk River at Lakewood Gauge	11.4 feet	7 feet	8 feet	9 feet	10 feet
	DETAILED WAVE DATA				
	LOCATION	SIGNIFICANT WAVE HEIGHT	DOMINANT WAVE PERIOD	WAVE STEEPNESS	AVERAGE WAVE PERIOD
Atlantic Ocean Buoy Station (#44091) ¹⁰	Barnegat, NJ 39.769 N, 73.770 W	6.2 feet	8 seconds	Steep	5.7 seconds

⁷ Based off calculations for the 100-Year Flood.⁸ Measurements are in feet NAVD (North American Vertical Datum of 1988)⁹ "Advanced Hydrologic Prediction Service for Philadelphia/Mount Holly." National Weather Service. Accessed July 14, 2015. <http://water.weather.gov/>.¹⁰ NOAA. National Data Buoy Center. Accessed July 16, 2015. <http://www.ndbc.noaa.gov/>



Part 4. Critical Facilities

The Township of Brick Floodplain Management Plan defines “critical facilities” as follows:

Critical facilities are those facilities considered critical to the health and welfare of the population and that are especially important following a hazard. As defined for this FMP, critical facilities include essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities, and hazardous material facilities.

Essential facilities are a subset of critical facilities that include those facilities that are important to ensure a full recovery following the occurrence of a hazard event. For the Township of Brick risk assessment, this category was defined to include police, fire, emergency medical services (EMS), schools/colleges, shelters, senior facilities, and medical facilities (Township of Brick, 2015).

Based on this definition, the Township has identified one facility that resides within an identified flood hazard area: Pioneer Hose Company Substation 22-1. The Township has additionally identified 16 other critical facilities within its corporate limits (14 of these facilities are also essential facilities). Essential facilities were then further divided into critical stakeholders and non-critical stakeholders. Critical stakeholders may be called by the Flood Alert Team to provide assistance in flood response. Responsibilities frequently include emergency services, medical aid, and shelter/reception center services. Not all critical stakeholders will be called to respond to every flood event. The Flood Alert Team will determine which stakeholders should be contacted based on situation factors, inclement weather indicators, and areas of greater vulnerability.

The full list of critical facilities is listed in Table 6 below:

Table 6. Critical Facilities in the Township of Brick

Facility	Facility Type	Additional Category, if applicable (Critical Facility, Essential Facility, Critical Stakeholder)
Township of Brick Municipal Utilities Authority	Utility System	Critical Facility
Jersey Central Power & Light	Utility System	Critical Facility
Laurelton Village	Senior Facility	Essential Facility
Shorrock Gardens Care Center, Inc.	Senior Facility	Essential Facility
Meridian Nursing and Rehab at Brick	Senior Facility	Essential Facility
Ocean County Vocational Tech	School/College	Essential Facility
Saint Dominic's School	School/College	Essential Facility



Facility	Facility Type	Additional Category, if applicable (Critical Facility, Essential Facility, Critical Stakeholder)
Saint Paul's Christian School	School/College	Essential Facility
Star Career Academy	School/College	Essential Facility
Township of Brick Volunteer First Aid (Two Locations)	EMS	Critical Stakeholder
Medical Center of Ocean County - Brick	Medical Facility	Critical Stakeholder
Township of Brick School District	School/College	Critical Stakeholder
Breton Woods Fire Station and Sub-Station 21-1	Fire	Critical Stakeholder
Pioneer Hose Company Fire Station 22 and Sub-Station 22-1	Fire	Critical Stakeholder
Laurelton Fire Station 23 and Sub-Stations 23-1 and 23-2	Fire	Critical Stakeholder
Herbertsville Fire Station 24 and Sub-Station 24-1	Fire	Critical Stakeholder

Seven facilities on the Township's list of essential facilities are not considered critical stakeholders. As such, and because these facilities serve vulnerable populations, the Township will provide advance and specialized warning to these sites. Critical stakeholders that are not activated for response needs will also require special advance notice. Critical facilities that are considered transportation systems, lifeline utility systems, or hazardous material facilities are notified by Ocean County and do not receive additional notification from the Township.

The Township of Brick notified all essential facilities of its flood alert procedures and flood response updates to determine the need for early notification. Where possible, the Township surveyed essential facilities for additional capabilities and response needs. This information is summarized in the table immediately below. Further information on essential facility response needs and capabilities is included in Attachment 7 and listed in Table 7 below.



Table 7. Essential Facility Capabilities and Response Needs

Facility	Flood Vulnerability	Emergency Response Plan Availability	Number of Beds (for possible shelter use)	Need for Advanced Warning	Necessary Lead Time for Evacuation	Additional Special Assistance Requested, Where Possible ¹¹
Township of BrickSchool District	Occasional accessibility issues from flooded roads	- All-hazards Emergency Management Plans - Updates coordinated with Township	Unknown; All schools available for shelter use	Yes	2 hours minimum, but dependent on school and situation	None noted
Ocean County Vocational Tech	None noted	Evacuation Plans Maintained internally and updated annually	0	Yes	1 hour minimum	Yes – transportation
Ocean Medical Center	Staffing shortages due to accessibility issues from flooded/dangerous roadway conditions. Infrequent direct flooding issues when water table on campus is higher.	- Evacuation Plan, Water Interruption Plan, and Severe Storm Plan (contains elements of hardening the facility for floods, flood shields that can be installed, etc.), amongst others - Internal plans, reviewed annually with Township input; exercise frequency is based on risk potential.	Approximately 275	Yes	24 hours minimum	Yes – transportation, evacuation, critical personnel notification, and activating mutual aid agreements
Shorrock Gardens Care Center, Inc.	Occasional accessibility issues from flooded roads	- Disaster manual has an evacuation plan and a flood plan - Reviewed annually by Township OEM; updated every 5-10 years - Occasional exercises to test plan	210	Yes	6 hours minimum	Yes – evacuation and transportation

¹¹ All essential facilities are aware that this information is for planning purposes only and does not legally bind the Township to provide this assistance.



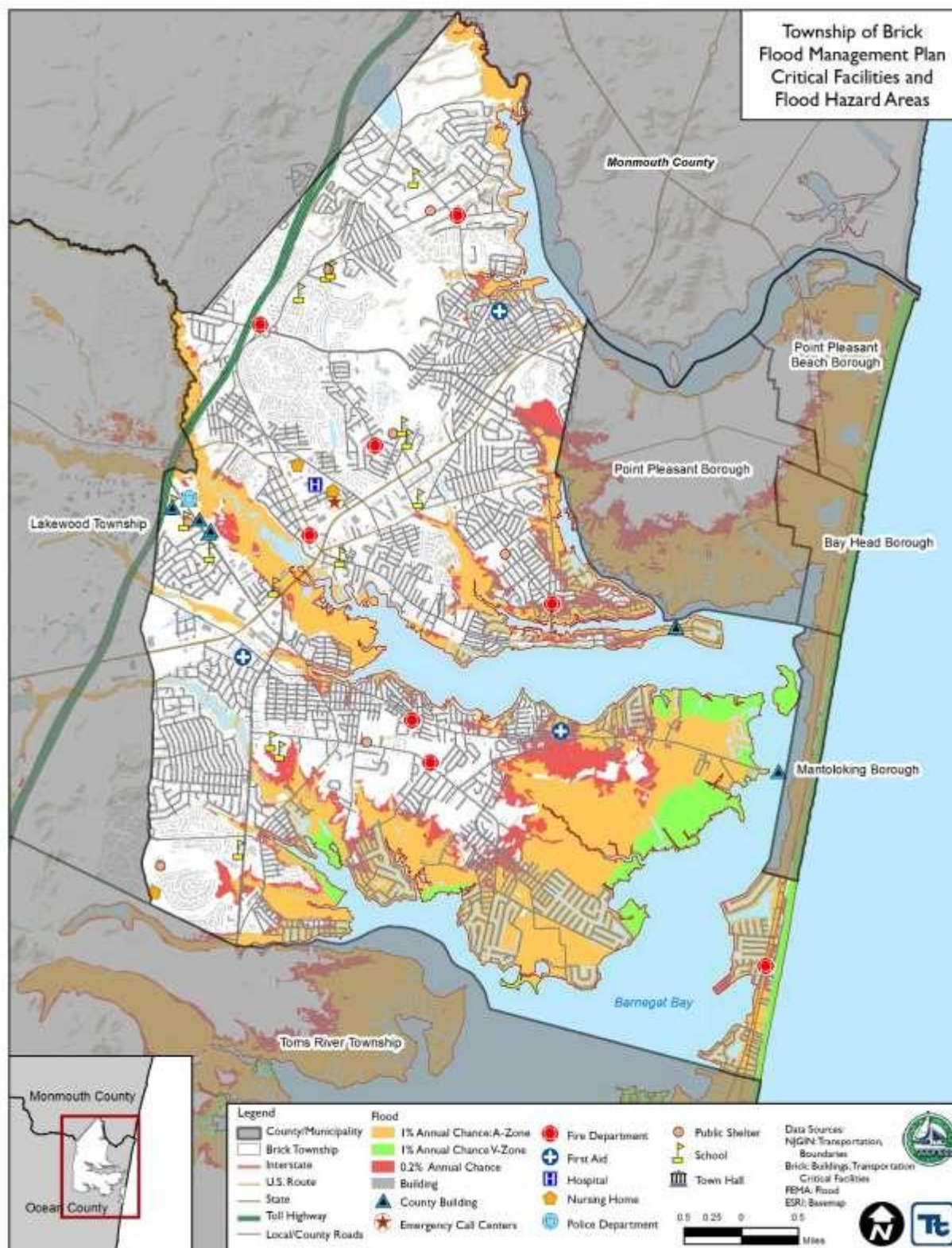
Facility	Flood Vulnerability	Emergency Response Plan Availability	Number of Beds (for possible shelter use)	Need for Advanced Warning	Necessary Lead Time for Evacuation	Additional Special Assistance Requested, Where Possible ¹¹
Laurelton Village	None noted. Village has previously served as an informal shelter.	- Emergency Response Book (section on floods/hurricanes and on evacuation). - Updated internally and reviewed by local OEM, state, and federal. - Exercised and trained on annually	Between 150-180, with the ability to add cots in larger areas during emergency event	Yes	3-4 hours minimum	Yes – transportation and logistics (evacuation)



Attachment 1 contains the contact information for both critical stakeholders and other essential facilities, as well as more information on communications requirements for these sites. Township staff will periodically (at least annually) update all communications lists and the list of critical facilities to make sure that the information is up to date. Figure 10 provides the location of critical facilities in the Township. An overlay of flood hazard areas has been included to highlight facility vulnerability.



Figure 10. Critical Facilities in the Township of Brick





Attachment 1. Flood Alert Team and Contact Procedures

The Flood Alert Team is a team of Township staff that continuously reviews weather data as inclement weather approaches the Township of Brick and before the onset of significant rainfall or tidal surge could threaten the area. The Flood Alert Team operates and maintains the jurisdiction's flood threat recognition system. The data they gather are supplied to Township officials prior to an event and to both relevant officials and the EOC during and after the event.

Contact information for members of the Flood Alert Team is listed in Table 8

Table 8. Flood Alert Team Contact Information

Call List Position	Role/Title	Name	Phone Number	E-mail
1	Emergency Management Coordinator	Joseph Pawlowicz	(732) 262-1167	joepawlowicz@brickpd.com
2	Deputy Emergency Management Coordinator	Joseph Gilsenan	(732) 262-1167	jgilsenan@twp.brick.nj.us
3	Mayor	John Ducey	(732) 262-1240	mayor@twp.brick.nj.us
4	Police Chief	Nils Bergquist, Jr.	(732) 262-1101	rbergquist@brickpd.com
5	Bureau Chief/Fire Marshal/Fire Sub Code Inspector	Kevin Batzel	(732) 458-4100	kbatzel@brickfire.org
6	Public Works Director	Glenn Campbell	(732) 501-8361	gcampbell@twp.brick.nj.us

When inclement weather or other information indicates a need to activate the Flood Alert Team, the Emergency Management Coordinator (**Call List Position #1**) will notify the rest of the Flood Alert Team about the activation. In the event that the Emergency Management Coordinator is not available, the Deputy Emergency Management Coordinator (**Call List Position #2**) will notify members of the Flood Alert Team.

If a non-member of the Flood Alert Team receives important flood alert information, they should contact **Call List Position #1**. If he is not reachable, the non-member should call each person by call list order until successful contact is achieved. The highest ranked Call List Position will determine whether or not to activate the Flood Alert Team, at that point. Non-members should note this list contains sensitive information and should remain confidential.

The Flood Alert Team may also notify critical stakeholders if inclement weather or other information indicates Township emergency response will be likely. Critical stakeholders will participate in an event



response but are not part of the Flood Alert Team. Critical stakeholders will be notified by phone, e-mail, or radio by **Call List Position #1**. Critical stakeholders that may be activated include those listed in Table 9 below.¹²

Table 9. Critical Stakeholder Contact Information

Critical Stakeholder	Point of Contact	Phone Number	E-mail ¹³
Township of Brick Volunteer First Aid (Two Locations)	On-Duty Supervisor	(732) 477-5020	--
Ocean Medical Center	Nursing Supervisor (for emergency alerts) OR Jason Beelitz (for non-emergency alerts)	(732) 840-2200 (for emergency alerts) OR (732) 836-4226 (for non-emergency alerts)	jbeelitz@meridianhealth.com
Township of Brick School District	Dr. Richard Caldes, Interim Superintendent	(732) 785-3000 x1019	rcaldes@brickschools.org
Breton Woods Fire Station and Sub- Station 21-1	Kevin Esposito, Fire Chief	(732) 477-0333	--
Pioneer Hose Company Fire Station 22 and Sub-Station 22-1	Joe Licandro, Fire Chief	(732) 477-0280	pioneerhose@brickfire.org
Laurelton Fire Station 23 and Sub-Stations 23-1 and 23-2	Ed Platt, Fire Chief	(732) 458-5066	station23web@comcast.net
Herbertsville Fire Station 24 and Sub- Station 24-1	William Robbins, Fire Chief	(732) 458-9164	--

All other critical facilities, including any critical stakeholders who were not activated for the event response effort, will be notified during the **Flood Watch** stage. Critical facilities will be notified by phone, e-mail, or radio by **Call List Position #1**. Critical facilities that were not also listed as critical stakeholders include those listed in Table 10 below.

