



5.4.12 NOR'EASTER

This section provides a hazard profile and vulnerability assessment of the Nor'easter hazard.

Hazard Profile

This section presents the Nor'Easter hazard description, extent, location, previous occurrences and losses, and probability of future occurrences.

Description

A Nor'Easter is a cyclonic storm that moves along the east coast of North America. It is called a Nor'Easter because the damaging winds over coastal areas blow from a northeasterly direction. Nor'Easters can occur any time of the year but are most frequent and strongest between September and April typically moving from southwest to northeast along the Atlantic Coast of the United States (NOAA 2013). In order to be called a Nor'Easter, a storm must have the following conditions, as per the Northeast Regional Climate Center (NRCC):

- Must persist for at least a 12-hour period.
- Have a closed circulation.
- Be located within the quadrilateral bounded at 45°N by 65° and 70°W and at 30°N by 85°W and 75°W.
- Show general movement from the south-southwest to the north-northeast.
- Contain wind speeds greater than 23 miles per hour (mph).

A Nor'Easter event can cause storm surges, waves, heavy rain, heavy snow, wind, coastal flooding and erosion. Nor'Easters have diameters that can span 1,200 miles, impacting large areas of coastline. The forward speed of a Nor'Easter is usually much slower than a hurricane, so with the slower speed, a Nor'Easter can linger for days and cause tremendous damage to those areas impacted. Approximately 20 to 40 Nor'Easters occur every year, with at least two considered severe (Storm Solution n.d.). The intensity of a Nor'Easter can rival that of a tropical cyclone in that, on occasion, it may flow or stall off the mid-Atlantic coast resulting in prolonged episodes of precipitation, coastal flooding, and high winds.

Due to their significant historical impact on Suffolk County, only Nor'Easter events are being further discussed in this hazard profile. For more detailed information on coastal erosion, flooding and surge related to Nor'Easters, refer to Section 5.4.1 (Coastal Erosion), Section 5.4.8 (Flood) and Section 5.4.10 (Hurricane). For information on severe winter storms, refer to Section 5.4.14.

Extent

The extent of a Nor'Easter depends on many factors, including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, time of occurrence during the day (e.g., weekday versus weekend), and time of season. NOAA's National Climatic Data Center (NCDC) produces the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from 1 to 5 based on the spatial extent of the storm, the amount of snowfall, and the interaction of the extent and snowfall totals with population (based on the 2000 Census). The NCDC has analyzed and assigned RSI values to over 500 storms since 1900 (NOAA-NCDC 2011). Table 5.4.12-1 presents the five categories:

Table 5.4.12-1. RSI Ranking Categories

Category	Description	RSI Value
1	Notable	1-3





Category	Description	RSI Value
2	Significant	3-6
3	Major	6-10
4	Crippling	10-18
5	Extreme	18.0+

Source: NOAA-NCDC 2011
RSI Regional Snowfall Index

Nor'Easters have the potential to impact society to a greater extent than hurricanes and tornadoes. These storms often have a diameter three to four times larger than a hurricane, and therefore impact much larger areas. More homes and properties become susceptible to damage as the size and strength of a Nor'Easter intensifies (Storm Solutions n.d.).

Location

Nor'Easters usually form off the east coast near the Carolina, and then follow a track northward along the coast until they blow out to sea. These storm events are most notable for snow accumulations greater than nine inches, accompanied by high, sometimes gale force, winds, and storm surges which cause severe flooding along the Long Island coastline (NYS DHSES 2011).

Being on an island and surrounded by coastal waters, Nor'Easters can impact all of Suffolk County. Coastal flooding, erosion and surge that often accompany these storm events impact the north and south shores as well as the eastern-end of the County. The County has felt the direct and indirect landward effects, including high winds, heavy rains, flash and coastal flooding, and beach erosion associated with Nor'Easters.

Previous Occurrences and Losses

Between 1954 and 2020, the State of New York was included in 48 Nor'easter-related disaster (DR) or emergency (EM) declarations (severe storm or snow events). Suffolk County was included in 11 of these declarations related to Nor'easters (FEMA 2020).