¹² Not all critical stakeholders will be activated for all response efforts.

¹³ E-mail addresses should be used for general information updates and not emergency notifications; not all e-mail addresses are maintained 24 hours per day/7 days per week.

Table 10. Critical Facility Contact Information¹⁴

Critical Stakeholder	Point of Contact	Phone Number	E-mail ¹⁵
Township of Brick Municipal Utilities Authority	Chris A. Theodos, Executive Director	(732) 458-7000	ctheodos@brickmua.com
Jersey Central Power & Light	On-Duty Supervisor	(800) 662-3115	
Ocean County Vo Tech	Edward Crawford, Facilities Manager	(732) 674-0706	bdamiano@mail.ocvts.org
Shorrock Gardens Care Center, Inc.	Billy Martinez, Maintenance Director	(732) 451-1000 x117	admin@sgcc-hshs.com
Meridian Nursing and Rehab at Brick	Greg Mastko, Director of Plan Operations	(732) 206-8000 (main) OR (732) 206-8036 (direct)	gmastko@meridianhealth.com
Laurelton Village	Sue Smith, Interim Executive Director	(732) 458-6600 (Office) OR (732) 775-7534 (Cell)	susanr.smith@reveraliving.com
Saint Dominic's School	Carol Bathmann, Principal	(732) 840-1412	cbathmann@stdomschool.org
Saint Paul's Christian School	Barry Glickman, Principal	(732) 458-2004	Spcs1979@gmail.com
Star Career Academy	Dennis Miskaley, Brick Campus Director	(732) 451-9710	info@starcareeracademy.com

Data sources the Flood Alert Team use to monitor potential inclement weather are listed in Table 11.

¹⁴ As noted in Part 4 of the Township of Brick Flood Warning and Response Plan, critical facilities that are considered transportation systems, lifeline utility systems, or hazardous material facilities are notified by Ocean County and do not receive additional notification from the Township.

¹⁵ E-mail addresses should be used for general information updates and not emergency notifications; not all e-mail addresses are maintained 24 hours per day/7 days per week.



Table 11. Data Sources for Inclement Weather Monitoring

Agency	Type of Data	Purpose
Nixle (State program)	Weather, Tide data	Enables two-way, real-time communication through text, e-mail, voice messages, social media, and the Nixle Mobile app. Allows information to be shared to Township and from Township
Ocean County Sheriff's Office	Weather, Tide data	Sheriff's Office provides e-mail notifications of relevant weather updates. Township may respond with appropriate response and situational update information.
U.S. Geological Survey (USGS)	Gage data	Township checks website for gage data on a recurring basis.
National Oceanic and Atmospheric Administration (NOAA)	Weather	Township checks website for weather data on a recurring basis.
National Weather Service (NWS)	Weather	NWS sends weather statements via e-mail and organizes conference calls for higher-priority events. Township also checks NWS website for weather data. NWS can issue public notifications via radio and other sources.
Various Television, Radio, and Weather Networks	Weather, Tide data	Township monitors various local, regional, and national media for relevant weather information. Township can issue public notifications via local media (television, social media, website, and radio).



Attachment 2. Additional Emergency Contacts and Contact Information

In addition to the critical stakeholders and critical and essential facilities previously identified by the Township of Brick, flood responses in the Township also employ a variety of response or support personnel that are not associated under these categories by the Township (either because they serve a non-related purpose or because their authority/jurisdiction resides under another entity). The Township Flood Alert Team or Emergency Operations Center (EOC) will liaison with these entities, as appropriate to each flood hazard to ensure appropriate response occurs.

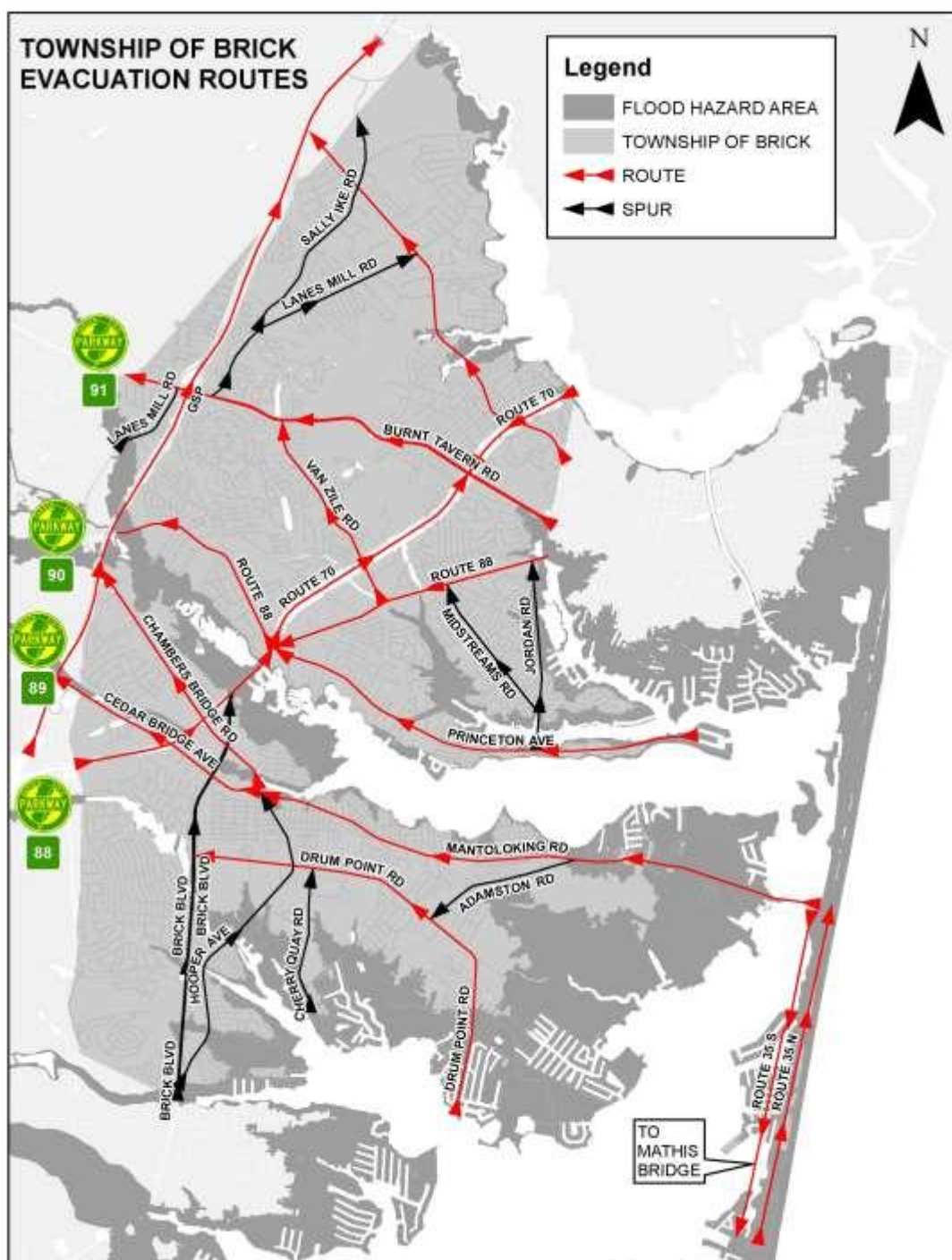
Contact information for all other organizations and agencies that would be involved in flood response efforts in the Township of Brick are detailed in the Table 12 below. Not all organizations and agencies will be contacted for all events. The Flood Alert Team will review this list at least annually to verify the continued accuracy of both listed organizations and contact information.

Table 12. Additional Flood Emergency Contacts

Organization / Agency Name	Point of Contact	Relation to Township	Phone Number	E-mail
Ocean County Office of Emergency Management		County	(732) 341-9700	OceanCountyEmergencyManagement@co.ocean.nj.us
		Media		
		Shelter Services		
		National Guard		



Attachment 3. Township of Brick Evacuation Routes



Source: Township of Brick (No Date)



Attachment 4. Authorities and References

This section lists references used to prepare the Township of Brick Flood Warning and Response Plan (FWRP). Existing plans and protocols were reviewed and integrated into the FWRP.

1. Barnegat Bay Partnership. "Barnegat Bay National Estuary Program (BBNEP) Comprehensive Conservation and Management Plan (CCMP)." 2002. Accessed 2015.
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22. U.S. Geological Survey. "Science in Your Watershed: Watershed Management." 2000. Accessed 2015. <http://water.usgs.gov/wsc/management.html>.



Attachment 5. Acronyms and Abbreviations

This resource identifies the acronyms and abbreviations used in or support of the FWRP. These are based on documents included in the reference section, with modifications as appropriate to address the Brick Township-specific identifications and requirements.

%	Percent
AAR	After Action Report
CCMP	Comprehensive Conservation and Management Plan
DOT	Department of Transportation
DPW	Department of Public Works
EAS	Emergency Alert System
EDT	Eastern Daylight Time
EMS	Emergency medical services
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
FMP	Floodplain Management Plan
Ft	Feet
FWRP	Flood Warning and Response Plan
HSEEP	Homeland Security Exercise Evaluation Program
IP	Improvement Plan
KCFS	Kilo cubic feet per second
mph	Miles per hour
NAVD	North American Vertical Datum of 1988
NJDEP	New Jersey Department of Environmental Protection
NJGIN	New Jersey Geographic Information Network
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
OEM	Township of Brick Office of Emergency Management
PIO	Public Information Officer
SLOSH	Sea, Lake, and Overland Surges from Hurricanes



SRPR	Strategic Recovery Planning Report
TA	Time needed to alert and instruct the public (usually estimated to be from 15-60 minutes, depending upon the time of day, etc.)
TD	Time from response to decision to evacuate
TM	Time needed to mobilize the population once warned (Under ideal circumstances, 500 vehicles can pass a single point in 1 hour on urban streets and 850 vehicles can pass a single point in 1 hour on two-lane rural roads. Estimate four persons per vehicle. Adjust accordingly for rain, snow, and poor road conditions.)
TN	Total time required to evacuate
Tr	Recognize Flood Threat
Ts	Flood Stage
TT	Time required to leave the hazard area
Tw	Actual Warning Time
Twp	Potential Warning Time
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WMA	Watershed Management Area



Attachment 6. Flood Inundation Maps

Attachment 6 contains maps that may aid the Flood Alert Team and other Township of Brick officials in identifying areas with greater risk to flood threats. These flood inundation maps, also known as flood stage forecast maps, provided estimated inundation levels for the 10-year, 50-year, 100-year, and 500-year flood scenarios.



Figure 11. 10-Year Flood Inundation Map for the Township of Brick

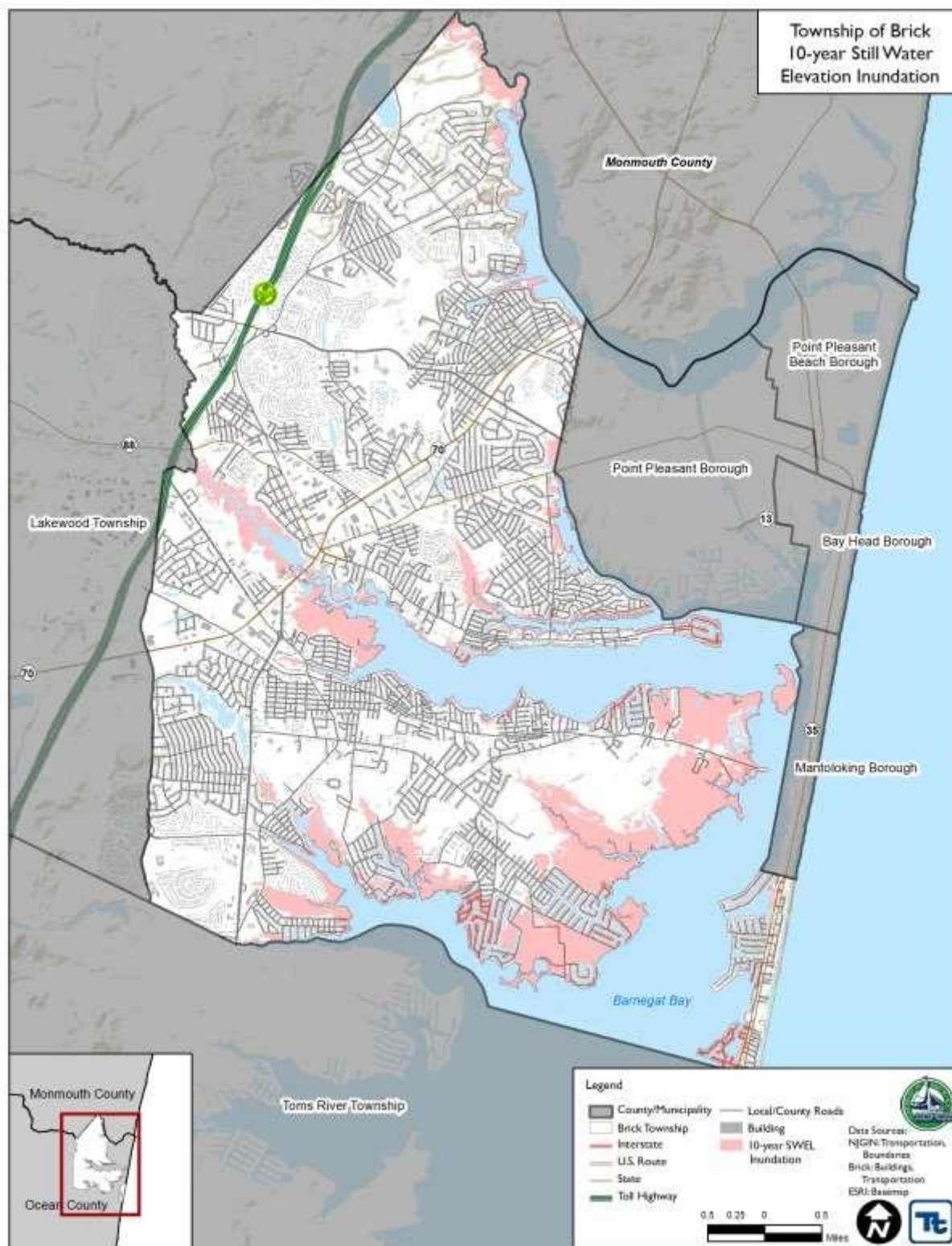




Figure 12. 50-Year Flood Inundation Map for the Township of Brick

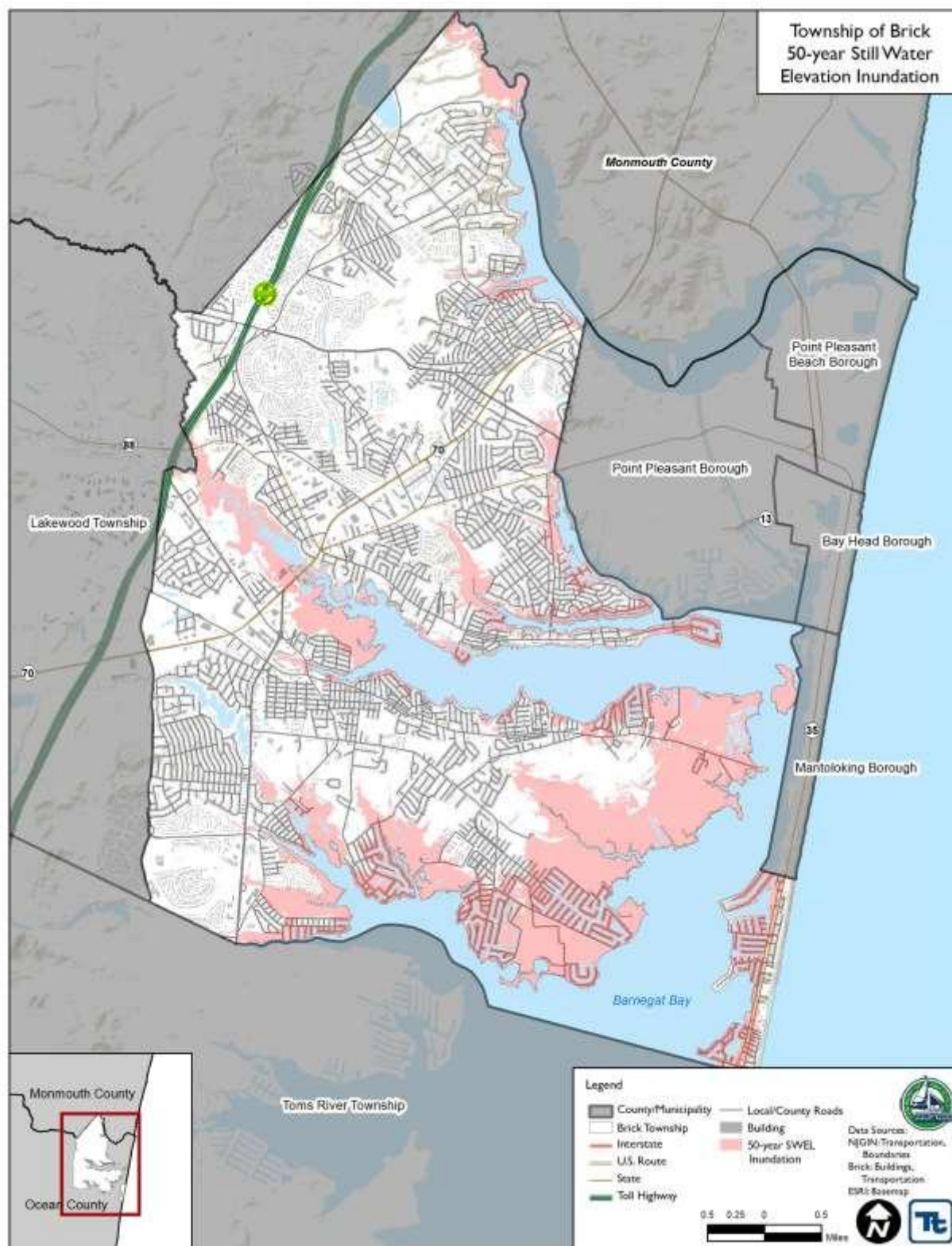




Figure 13. 100-Year Flood Inundation Map for the Township of Brick

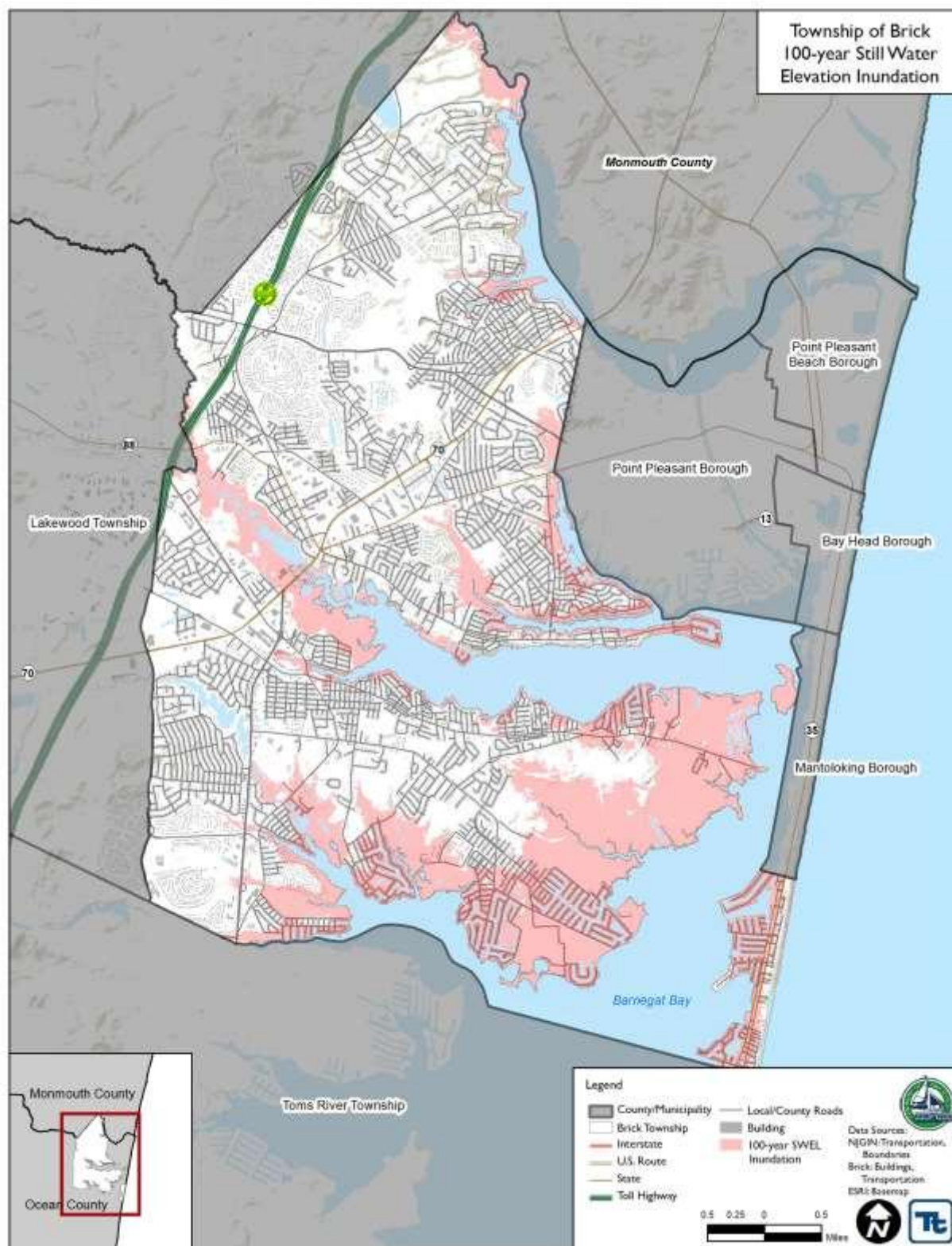
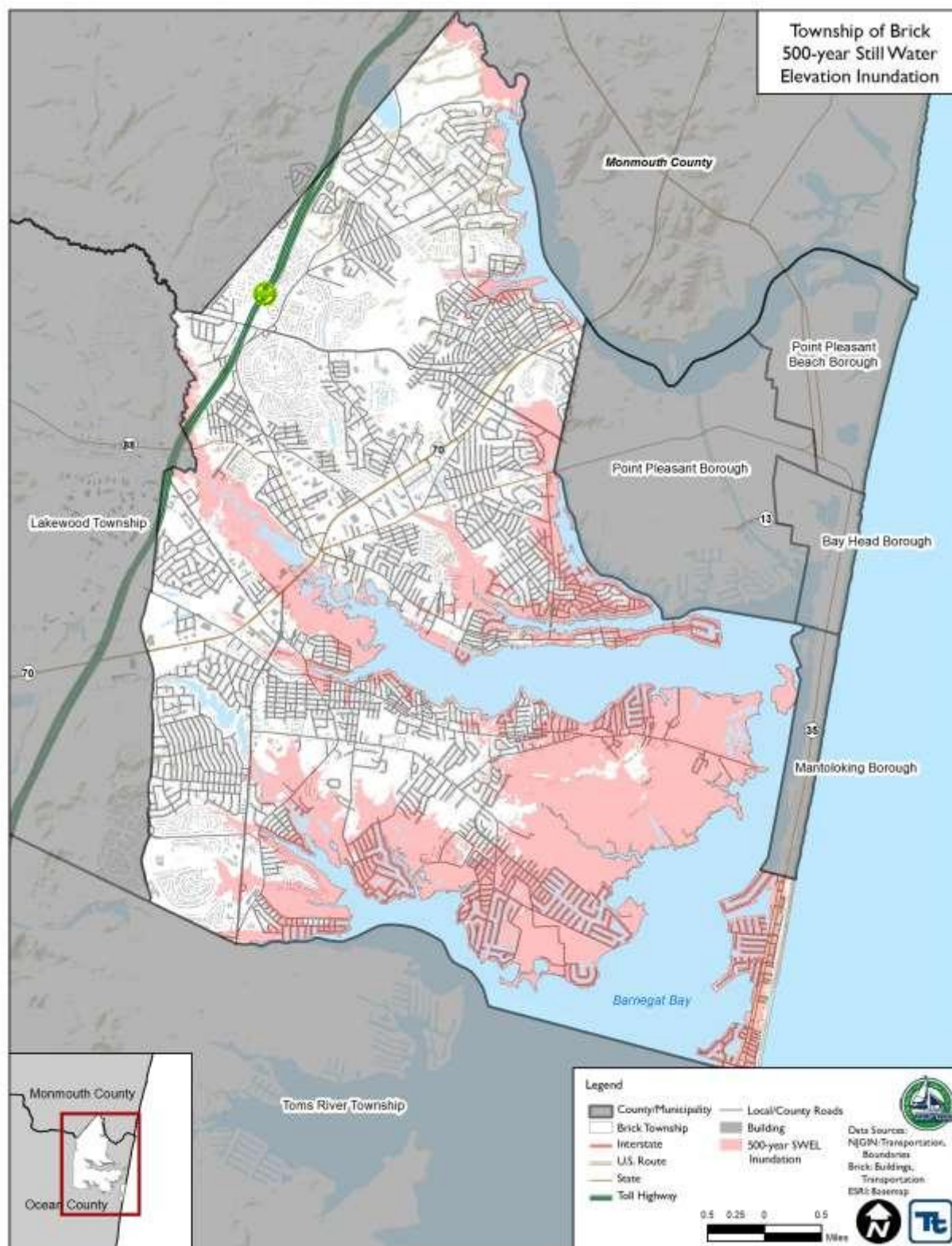




Figure 14. 500-Year Flood Inundation Map for the Township of Brick





Attachment 7. Essential Facility Survey Response

Township of Brick contacted each essential facility to determine which facilities require advanced notification, resources, or other aid during a flood event. Each essential facility that participated filled out surveys answering specific questions related to their response needs during a flood event. These informal surveys also reviewed each facility's internal response procedures, appropriate points of contact, and other relevant information. Although all essential facilities were notified about the FWRP update and received requests for information, not all facilities responded to the information request. For those facilities who did not respond, the Township will provide advanced notification where possible and will continue to annually verify that contact information is correct.

The list of survey questions and the survey responses for all other essential facilities are provided below. Facilities are organized alphabetically.



Survey Script

All survey responses for each facility correspond to the following list of questions:

Q1. Because you have been identified as a critical facility, the Township wants to ensure you have enough notice to prepare for a flood event. If the Township were to call, would you be the appropriate point of contact for an emergency notification? Or do you think someone else would better fill this role?

Q1a. Name of POC:

Q1b. Job Title:

Q1c. Phone Number:

Q1d. E-mail Address:

Q2. (If applicable) We also have listed that your facility operates these secondary facilities - _____. Is this information still correct?

Q3. We have the following address listed for your facility - _____. Is this information correct?

Q4. Can you please share a brief description of your internal notification procedures for emergency events? This would include notifying employees at your main facility, employees at any secondary facilities, and any relevant stakeholders or constituents.

Q5. (If applicable) Are you aware that your facility is in the floodplain?

Q6. Are you aware of any flood issues that have impacted your facility? Are you aware of any flood issues that have impacted your and your staff's ability to access your facility (flooded roads, etc.)?

Q7. Have you developed a Flood Response Plan and/or any other evacuation or response plans for your facility?

Q7a. If yes, is this something that is maintained internally or do you work with the Township to update it and maintain it?

Q7b. If yes, how frequently has this plan been updated or exercised?

Q8. Do you have eight or more beds in your facility?

Q9. Do you need any special warning or notifications during a flood to ensure you (and if applicable, your constituents) can respond appropriately? This could include earlier or more advanced notice; alerts designed for persons who may have hearing or visual impairments; or alerts designed for persons who do not speak English as a first language.

Q10. How much lead time would you need in order to safely evacuate all your constituents – 2 hours, 5 hours, etc.?





Q11. Do you know of any other special assistance you might need in responding to a flood alert? This could include help with evacuation or transportation, help in notifying other critical personnel (such as for shelter activation), or help in activating mutual aid agreements.

Q11a. Do you know if the Township is already aware of these needs? If they are not, we will share this information with them; however please note that knowledge of this information does not legally bind the Township to provide such assistance. At this time, such knowledge is purely for planning purposes.

Q12. Are you interested in receiving more information about some of the floodplain management projects that Township of Brick is working on, including public meetings and survey opportunities?



Township of BrickSchool District

Point of Contact: James E. Edwards, Business Administrator/Board Secretary

Phone Number: (732) 785-3000 x1016

E-mail: jedwards@brickschools.org

Q1. Dr. Richard Caldes, Interim Superintendent

Q1a./b./c./d. Mr. Edwards did not feel comfortable giving out Dr. Caldes' number, but he said the Township Police Chief and Emergency Management Coordinator (EMC) already have it (specifically, also have his cell number).

Q2. All schools that we have listed (copied below) are correct. In regards to the childcare program, that references a course that students can take. Parents drop their kids off to the daycare and students learn childcare skills by interacting with these kids. Additionally, all schools are listed as shelters.

Township of BrickSchool District facilities include the following:

- Brick Primary Learning Center (224 Chambers Bridge Road)
- Educational Enrichment Center (107 Hendrickson Avenue)
- Veterans Memorial Elementary School (103 Hendrickson Avenue)
- Lanes Mill Elementary School (1891 Lanes Mill Road)
- Emma Havens Young Elementary School (43 Drum Pt Road)
- Drum Pt Road Elementary School (41 Drum Pt Road)
- Osbornville Elementary School (216 Drum Pt Road)
- Midstreams Elementary School (500 Midstreams Road)
- Herbertsville Elementary School (2282 Lanes Mill Road)
- Lake Riveria Middle School (171 Beaverson Boulevard)
- Veterans Memorial Middle School (105 Hendrickson Avenue)
- Township of BrickHigh School (and Child Care) (346 Chambers Bridge Road)
- Brick Memorial High School (and Child Care) (2001 Lanes Mill Road)

The Primary Learning Center and Educational Enrichment Center are both elementary schools.

Q3. Information is correct.

Q4. The school district utilizes a Honey-well Alert automatic dialer system for emergency notifications. This system can be used to notify staff and/or students' families of an event.

Q5. Not relevant. None of the schools are located in the floodplain.

Q6. The schools have not experienced any direct flooding issues, although accessibility to school facilities was a problem after Superstorm Sandy (roads, etc.). The school district was closed for 2 weeks as a result of Superstorm Sandy but that was due to a power outage, not flooding.



Q7. The school district maintains Emergency Management Plans for the school facilities. Every school has the plans/policies required by the Township Board of Education. The Emergency Management Plans are all-hazards focused – on-site shooters, fires, hurricanes, security, and evacuation.

Q7a. The Superintendent works with the Township to update plans through the Board of Education.

Q7b. Mr. Edwards did not know how frequently the plan is updated or exercised.

Q8. Mr. Edwards did not know how many beds each school has when activated as a shelter site. This should be checked with the Township or American Red Cross.

Q9. Mr. Edwards was not aware of any special alert or notification needs.

Q10. The amount of lead time necessary would depend on the event and the location in question. The smallest elementary school has 250 students and staff, while the high school has up to 1,500 people. He thought 2 hours would be a believable amount of time but was hesitant to confirm it as definite because it would be so situation-specific. If more information is needed, we can check again to try to be more specific.

Q11. No needs listed. The Township and School District already communicate regularly.

Q12. We do not need to send a link to the project website or more information on the project.



Laurelton Village

Point of Contact: Sue Smith, Interim Executive Director

Phone Number: (732) 458-6600 x8761, Fax: (732) 458-2674

E-mail: susanr.smith@reveraliving.com

Q1. The appropriate point of contact is the Executive Director (ED).

Q1a. Sue Smith (Interim Director until about October [estimated]), Nanetta Malone should return as ED at that point.

Q1b. Executive Director (ED)

Q1c. Landline: (732) 458-6600 x8761

Cell Phone for Sue Smith: (732) 775-7534

Cell Phone for Nanetta Malone: She will call with this information upon her return

Q1d. susanr.smith@reveraliving.com, then Nanetta.malone@reveraliving.com upon Ms. Malone's return.

Q2. This question is not applicable.

Q3. 475 Jack Martin Boulevard is the correct address.

Q4. Laurelton Village consists of one facility, which provides short-term, sub-acute and long-term care (i.e., skilled nursing and long-term care). If something happens in the building, the appropriate authorities (fire and police) are notified first. The facility supervisor is notified immediately after. During the day, this supervisor is the ED; during other shifts, this supervisor would be the Director of Nursing or Nursing Supervisor. The administrator and Director of Nursing are also contacted immediately, however.

Internally, Laurelton Village uses an overhead page system with the appropriate alert/event code. They train on this all the time (annually). Certain people know to grab blankets, fire extinguishers, move medical records, move residents, etc., to the appropriately safe location. Then, they'll call externally (especially after hours with lower staffing) to the Director of Nursing and ED, who will then start calling in all of employees to ensure appropriate staffing capacity.

If it's a snowstorm or hurricane with a lot of advance notice, the facility will call all of the employees and let them know they can stay in building, pack a bag, and will get picked up if needed. The Village makes sure there is enough staff in the building to manage an emergency. Even if other staff can't get to the Village, staff can do shift work in emergencies (x hours on, then x hours off). This is not needed very frequently, and people volunteer to work doubles frequently. People with SUVs or weather-safe vehicles will also volunteer to pick up stranded staff (sometimes the ambulances will too).

Q5. Not relevant. Facility is not located in the floodplain.



Q6. The only impact during Superstorm Sandy was taking people in and making beds available to people stranded by the flood. Laurelton Village has the capability to serve as an evacuation facility. Their previous shelter experience has been as an informal shelter and not as a formal shelter coordinated through the Township or County.

All nursing homes have transfer agreements with local facilities to take in patients based on bed availability (and Laurelton Village has agreements with other facilities in system). Number of beds available is updated regularly.

Q7. Laurelton Village maintains an emergency response book, which has sections on floods and/or hurricanes, as well as evacuation.

Q7a. The emergency response books are available at most nursing stations, maintenance director's office, administrator's office, and the office for the Director of Nursing. The book is updated internally and then reviewed/signed off on by the local Office of Emergency Management (OEM), and state and federal authorities.

Q7b. Laurelton Village conducts annual exercises/training. Staff is very familiar with requirements.

Q8. Laurelton Village is licensed for 180 beds but a lot of rooms are suites (realistically, there are closer to 150 actual beds). In an emergency, Laurelton Village can set up cots in larger areas to handle surge.

Q9. Laurelton Village emphatically requested advance notification due to the special needs of their constituents.

Q10. Laurelton Village requires a minimum of 3-4 hours (preferably more) of lead time. They are located near a hospital, which provides them an additional resource if needed.

Q11. Yes, Laurelton Village considers coordination with the OEM essential if an evacuation were to occur. They would require assistance with transportation, buses, logistics, etc.

Q11a. Laurelton Village would like to increase their coordination and communication with the Township OEM because they have so many residents with unique needs.

Q12. Laurelton Village would like to be kept apprised of any other initiatives and be added to regular notification e-mails, etc. (such as the annual hurricane/preparedness warning).



Ocean Medical Center

Point of Contact: Jason Beelitz, Emergency Management Coordinator

Phone Number: (732) 840-2200 (main number); (732) 836-4226 (direct to Jason)

E-mail: jbeelitz@meridianhealth.com

Q1. Although Mr. Beelitz is the EMC and appropriate for non-emergency/non-urgent hazard information/update contact (see contact information above), Ocean Medical Center has a different notification approach for emergency events.

Q1a. Ask for Nursing Supervisor (No specific point of contact because of staff schedules and rotation; however, this position was selected because it is staffed 24 hours per day, 7 days per week)

Q1b. Nursing Supervisor

Q1c. (732) 840-2200 (main number)

Q1d. N/A (Emergency notification should be done via phone; non-emergency communications can use Jason's e-mail above)

Q2. N/A

Q3. 425 Jack Martin Boulevard is the correct address.

Q4. Ocean Medical Center uses a couple mechanisms for internal notification to staff/team members:

- Mass e-mail notification to leadership
- Group text capability to designated critical function members
- Mass notification system for all team members

The Medical Center is limited in its ability to notify patients and their families. They can use lower-tech measures, such as passing out fliers to patients and if there is enough time, posting notices in the main lobbies.

Q5. Not relevant. Facility is not located in the floodplain.

Q6. Ocean Medical Center has had staffing shortages during flood events due to personnel not being able to access the facility (from flooded or dangerous roadway conditions). Additionally, the Medical Center also has experienced flooding issues directly when the water table on campus was higher. This impacted the electric transfer room and interrupted the power supply. The facility used its emergency generators until the situation was resolved. This is not a frequent issue.

Q7. Evacuation Plan, Water Interruption Plan, and Severe Storm Plan (contains elements of hardening the facility for floods, flood shields that can be installed, etc.), amongst others

Q7a. Internal plans, but they are reviewed with the OEM





Q7b. Reviewed annually, and exercise frequency is based on risk potential

Q8. Approximately 275 beds

Q9. The earlier, the better. The Medical Center has almost 1400 team members, plus they need to notify members of the physician team (almost 500) about surge potential. Having more time to alert so many people is very helpful.

Q10. Lead time needed is difficult to quantify, but estimated to be at least 24 hours if the center were to evacuate. However, the Medical Center authorities try to wait until the last possible moment to make a decision regarding evacuation, and avoid evacuation if possible (because of stressing patients that may not be able to evacuate easily).

Q11. All three (help with evacuation and transportation, notifying critical personnel, and activating mutual aid agreements), but primarily would need assistance with evacuation, along with ensuring the safety and security of facility once evacuated. The Township should already be aware of this as the Township OEM has helped during a full-scale evacuation drill.

Q12. Ocean Medical Center was interested in receiving additional information on the project. This information has since been sent.



Ocean County Vocational Tech

Point of Contact: Beth Damiano (on behalf of Edward Crawford)

Phone Number: (732) 286-5670

E-mail: bdamiano@mail.ocvts.org

Q1. The appropriate point of contact for emergency notifications is the Facilities Manager; however, information alerts and general updates can be sent to his assistant, Beth Damiano.

Q1a. Edward Crawford

Q1b. Facilities Manager

Q1c. (732) 674-0706

Q1d. bdamiano@mail.ocvts.org (general information only, not emergency alerts)

Q2. N/A

Q3. 350 Chambers Bridge Road is the correct address.

Q4. For full closings, students are notified by broadcasts on local radio and the local television channel.

For internal notifications, staff are notified by a call-in system. The Facilities and Grounds Manager and the Business Administrator meet to discuss what is going on and will put in a call to advise employees not to come in.

Q5. Not relevant. Facility is not located in the floodplain.

Q6. Ocean County Vocational Tech (Vo-Tech) has never closed for an in-house emergency. They did close in advance for Superstorm Sandy (some buildings and campuses were affected by Sandy). The Brick Center building is not aware of any flood issues.

Q7. The Ocean County Vo-Tech maintains emergency evacuation plans.

Q7a. These plans are maintained internally.

Q7b. These plans are updated annually.

Q8. Ocean County Vo-Tech does not have any dormitories or beds.

Q9. Yes. Brick campus is a shared-time school and the students' home school transports students to the building. If there were a closure or evacuation, the school would need time to make arrangements to return the students to their appropriate home school.

Additionally, the campus has handicapped students (not sure of percentage in Brick because Ocean County Vo-Tech has seven schools/campuses).





Q10. Lead time requested is one hour (some schools are 45 minutes away) minimum.

Q11. Yes, Ocean County Vo-Tech probably would appreciate help with transportation.

Q12. Ocean County Vo-Tech received additional information on the project.



Shorrock Gardens Care Center, Inc.

Point of Contact: Billy Martinez, Maintenance Director

Phone Number: (732) 451-1000 (direct number to Shorrock); (732) 244-1400 (number for Hovnanian - HQ)

E-mail: <http://www.hovnanianseniorhousing.com/contact-us/> (No direct e-mail addresses found)

Q1. Yes, the Maintenance Director can serve as a point of contact, but the Administrator might be more appropriate.

Q1a. Deborah Shapiro

Q1b. Administrator

Q1c. (732) 451-1000 x117

Q1d. admin@sgcc-hshs.com

Q2. N/A

Q3. 75 Old Toms River Road is the correct address.

Q4. Yes, we have an internal notification procedure outlined in our disaster manual, including to contact sister facilities. The company has a total of five facilities, including Shorrock, and has agreements with those other facilities in the area. The disaster manual outlines agreements with those four sister facilities: Arbor Care Center; Holiday Care Center; Haven at Silver Woods; Silver Woods – all in Toms River.

Q5. Not relevant. Facility is not located in the floodplain.

Q6. Shorrock has not had any issues with flooding at the facility in the past. Mr. Martinez has worked there for eight years, and the building has been there for 16. Mr. Martinez lives in a flood zone. During Superstorm Sandy, people that lived near the bay area were affected, and 20-30 employees (out of 210) did not make it to work.

Q7. The disaster manual has an evacuation plan and a flood plan.

Q7a. Sent every year to Brick OEM to review.

Q7b. Dated 2007, 2014. It has been exercised. The last disaster drill that Mr. Martinez recalls was a flood drill in 2008.

Q8. Yes – 210 beds in the facility.

Q9. Yes, Shorrock needs special warning or notification to ensure they can respond properly. Specifically, the earlier warning the better. As with snowstorms, they need to try to get extra staff in to the facility before conditions get so bad that people can't travel. Once staff are at the facility, they can be





accommodated to stay there overnight if needed to avoid hazardous conditions, or if sheltering is needed. No other modes of outreach/communication or languages needed.

Q10. Estimate needing six hours of lead time to fully evacuate all 210 people in the building, plus staff.

Q11. Yes, we would need help with evacuation and transportation. Specifically, Mr. Martinez is concerned as far as evacuation routes. There is only one way in and out. There used to be a dirt access road that OEM and the Fire Department could use for emergency access, but that is now overgrown and impassible.

Q11a. The Township is probably not aware of Shorrock's need for help with evacuation and transportation.

Q12. No requests for additional project information were noted.



Attachment 8. Sample Flood Forecast

To: Residents and Businesses in the Township of Brick
From: Township of Brick Flood Alert Team
Subject: Flood Forecasted for <<LOCATION>>
Date: <<DATE>>

Information released from <<Source – the National Weather Service (NWS), NWS river or tidal gages, Ocean County Sheriff's Office, etc. >> indicates that a flood event may impact Brick Township.

This flood notice is to alert residents and local businesses that a **flood <<advisory/warning/watch>>** has been issued for <<river name/coastal location>> and will last until <<DAY, DATE>>. Additional details regarding this flood notification include:

- At <<TIME/DATE>>, the stage was <<##>> feet.
- The flood stage will be reached if water reaches <<##>> feet.
- The <<river name/coastal location>> will continue rising to near <<flood stage height>> by <<time – this morning, afternoon, evening, or specific time>>. The flood stage is expected to last until <<DAY, DATE>>.

Potential impacts from this flood event include [INSTRUCTIONAL NOTE: LIST AS MANY IMPACTS AS NECESSARY, DEPENDING ON EVENT MAGNITUDE AND POTENTIAL INCREASING SEVERITY]:

- At <<##>> feet, <<streets/neighborhoods>> will experience <<potential impacts – partial/complete road flooding, partial/significant home flooding, etc.>>
- At <<##>> feet, <<streets/neighborhoods>> will experience <<potential impacts – partial/complete road flooding, partial/significant home flooding, etc.>>

This flood event will compare to a previous event on <<DATE>>, where <<LOCATION>> reached a stage of <<##>> feet.

Township of Brick recommends that all residents prepare for the pending flood event by completing the following actions:

- Review alternate routes and avoid those roads most likely to flood.
- Avoid areas where the road is flooded – cars can float in as little as one foot of water and can stall in as little as six inches of water.
- If driving, consider other drivers when negotiating flooded areas of the roadway. If a flooded roadway cannot be avoided, pass through the flooded sections in the middle of the road, where it is most shallow, and only allow one car through at a time.
- Park your car in a safe place (garage, higher elevation) where it is less likely to receive flood damage.
- Ensure that you have a sufficient amount of gas in your car and a three-day supply of food, medicine, and water in the event of power outages or flooded roads.



Attachment 9. Additional Information

Impact on Life, Health and Safety

The impact of the hydrologic hazards on life, health, and safety is dependent upon several factors including the severity of the event and whether or not adequate warning time is provided to residents. Exposure represents the population living in or near the hazard areas that could be impacted should an event occur. Additionally, exposure should not be limited to only those who reside in a defined hazard zone, but everyone who may be affected by the cascading impacts of a hazard event (e.g., people are at risk while traveling in flooded areas, or their access to emergency services is compromised during an event).

Cascading impacts may also include exposure to pathogens such as mold. As a result of repetitive flooding, mold has the potential to develop endangering the health of residents, especially those with already compromised immune systems (e.g., people with HIV infection, cancer patients receiving chemotherapy, and individuals who have received an organ transplant) along with other vulnerable populations, including infants, children, the elderly, and pregnant women. The degree of that impact will vary and is not strictly measurable. Molds can grow in as short a period as 24-48 hours in wet and damp areas of buildings that have not been cleaned after flooding. Very small mold spores can easily be inhaled, creating the potential for allergic reactions, asthma episodes, and other respiratory problems. Buildings should be properly cleaned and dried out to safely prevent mold growth (Centers for Disease Control and Prevention [CDC], 2015).

Molds and mildews are not the only public health risk associated with flooding. Floodwaters can be contaminated by pollutants such as sewage, human and animal feces, pesticides, fertilizers, oil, asbestos, and rusting building materials. Common public health risks associated with flood events also include:

- Unsafe food
- Contaminated drinking and washing water and poor sanitation
- Mosquitos and animals
- Carbon monoxide poisoning
- Secondary hazards associated with re-entering/cleaning flooded structures
- Mental stress and fatigue

Current loss estimation models such as Hazus are not equipped to measure public health impacts. The best level of mitigation for these impacts is to be aware that they can occur, educate the public on prevention, and be prepared to deal with these vulnerabilities in responding to flood events.

To estimate the population exposed to the hazard areas, the 1- and 0.2-percent floodplain boundaries, SLOSH zones, and sea-level rise scenarios were overlaid upon the 2010 Census population data in GIS (U.S. Census 2010). The 2010 Census blocks with their centroid in the hazard areas were used to calculate the estimated population exposed. The total population of the Township of Brick is 75,075 (U.S. Census 2010).

Census blocks do not follow the boundaries of the floodplain, SLOSH, or sea-level rise scenarios and can grossly over or under estimate the population exposed when using the centroid or the intersect of the Census block with these zones. The limitations of these analyses are recognized, and as such the results are only used to provide a general estimate. The calculation of the 0.2-percent annual chance flood event results is cumulative in nature, as the population exposed to the 1-percent flood event will also be exposed to the 0.2-percent annual chance flood event. The SLOSH and sea-level rise analyses for the exposure of population, general



building stock, and critical facilities are also cumulative in nature. For example, if a Census block is located within the Category 1 SLOSH zone, it is also located within the Category 2 SLOSH zone. The assumption is that if a Census block is affected by a Category 1 storm it would also be affected by a Category 2 or 3 storm event. For this purposes of this assessment, the population/demographic data presented include only those Census blocks whose geometric centers fall within the identified hazard areas.

Using this approach, it is estimated that 10,565 people are located in the 1-percent annual chance event and 14,543 people are exposed to the 0.2-percent annual chance flood event. It is estimated that 6,230 people are located in the Category 1 SLOSH zone, 17,414 people are located in the Category 2 SLOSH zone, 30,835 people are located in the Category 3 SLOSH zone, and 43,833 people are located in the Category 4 SLOSH zone. There are an estimated 11,470 people who are located in the 2050 Intermediate-High sea-level rise scenario delineated area, and 13,566 people in the 2050 Highest sea-level rise scenario area.

Impact on General Building Stock

After considering the population exposed and potentially vulnerable to the hazard areas, the built environment was evaluated. Exposure includes those buildings located in the hazard areas. Potential damage is the modeled loss that could occur to the exposed inventory, including structural and content value.

Overall, there are a total of 40,489 structures in the Township with a total replacement cost value of greater than \$18 billion and a total tax ratable amount of greater than \$10 billion. To provide a general estimate of the building value exposed to the flood hazards, the 1- and 0.2-percent floodplain boundaries, SLOSH zones, and sea-level rise scenarios were overlaid upon the Township's updated building stock inventory at the structure level. The buildings with their centroid in the hazard areas were totaled. Tables -13 and -14 and Figures 15 through 17 summarize these results.

Table 13. Estimated General Building Stock Exposure to All Flood Hazard Areas

Hazard	Number of Structures Exposed	% of Total	Total RCV Exposed	% of Total	Total Tax Ratable Exposed	% of Total
1-percent Annual Chance Flood Event	7,488	18.5%	\$3,481,039,250	18.6%	\$1,418,745,677	13.2%
0.2% Annual Chance Flood Event	10,166	25.1%	\$4,659,704,863	24.8%	\$2,440,230,651	22.7%
SLOSH Category 1	5,005	12.4%	\$2,313,165,139	12.3%	\$917,559,002	8.5%
SLOSH Category 2	11,395	28.1%	\$5,180,357,074	27.6%	\$3,080,119,761	28.6%
SLOSH Category 3	19,230	47.5%	\$8,676,175,170	46.3%	\$4,993,605,576	46.4%
SLOSH Category 4	25,494	63.0%	\$11,221,622,025	59.8%	\$6,422,371,185	59.7%
2050 Intermediate-High Scenario Sea-Level Rise	9,237	22.8%	\$4,215,445,897	22.5%	\$1,745,934,419	16.2%
2050 Highest Scenario Sea-Level Rise	10,105	25.0%	\$4,581,928,097	24.4%	\$2,222,444,719	20.7%

Source: FEMA 2015, NJOEM 2013, NOAA 2012, Brick Township

Note: % - Percent

RCV – Replacement Cost Value



Table 14. Estimated Number of Buildings Exposed by Occupancy Type to All Flood Hazard Areas

Hazard	Number of Residential Structures	Number of Commercial Structures	Number of Industrial Structures	Number of Government Structures	Number of Education Structures	Number of Religion/ Non-Profit Structures
1-percent Annual Chance Flood Event	7,285	193	0	2	0	7
0.2% Annual Chance Flood Event	9,881	259	1	3	2	19
SLOSH Category 1	4,871	130	0	0	0	0
SLOSH Category 2	11,068	288	1	3	14	18
SLOSH Category 3	18,533	619	4	14	19	37
SLOSH Category 4	24,522	859	9	21	23	55
2050 Intermediate-High Scenario Sea-Level Rise	8,958	234	1	3	0	11
2050 Highest Scenario Sea-Level Rise	9,818	261	1	3	2	17

Source: FEMA 2015, NJOEM 2013, NOAA 2012, Brick Township



Figure 15. Estimated General Building Stock Exposure to Flood Hazard Areas

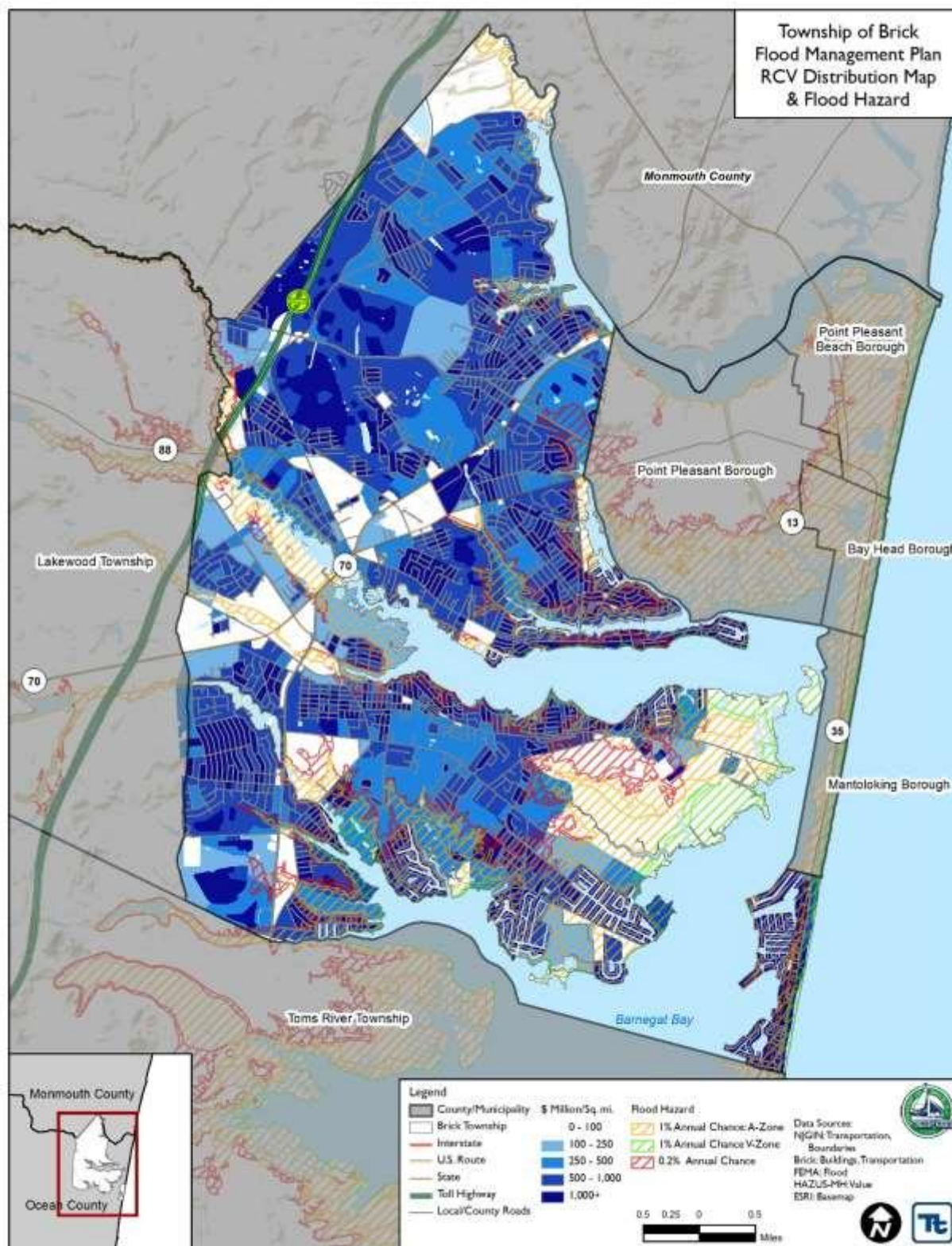




Figure 16. Estimated General Building Stock Exposure to SLOSH Hazard Areas

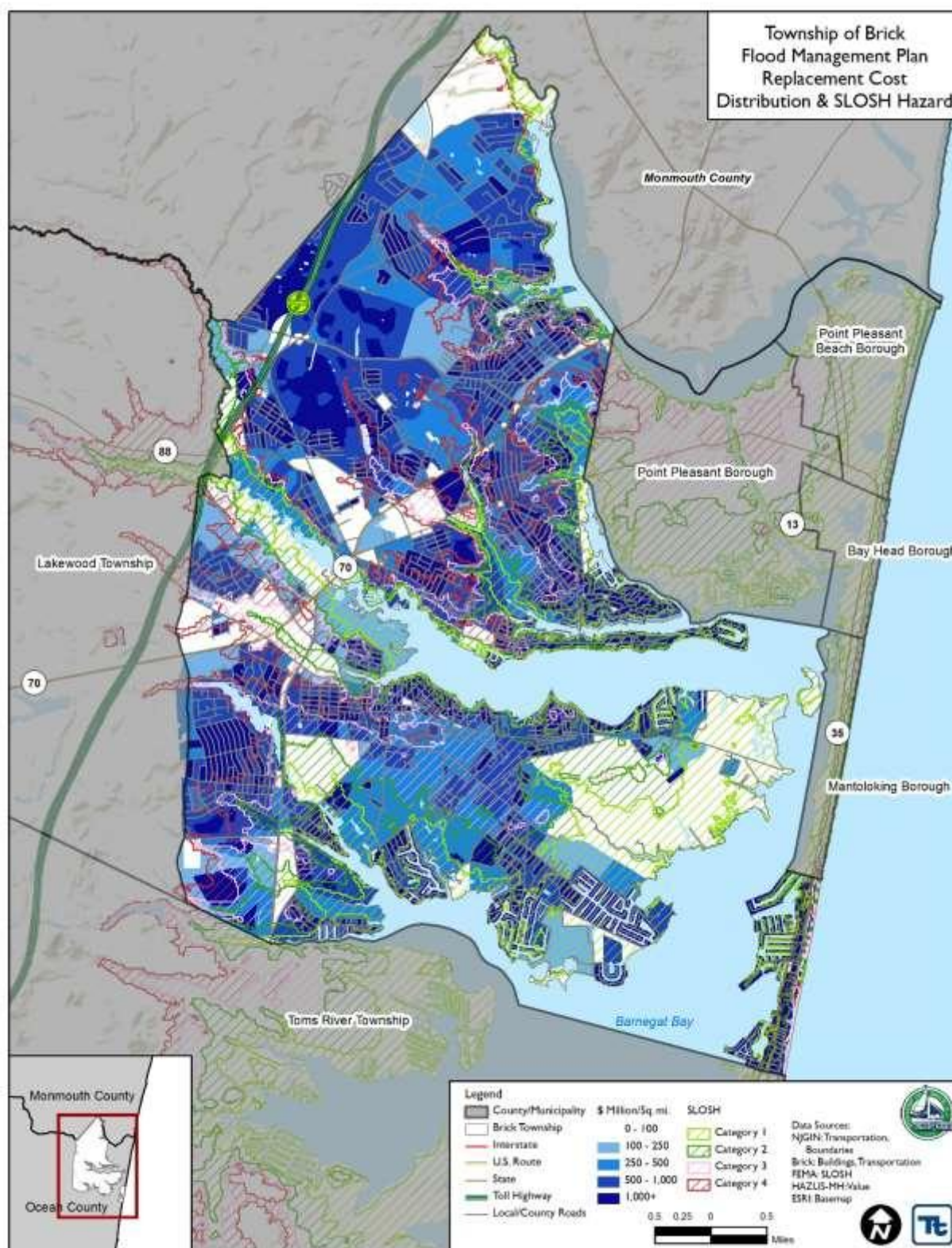
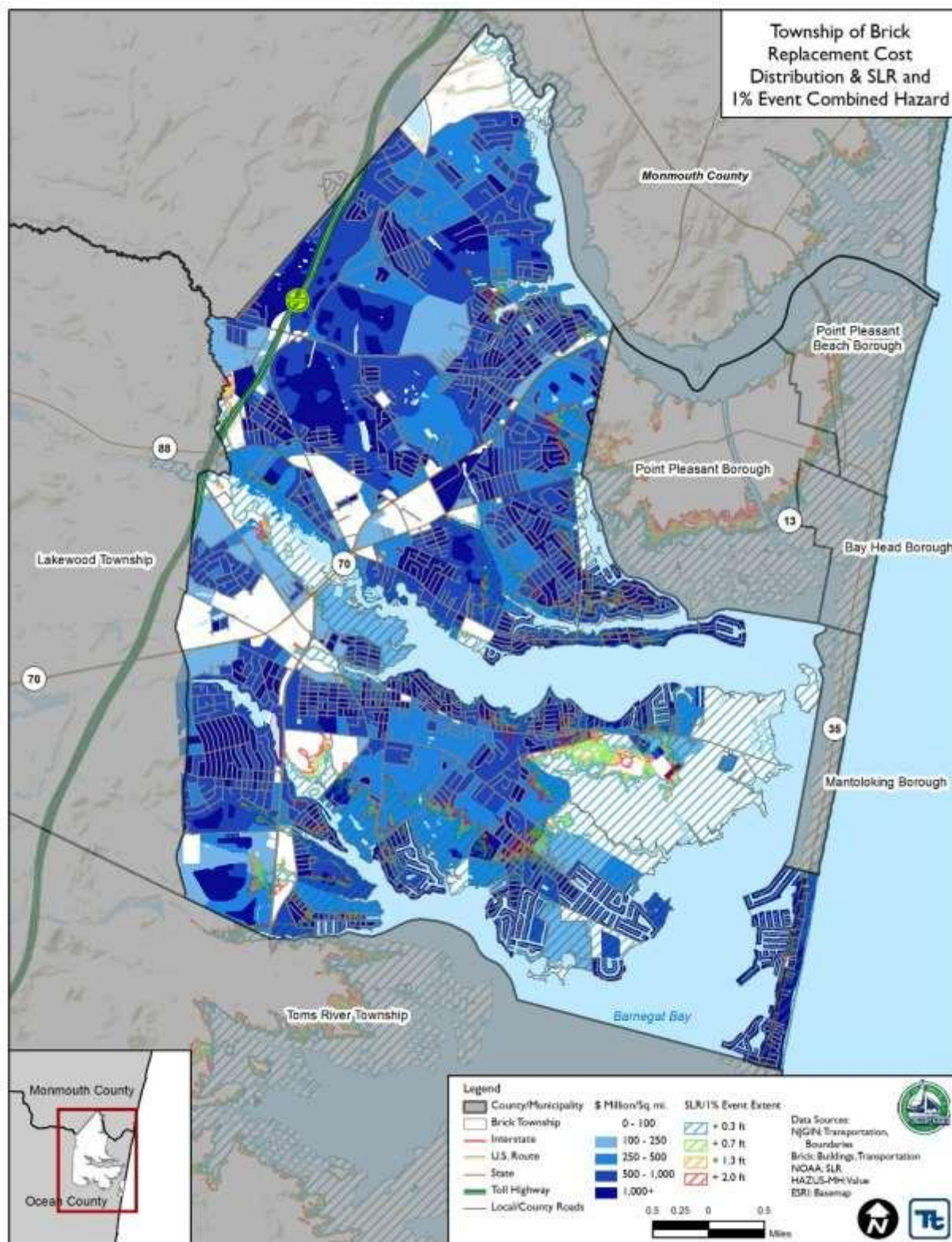




Figure 17. Estimated General Building Stock Exposure to Sea-Level Rise Hazard Areas





The HAZUS-MH model estimated potential damages to the buildings in the Township of Brick at the structure level using the custom Township structure inventory developed for this plan. The potential damage estimated by HAZUS-MH to the general building stock inventory associated with the 1-percent annual chance flood is approximately \$497 million or 2.6-percent of the total building stock replacement cost value. HAZUS-MH also estimated 1-percent, 6.6-percent, 16.2-percent, and 26.2-percent of the Township's total building stock replacement cost value for the Category 1, Category 2, Category 3, and Category 4 inundation areas, respectively.

Table 15. Estimated General Building Stock Potential Loss to the 1-percent Annual Chance Flood Event

Occupancy Type	Total Replacement Cost Value	1-percent Annual Chance Event			
		Total Estimated Loss	Estimated Building Loss	Estimated Contents Loss	% of Total RCV
All Occupancies	\$18,755,258,907	\$496,762,914	\$289,741,798	\$207,021,116	2.6%
Residential	\$15,766,432,088	\$432,651,836	\$275,517,431	\$157,134,405	2.7%
Commercial	\$2,131,577,543	\$60,258,950	\$13,718,257	\$46,540,693	2.8%
Industrial, Religious, Education and Government	\$857,249,277	\$3,852,128	\$506,110	\$3,346,017	<1%

Source: HAZUS-MH 2.2

Note: % - Percent

Table 16. Estimated General Building Stock Potential Loss to the SLOSH Hazard for All Occupancy Classes

Hazard Area	Total Replacement Cost Value	Estimated Loss	Estimated Building Loss	Estimated Contents Loss	% of Total
SLOSH Category 1	\$18,755,258,907	\$188,238,930	\$116,144,074	\$72,094,856	1.0%
SLOSH Category 2	\$18,755,258,907	\$1,242,639,405	\$701,930,535	\$540,708,870	6.6%
SLOSH Category 3	\$18,755,258,907	\$3,029,459,417	\$1,665,429,040	\$1,364,030,377	16.2%
SLOSH Category 4	\$18,755,258,907	\$4,918,850,388	\$2,766,282,412	\$2,152,567,976	26.2%

Source: HAZUS-MH 2.2

Note: % - Percent

NFIP Policy, Claim and Repetitive Loss Statistics

In addition to total building stock modeling, individual data available on flood policies, claims, Repetitive Loss (RL) properties and severe RL (SRL) properties were analyzed. FEMA Region 2 provided a list of properties with NFIP policies, past claims and multiple claims (RL and SRLs). According to the metadata provided: "The (*sic* National Flood Insurance Program) NFIP Repetitive Loss File contains losses reported from individuals who have flood insurance through the Federal Government. A property is considered a repetitive loss property when there are two or more losses reported which were paid more than \$1,000 for each loss. The two losses must be within 10 years of each other & be as least 10 days apart. Only losses from (*sic* since) 1/1/1978 that are closed are considered."

SRLs were then examined for the Township. According to section 1361A of the National Flood Insurance Act, as amended (NFIA), 42 U.S.C. 4102a, an SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:



- Has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or
- For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
- For both of the above, at least two of the referenced claims must have occurred within any 10-year period, and must be greater than 10 days apart.

Tables 17 and Table 18 as well as Figure 18 summarize the NFIP policies, claims and repetitive loss statistics for Brick Township. According to FEMA, Table 18 summarizes the occupancy classes of the RL and SRL properties in Brick Township. The majority of the RL occupancy class is comprised of single family residences (95.4%). All of the SRL occupancy class is comprised of single family residences (100%) (FEMA Region 2, 2014). This information is current as of December 31st, 2014.

The location of the properties with policies, claims and repetitive and severe repetitive flooding were geocoded by FEMA with the understanding that there are varying tolerances between how closely the longitude and latitude coordinates correspond to the location of the property address, or that the indication of some locations are more accurate than others.

Table 17. Occupancy Class of Repetitive Loss Structures in Brick Township

Occupancy Class	Total Number of Repetitive Loss Properties	Total Number of Severe Repetitive Loss Properties	Total (RL + SRL)
Single Family	104	3	107
Condo	0	0	0
2-4 Family	3	0	3
Other Residential	1	0	1
Non-Residential	1	0	1
Brick Township	109	3	112

Source: FEMA Region 2 2014

Note (1): Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA Region 2, and are current as of 12/31/2014

RL Repetitive Loss

SRL Severe Repetitive Loss

Table 18. NFIP Policies, Claims and Repetitive Loss Statistics

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in the 1-percent Flood Boundary (3)
Brick Township	4,083	3,471	\$255,386,689	109	3	3,381

Source: FEMA Region 2, 2014

(1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA Region 2, and are current as of 12/31/2014.

Please note the total number of repetitive loss properties includes the severe repetitive loss properties. The number of claims represents claims closed by 12/31/14.

(2) Total building and content losses from the claims file provided by FEMA Region 2.

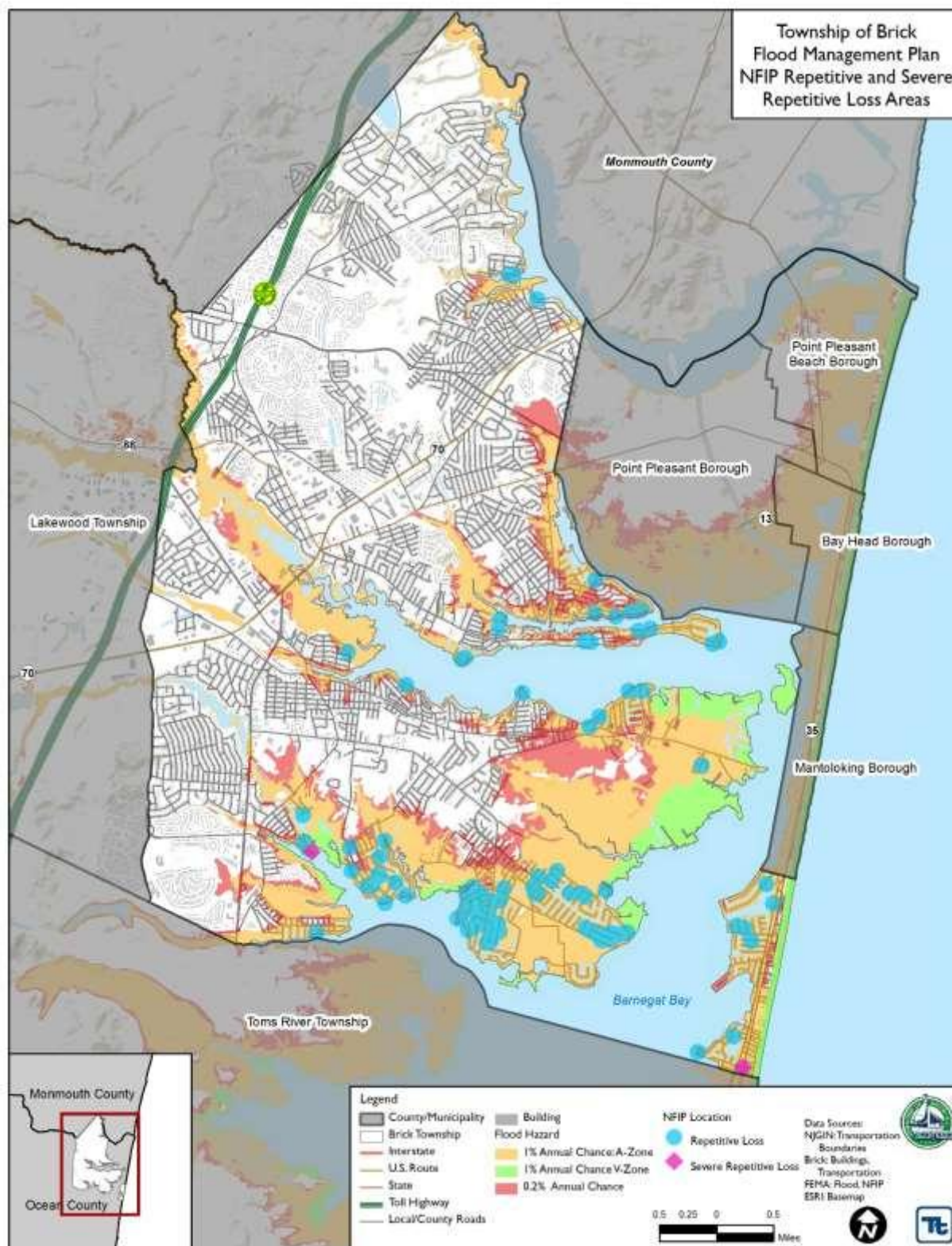
(3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Notes: FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.

A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.



Figure 18. NFIP Repetitive Loss and Severe Repetitive Loss Areas in Relation to All Hazard Areas





Repetitive Loss Area Analysis (RLAA)

A repetitive loss area analysis was performed to enhance the information in this plan to support targeted outreach and more effective floodplain management for the community. The repetitive loss area includes both repetitive loss properties, as determined by FEMA, and properties that may undergo repetitive flood damage but are not technically considered repetitive loss properties by the NFIP. Properties that may undergo repetitive flood damage but are not classified as NFIP RLs or SRLs can occur for a variety of reasons, including the following:

- Property owners may not have flood insurance. Only properties within the floodplain and with a federally-backed mortgage are required to carry flood insurance.
- Owners of a flooded property may choose not to file a claim, even if the owner has flood insurance.
- The flood damage may not meet the minimum \$1,000 threshold necessary for repetitive loss, but the property may still undergo recurring flood damage.

In the Township of Brick, the majority of repetitive loss properties are located in the floodplain. The cause of repetitive flooding at these properties is commensurate with the flood risk reflected on the current preliminary FIRM for the community. In many cases there are multiple causes of flooding as homes in the floodplain also experience stormwater flooding caused by inadequate flow with respect to issues related to local topography and drainage issues related to the low relative elevation of outfalls with respect to water surface elevations at high tide. The Township has identified 27 repetitive loss areas including 2,799 structures based on the methodology detailed below.

RLAA Methodology

Rationale

For the Township of Brick RLAA, building data was collected using a desktop method as an alternative to that outlined in Step 3 of the CRS Coordinator's Manual. The planning team selected the alternative approach, a topographic review based on flood damage NFIP claim history and surface gradients, to provide a delineation of the RL areas.

The Township of Brick has over 7,000 properties in the designated floodplain with over 3,000 insured properties in the same area. As the sheer magnitude of performing property inspection visits to gather data was unrealistic within the time and budget constraints of this process, initially a desktop "reverse damage function" methodology was utilized to estimate flood impacts on properties without known claims or flood history. The "reverse damage function" methodology included estimating the depth of water associated with NFIP claims using U.S. Army Corps of Engineers depth damage functions to assist with estimating damages to non-NFIP insured properties. However the results of this analysis indicated that the repetitive loss area (RLA) consisted of the entire floodplain and did not provide results adequate to define unique RL areas. Therefore an alternate approach based on the location of historical claims with respect to existing topography was performed to delineate the RL areas of concern.

The selected approach used available data and capabilities to reduce the expenditure of Township time and resources needed for the RLAA. The alternative approach addresses the intent of Section 512.b of the 2013 CRS Coordinator's Manual, while providing the Township a basis for maintaining this data in the future including the identification of properties in defined repetitive loss areas and determining the cause of repetitive flooding.



Description of Selected Approach - RLAA Delineation Process

In GIS, RLAs were identified focusing on clusters of RL and SRL properties and defining the areas based on Township-provided two-foot contours, and FEMA flood hazard areas. For each RLA, a water surface elevation was identified using the average lowest adjacent grade (LAG) for each cluster of RL/SRL properties, plus 1 foot. One foot of water was selected as a reasonable estimate because this was the average water depth for all non-basement properties determined by the reverse damage function methodology. After identifying the water surface elevation, the appropriate two-foot contour was selected and used to identify areas that were lower in elevation than the RL/SRL properties. It is reasonable to assume these areas would also experience flooding. In some cases, the identified RL/SRL properties were the only structures exposed to this repetitive flooding. However, in most cases there were additional properties impacted. Supporting GIS data was used to review the surrounding properties and ensure that all appropriate properties were included. In addition to the two-foot contour layer, LAG data was extracted for each property using the Ocean County Digital Elevation Model (DEM) and used during the review process.

The same process was used for RL/SRL properties with basements, focusing only on surrounding properties that also had basement construction. The RLAs indicate potentially impacted structures.

An overview map of the RLAs is provided below to illustrate the relationship of the areas with documented NFIP RL properties and the probable causes of flooding. Areas 26 and 27 are included as an inset map, and are located within the blue box on the Township inset map. Individual maps indicating each area as well as a list of the properties in each delineated area are provided in Township of Brick Floodplain Management Plan for further information.



Figure 19. NFIP Repetitive Loss Areas – Brick Township.





Impact on Critical Facilities

HAZUS-MH was used to estimate the flood loss potential to critical facilities exposed to the flood hazard. Using depth-damage function curves, HAZUS estimates the percent of damage to the building and contents of critical facilities. Due to the sensitive nature of facility-specific information, the results of this detailed analysis is not included in the plan. Table 19 summarizes the number of critical facilities located in the hazard areas by type.

In cases where short-term functionality is impacted by a hazard, other facilities of neighboring municipalities may need to increase support response functions during a disaster event. Mitigation planning should consider means to reduce impact to critical facilities and ensure sufficient emergency and school services remain when a significant event occurs.

Table 19. Number of Critical Facilities Located in the Hazard Areas

Facility Type	Hazard								Insured by Township (Y or N)
	1-percent Annual Chance Event	0.2% Annual Chance Event	SLOSH Category 1	SLOSH Category 2	SLOSH Category 3	SLOSH Category 4	2050 Intermediate-High Scenario SLR	2050 Highest Scenario SLR	
Bridge	10	10	6	8	9	11	7	7	
County Building	2	2	-	1	3	3	1	1	
Dam	1	2	1	2	3	3	-	1	
EMS	-	1	-	1	1	2	1	1	
EOC	1	1	-	1	1	3	1	1	
Fire	1	2	-	2	5	5	2	2	
Library	-	-	-	-	-	1	-	-	
Police	1	1	-	1	1	2	1	1	
Post Office	-	-	-	-	1	2	-	-	
Potable Pump	3	3	3	3	4	4	2	3	
School	-	1	-	2	7	14	1	1	
Shelter	-	-	-	-	2	3	-	-	
Substation	2	3	1	3	3	4	2	3	
Potable Tank	-	-	-	1	2	2	-	-	
Town Hall	-	-	-	-	-	1	-	-	
Well	8	9	11	11	11	11	8	9	
Wastewater Pump	13	15	7	15	16	18	15	15	
Wastewater Treatment Facility	-	-	-	-	1	1	-	-	

Source: FEMA 2015, NJOEM 2013, NOAA 2012, Brick Township

Notes: Cumulative analysis conducted.

Impact on the Economy

For impact on economy, estimated losses from a flood event are considered. Losses include but are not limited to general building stock damages, business interruption, impacts to tourism and tax base to the Township.



Estimated damages to the general building stock can be quantified using HAZUS-MH as discussed above. Other economic components such as loss of facility use, functional downtime and social economic factors are less measurable with a high degree of certainty.

Flooding can cause extensive damage to public utilities and disruptions to the delivery of services. Loss of power and communications may occur; and drinking water and wastewater treatment facilities may be temporarily out of operation. As indicated in Table 5-20, 42 facilities are located in the 1-percent annual chance flood hazard area, and eight (8) additional facilities in the 0.2% annual chance flood area. There are 29 facilities located in the Category 1 SLOSH inundation area, 51 facilities in the Category 2 SLOSH inundation area, 70 facilities in the Category 3 SLOSH inundation area, and 90 facilities in the Category 4 SLOSH inundation area; all of which are cumulative in nature.

In terms of sea level rise, there are 41 facilities located in both the intermediate-high and high sea-level rise scenario inundation areas, with four (4) additional facilities exposed to the highest sea-level rise scenario inundation area. In addition to critical facility potential damages and loss of function, flooded streets and road blocks make it difficult for emergency vehicles to respond to calls for service. Floodwaters can wash out sections of roadway and bridges (Foster, Date Unknown). In addition to travel along the roadways, public transit will be greatly impacted, causing problems for emergency responders.

Direct building losses are the estimated costs to repair or replace the damage caused to the building. Refer to the 'Impact on General Building Stock' subsection which discusses these potential losses. These dollar value losses to the Township's total building inventory replacement value, in addition to damages to roadways and infrastructure, would greatly impact the local economy.

HAZUS-MH estimates the amount of debris generated from the 1-percent annual chance flood event. The model breaks down debris into three categories: 1) finishes (dry wall, insulation, etc.); 2) structural (wood, brick, etc.) and 3) foundations (concrete slab and block, rebar, etc.). The distinction is made because of the different types of equipment needed to handle the debris. The HAZUS-MH Flood Model focuses on building-related debris and does not estimate debris generated for building contents such as household appliances (e.g., ovens or refrigerators), electronics and other personal items, or environmental (trees, shrubs, sediment etc.) debris. Table 20 summarizes the debris HAZUS-MH 2.2 estimates for these events. As a result of the 1-percent event, HAZUS-MH estimates a total of approximately 30,571 tons of debris will be generated. As a result of the Category 1 storm surge scenario, HAZUS-MH estimates approximately 5,062 tons of debris. HAZUS-MH also estimates approximately 53,692 tons, 249,871 tons, and 463,331 tons of debris as a results of the Category 2, Category 3, and Category 4 storm surge scenarios, respectively.

Please note this table only represents estimated debris generated by coastal flooding and does not include additional potential damage and debris which may be generated with the presence of wind.

Table 20. Estimated Debris Generated from the 1-Percent Flood Event and SLOSH Category 1-4 Scenarios

Hazard	1-percent Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
1-percent Annual Chance Event	30,571	20,564	6,083	3,924
SLOSH Category 1	5,062	4,081	602	380
SLOSH Category 2	53,692	31,780	13,425	8,487



Table 20. Estimated Debris Generated from the 1-Percent Flood Event and SLOSH Category 1-4 Scenarios

Hazard	1-percent Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
SLOSH Category 3	249,871	72,165	103,917	73,788
SLOSH Category 4	463,331	109,826	203,772	149,732

Land Use, Land Cover, and Land Use Trends

Local zoning and planning authority is provided for under the New Jersey Municipal Land Use Law, which gives municipalities zoning and planning authority. This plan provides a general overview of land use and development trends occurring within the study area. Local land use significantly impacts exposure and vulnerability to various hazards and impacts the need for, and priority of, mitigation options over time. An understanding of these trends and conditions can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place to protect human health and community infrastructure.

The land use pattern of the Township of Brick has been influenced by a combination of a historic pattern of suburban auto-oriented development and environmental limitations. Traditional resource-related industries, such as agriculture still exist but are not considered the economic driver that they were a century ago. Other factors such as floodplains, environmental regulations, and natural terrain characteristics, have influenced land use and development. As a coastal community with the most waterfront of any New Jersey municipality, Township of Brick has strict land use regulations in place to protect waterfront resources including those associated with its location in the federally regulated Coastal Areas Facility Review Act (CAFRA) Zone. The CAFRA Zone is New Jersey's coastal zone in which NJDEP has the authority to approve the location, design, and construction of major facilities to ensure the protection of coastal resources (Brick Township Master Plan 2007, Ocean County Hazard Mitigation Plan [OC HMP] 2014).

The barrier island of Township of Brick serves a unique and protective function for the community. It serves as a naturally occurring protective response against the Township's vulnerability to hurricanes, storms, and coastal flooding, and it primarily shields residential land use. Township zoning and development regulations coordinate with the State rules on Coastal Zone Management to protect the barrier island and other beach-dune areas from inappropriate development. Enforcing these regulations can occasionally be challenging to the community due to the scenic value and special attraction of the barrier island location increasing demand for property nearby (Brick Township Master Plan 2007).

According to the 2007 Brick Township Master Plan, the vast majority of the Township's developable areas are built-out and there are few large undeveloped parcels remaining. In addition, most of the developed land area has been dedicated to residential use. The Township promotes flexible residential design while limiting over development of individual lots, environmentally critical areas, and high-density single-family and multi-family residences. The Township also has several main types of commercial development, including highway commercial, general commercial, neighborhood commercial, and waterfront commercial.

The Township remains open to opportunities for development and redevelopment. New development is limited by the Township's location near two state highways and the Metedeconk River, leading to an increased focus on mixed-use design and the redevelopment of commercial properties in the Town Center. The Township has identified vacant commercial properties for potential redevelopment. These properties most typically include obsolete buildings or layouts, known health or safety issues, or lands not likely to be developed due to



location, remoteness, or lack of access. The Township currently has four primary locations targeted for mixed-use development or redevelopment (Brick Township Master Plan 2007).

The Township is also dedicated to preserving open space for conservation and recreational purposes. As of 2007, the Township maintained approximately 3,000 acres of preserved lands, owned by federal, state, county, municipal, or private entities (Brick Township Master Plan 2007).

The Township of Brick contains approximately 13,700 acres of land, of which, approximately 87.5% is developed, including 6,471 acres of residential development (47.2% of land), 3,606 acres of public property (26.3% of land), and 1,184 acres of commercial development (8.6% of land) (Brick Township Master Plan 2007). Figure 20 illustrates land use throughout the Township of Brick. Table 21 below shows the land use categories and their total square miles and percentages in the township.

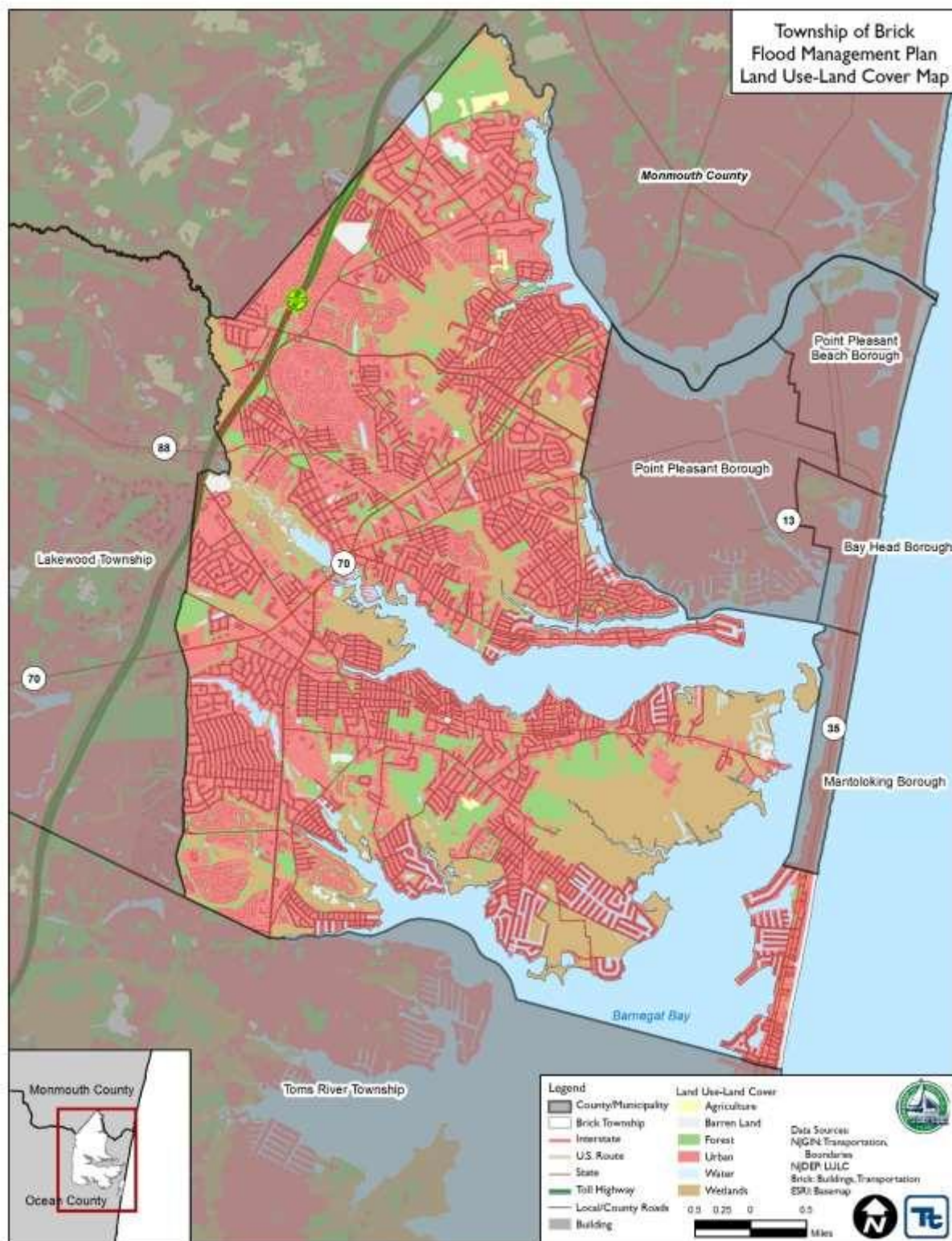
Table 21. Land Use (2007) in the Township of Brick

Land Use	Acres	Total Area (square miles)	Percent of Township (%)
Vacant	1717.03	2.68	12.53
Residential	6471.32	10.11	47.23
Farm	1.48	0.00	0.0
Commercial	1184.33	1.85	8.64
Industrial	38.35	.06	.27
Apartment	175.17	.27	1.27
Public School Property	290.07	.45	2.2
Other School Property	1.06	0.0	0.0
Public Property	3606.44	5.64	26.32
Church and Charitable Property	106.38	0.17	0.78
Cemeteries and Graveyards	3.05	0.00	0.02
Other Exempt	106.99	0.17	0.78
Total	13,701.68	21.4	100

Source: Brick Township Master Plan 2007



Figure 20. Land Use in the Township of Brick



Source: NJDEP, 2015



Attachment 10 – Sample After-Action Report Template

[Exercise Name]

After-Action Report/Improvement Plan

[Date]

The After-Action Report/Improvement Plan (AAR/IP) aligns exercise objectives with preparedness doctrine to include the National Preparedness Goal and related frameworks and guidance. Exercise information required for preparedness reporting and trend analysis is included; users are encouraged to add additional sections as needed to support their own organizational needs.

EXERCISE OVERVIEW

Exercise Name	[Insert the formal name of exercise, which should match the name in the document header]
Exercise Dates	[Indicate the start and end dates of the exercise]
Scope	This exercise is a [exercise type], planned for [exercise duration] at [exercise location]. Exercise play is limited to [exercise parameters].
Mission Area(s)	[Prevention, Protection, Mitigation, Response, and/or Recovery]
Core Capabilities	[List the core capabilities being exercised]
Objectives	[List exercise objectives]
Threat or Hazard	[List the threat or hazard (e.g. natural/hurricane, technological/radiological release)]
Scenario	[Insert a brief overview of the exercise scenario, including scenario impacts (2-3 sentences)]
Sponsor	[Insert the name of the sponsor organization, as well as any grant programs being utilized, if applicable]
Participating Organizations	[Insert a brief summary of the total number of participants and participation level (i.e., Federal, State, local, Tribal, non-governmental organizations (NGOs), and/or international agencies). Consider including the full list of participating agencies in Appendix B. Delete Appendix B if not required.]
Point of Contact	[Insert the name, title, agency, address, phone number, and email address of the primary exercise POC (e.g., exercise director or exercise sponsor)]

ANALYSIS OF CORE CAPABILITIES

Aligning exercise objectives and core capabilities provides a consistent taxonomy for evaluation that transcends individual exercises to support preparedness reporting and trend analysis. Table 1 includes the exercise objectives, aligned core capabilities, and performance ratings for each core capability as observed during the exercise and determined by the evaluation team.

Objective	Core Capability	Performed without Challenges (P)	Performed with Some Challenges (S)	Performed with Major Challenges (M)	Unable to be Performed (U)
[Objective 1]	[Core capability]				
	[Core capability]				
[Objective 2]	[Core capability]				
[Objective 3]	[Core capability]				
Ratings Definitions: - Performed without Challenges (P): The targets and critical tasks associated with the core capability were completed in a manner that achieved the objective(s) and did not negatively impact the performance of other activities. Performance of this activity did not contribute to additional health and/or safety risks for the public or for emergency workers, and it was conducted in accordance with applicable plans, policies, procedures, regulations, and laws. - Performed with Some Challenges (S): The targets and critical tasks associated with the core capability were completed in a manner that achieved the objective(s) and did not negatively impact the performance of other activities. Performance of this activity did not contribute to additional health and/or safety risks for the public or for emergency workers, and it was conducted in accordance with applicable plans, policies, procedures, regulations, and laws. However, opportunities to enhance effectiveness and/or efficiency were identified. - Performed with Major Challenges (M): The targets and critical tasks associated with the core capability were completed in a manner that achieved the objective(s), but some or all of the following were observed: demonstrated performance had a negative impact on the performance of other activities; contributed to additional health and/or safety risks for the public or for emergency workers; and/or was not conducted in accordance with applicable plans, policies, procedures, regulations, and laws. - Unable to be Performed (U): The targets and critical tasks associated with the core capability were not performed in a manner that achieved the objective(s).					

Table 1. Summary of Core Capability Performance

The following sections provide an overview of the performance related to each exercise objective and associated core capability, highlighting strengths and areas for improvement.

[Objective 1]

The strengths and areas for improvement for each core capability aligned to this objective are described in this section.

[Core Capability 1]

Strengths

The [full or partial] capability level can be attributed to the following strengths:

Strength 1: [Observation statement]

Strength 2: [Observation statement]

Strength 3: [Observation statement]

Areas for Improvement

The following areas require improvement to achieve the full capability level:

Area for Improvement 1: [Observation statement. This should clearly state the problem or gap; it should not include a recommendation or corrective action, as those will be documented in the Improvement Plan.]

Reference: [List any relevant plans, policies, procedures, regulations, or laws.]

Analysis: [Provide a root cause analysis or summary of why the full capability level was not achieved.]

Area for Improvement 2: [Observation statement]

Reference: [List any relevant plans, policies, procedures, regulations, or laws.]

Analysis: [Provide a root cause analysis or summary of why the full capability level was not achieved.]

[Core Capability 2]

Strengths

The [full or partial] capability level can be attributed to the following strengths:

Strength 1: [Observation statement]

Strength 2: [Observation statement]

Strength 3: [Observation statement]

Areas for Improvement

The following areas require improvement to achieve the full capability level:

Area for Improvement 1: [Observation statement. This should clearly state the problem or gap; it should not include a recommendation or corrective action, as those will be documented in the Improvement Plan.]

Reference: [List any relevant plans, policies, procedures, regulations, or laws.]

Analysis: [Provide a root cause analysis or summary of why the full capability level was not achieved.]

APPENDIX A: IMPROVEMENT PLAN

This IP has been developed specifically for [Organization or Jurisdiction] as a result of [Exercise Name] conducted on [date of exercise].

Core Capability	Issue/Area for Improvement	Corrective Action	Capability Element ¹	Primary Responsible Organization	Organization POC	Start Date	Completion Date
Core Capability 1: [Capability Name]	1. [Area for Improvement]	[Corrective Action 1]					
		[Corrective Action 2]					
		[Corrective Action 3]					
	2. [Area for Improvement]	[Corrective Action 1]					
		[Corrective Action 2]					

¹ Capability Elements are: Planning, Organization, Equipment, Training, or Exercise.

APPENDIX B: EXERCISE PARTICIPANTS

Participating Organizations
Federal
State
[Jurisdiction A]
[Jurisdiction B]