Table 5.4.12-3. Nor'Easter-Related FEMA Declarations for Suffolk County, 1954 to 2020

Date(s) of Event	FEMA Declaration Number	Event Type
March 13-17, 1993	EM-3107	New York Severe Blizzard
January 6-12, 1996	DR-1083	New York Blizzard
October 19-20, 1996	DR-1146	Severe Storms, Flooding, Heavy Rains, High Winds
February 17-18, 2003	EM-3184	New York Snowstorm
May 13-June 17, 2004	DR-1534	Severe Storms and Flooding
April 14-18, 2007	DR-1692	Severe Storms and Inland and Coastal Flooding
November 12-14, 2009	DR-1869	Severe Storms and Flooding Associated with Tropical Depression Ida and Nor'Easter
March 13-31, 2010	DR-1899	Severe Storms and Flooding
December 26-27, 2011	DR-1957	Severe Winter Storm and Snowstorm
February 8-9, 2013	DR-4111	Severe Winter Storm and Snowstorm
March 14-15, 2017	DR-4322	New York Severe Winter Storm and Snowstorm

Source: FEMA 2020





Table 5.4.12-3 summarizes the known Nor'easter events that have impacted Suffolk County between 2013 and 2020. Events identified in the 2014 HMP are included in Appendix E.

Probability of Future Occurrence

Winter storm events in New York State occur annually due to its latitude and exposure to large quantities of moisture from the Great Lakes and Atlantic Ocean. Based on historical snow-related disaster declaration occurrences, New York State can expect a snowstorm of disaster declaration proportions, on average, once every three to five years. Similarly, for ice storms, based on historical disaster declarations, it is expected that on average, ice storms of disaster proportions will occur once every seven to 10 years within the State (NYS DHSES 2011).

In Section 5.3, the identified hazards of concern for Suffolk County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for severe winter storms such as a Nor'Easter in the County is considered 'frequent'.



Table 5.4.12-4. Nor'Easter Events in Suffolk County, 2013 to 2020

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Location	Description
February 8-9, 2013	Nor'Easter, Winter Storm	DR-4111	Yes	Suffolk County	Low pressure that formed along the northern Gulf coast by the morning of Thursday, February 7, 2013 moved northeast to near Cape Hatteras by the morning of Friday, February 8, 2013 . The low then rapidly intensified while moving northeast to a position east of Cape Cod by the morning of Saturday, February 9, 2013, producing very heavy snowfall and blizzard conditions across central and eastern Long Island on February 8th and 9th, and winter storm conditions across the rest of southeast New York.
January 21-22, 2014	Heavy Snow	N/A	N/A	Suffolk County	Low pressure moving from the central Appalachians the morning of the 21st intensified off the Mid Atlantic coast and brought heavy snow to most of southeast New York on the 21st and 22nd. NWS employees in Patchogue and Sayville reported snowfall totals of 11.8 and 10.2 inches, respectively. Elsewhere, the public and trained spotters reported widespread snowfall totals of 11 to 15 inches.
January 26-27, 2015	Nor'Easter, Winter Storm, Blizzard	N/A	N/A	Suffolk County	A potent Alberta Clipper low moved from southwestern Canada on January 24th to the Plains states and Ohio Valley on the 25th. The low then redeveloped off the Mid Atlantic coast on the 26th and rapidly intensified into a strong nor'easter, bringing heavy snow and strong winds to much of southeastern New York, and blizzard conditions to Suffolk County. Trained spotters and the public reported snowfall of 16 to 26 inches. North winds gusted to 52 mph at Eaton's Neck, with blowing and drifting of snow. MacArthur Airport reported 24.8 inches of snowfall. MacArthur Airport experienced one-quarter mile visibility in heavy snow. Trained spotters and the public also reported snowfall of 16 to 26 inches. North winds gusted to 50 mph at MacArthur Airport, with blowing and drifting of snow. The NWS office in Upton reported snowfall of 17.1 inches. A trained spotter in Orient reported snowfall of 30 inches. North winds gusted to 56 mph at Great Gull Island, with blowing and drifting of snow. The



Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Location	Description
					<p>public reported snowfall of 29 inches in Southampton. A trained spotter in Flanders reported snowfall of 22 inches. North winds gusted to 60 mph at Gabreski Airport, with blowing and drifting of snow.</p>
<p>January 23, 2016</p>	<p>Nor'Easter, Winter Storm, Blizzard, High Surf</p>	<p>N/A</p>	<p>N/A</p>	<p>Suffolk County</p>	<p>Low pressure moving across the deep South on Thursday January 21st and Friday January 22nd intensified and moved off the Mid Atlantic coast on Saturday January 23rd, bringing heavy snow and strong winds to southeast New York, and blizzard conditions to Long Island, New York City, and nearby southern Westchester County.</p> <p>NY Gov. Cuomo declared a state of emergency early Saturday January 23rd. Metro North and Long Island Railroad service halted at 4 PM Saturday.</p> <p>An NWS employee, the public, and trained spotters reported snowfall of 19 to 26 inches. MacArthur Airport reported snowfall of 23.7 inches. Numerous ASOS and mesonet stations also reported sustained winds of 35 to 45 mph, with gusts as high as 58 mph at Islip Airport and nearby Blue Point.</p> <p>The public, trained spotters, and NWS cooperative weather observers reported snowfall ranging from 15 to 27 inches. At Eaton's Neck, northeast winds were sustained at 49 mph at noon on Saturday the 23rd, and gusted to 59 mph at 9:55 AM on Saturday the 23rd. At Mount Sinai Harbor, north winds gusted to 42 mph at 7:46 PM on Saturday the 23rd.</p> <p>NWS cooperative observers in Westhampton and Riverhead, trained spotters, an NWS employee, and the public reported snowfall of 15 to 22 inches. ASOS and numerous mesonet stations also reported strong northeast winds, highest at Shinnecock Light, with sustained winds of 43 mph and gusts to 58 mph at 12:20 PM Saturday January 23rd.</p> <p>The NWS office in Upton reported snowfall of 18.2 inches. Elsewhere, the public and a trained spotter reported snowfall of 9 to</p>



Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Location	Description
					<p>16 inches. Also, northeast winds at Great Gull Island were sustained at 43 mph at 10:03 AM, with a gust to 54 mph at 11:38 AM.</p> <p>The resulting surge from 36 hours of gale to storm force north to northeast winds, combined with high astronomical tides, resulted in widespread minor to moderate coastal flooding for three consecutive tidal cycles the morning of the 23d into the morning of the 24th along the southern coastal areas of Long Island. Areas of minor to localized moderate coastal flooding occurred along Long Island Sound and East End portions of Long Island during this time period as well.</p> <p>In addition, widespread dune toe erosion and localized wash overs were reported along the Atlantic Ocean facing beaches of Long Island. Fire Island was especially hard hit.</p> <p>A truck was inundated, and half buried in sand at Scott Cameron Beach on Dune Road in Bridgehampton due to the high surf and water levels. The truck was discovered the morning of the 24th after high tide. At Gilgo Beach, heavy beach erosion was reported with some dune damage. At Robert Moses State Park in Babylon, NY, beach flooding occurred to the dune lines on the ocean fronts. The surf was very rough. The emergency manager estimated 8-12 foot waves, although with the white out, the view of the ocean was limited. At Robbins Rest on Fire Island, significant beach erosion was reported with localized wash overs. At Captree State Park in Bay Shore, NY, bordered by the Fire Island Inlet and State Boat Channel, erosion was experienced during high tides on the east side of the shoreline. Along the Gardiner's Bay shoreline along the Entrance Drive of Orient Beach State Park, moderate erosion and sand scouring occurred on the west side of jetties and on south facing dunes.</p>
February 9, 2017	Nor'Easter, Winter Storm, Blizzard	N/A	N/A	Suffolk County	Low pressure developed along a cold front over the Middle Atlantic early Thursday, February 9th. The low rapidly intensified as it moved off the Delmarva coast in the morning and then to the south and east of Long Island late morning into the afternoon. The low



Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Location	Description
					<p>brought blizzard conditions to Long Island and portions of the Lower Hudson Valley. Heavy snow and strong winds also occurred over the New York City Metro.</p> <p>The blizzard brought delays and cancellations to the region's transportation systems as well as numerous accidents on roadways. The Long Island Railroad had system wide delays and at least 20 trains were cancelled. Several hundred rescues were performed by police and fire departments on Long Island.</p> <p>Trained spotters, NWS Employees, and the Public reported 12 to 16 inches of snowfall. Winds also gusted to 57 mph at Eatons Neck at 12:20 pm. Islip Airport reported 14.3 inches of snow. Trained spotters, NWS Employees, and the Public reported 12 to 16 inches of snowfall. Winds also gusted to 48 mph at the Islip Airport at 1:47 pm. Trained spotters and the Public reported 10 to 13 inches of snowfall. Winds also gusted to 50 mph at Sag Harbor at 1:00 pm, and to 45 mph at Orient at 12:05 pm. Trained spotters, an NWS Employee, and the Public reported 10 to 13 inches of snowfall. Winds also gusted to 66 mph at Mecox at 12:25 pm, 61 mph in the Hampton Bays at 12:35 pm, and 49 mph at Westhampton Beach Airport at 12:26 pm.</p>
March 14-15, 2017	Nor'Easter, Severe Winter Storm and Snowstorm	DR-4322	Yes	Suffolk County	On Tuesday, March 14th, rapidly deepening low pressure tracked up the eastern seaboard resulting in damaging winds in Suffolk County.
October 29-30, 2017	Nor'Easter, High Wind	N/A	N/A	Southeast Suffolk, Northeast Suffolk, Southwest Suffolk, Northwest Suffolk	<p>An extratropical storm absorbed the remnants of Tropical Storm Philippe. The combined systems became an extremely powerful nor'easter that wreaked havoc across the Northeastern United States and Eastern Canada.</p> <p>A low-pressure system rapidly intensified as it moved north, passing west of the local area.</p>



Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Location	Description
					<p>A mesonet station near Hampton Bays measured a 67-mph wind gust at 1135 pm on the 29th. At 1215 am on the 30th, a trained spotter in Montauk measured a wind gust to 67 mph. Another mesonet station measured a wind gust to 64 mph at Hither Hills at 206 am on the 30th. A mesonet station in Mastic Beach measured a wind gust to 63 mph at 841 pm on the 29th. At 11 pm on the 29th, the broadcast media reported trees down with power outages across town. Southeast Suffolk reported \$100K in property damage.</p> <p>A mesonet station, at an elevation of 53 feet, measured a 75-mph gust near Plum Island at 210 am on the 30th. Another mesonet station near Fishers Island measured a wind gust to 64 mph at 130 am on the 30th. At 915 pm on the 29th, a trained spotter observed power lines down, which led to power outages for the town of Orient. At 929 pm, a trained spotter in Manorville observed several medium sized trees down. At 11 pm, a National Weather Service employee reported a large tree down on Duryea Street in Riverhead. At the National Weather Service office in Upton, a large tree limb and branch was downed, which blocked the adjacent road around 1 am. Northeast Suffolk reported \$100K in property damage.</p> <p>A 67-mph gust was measured at a mesonet station at Captree State Park at 1109 pm on the 29th. Near Copiague, a mesonet station measured a wind gust to 59 mph at 1204 am on the 30th. In the town of Babylon, social media reported a wind gust to 63 mph at 1019 pm on the 29th. Also, in Babylon, a downed tree on East Main Street was reported by the public at 1145 pm. Sustained winds of 41 mph were measured at Farmingdale Airport at 1041 pm, and at Islip MacArthur Airport at 1044 pm on the 29th. Southwest Suffolk reported \$50K in property damage.</p> <p>At 1030 pm on the 29th, the broadcast media reported a large tree uprooted and fell onto a roof of a home on Sherbrooke Drive in Hauppauge. At 1045 pm, a National Weather Service employee observed a tree down on power lines on NY454 and NY111 in Hauppauge. At the same time, the media reported a large tree down blocking Boulder Street in Ronkonkoma. In Huntington, numerous trees snapped and were uprooted with trees and power lines down</p>



Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Location	Description
					<p>throughout the town around 11 pm. At midnight on the 30th, the broadcast media reported a large branch down on a minivan in East Northport. At 2 am on the 30th, a National Weather Service employee reported numerous large branches down on Hargrove Drive in Stony Brook. At 6 am in Hauppauge, the broadcast media reported power lines down with a transformer fire on Veterans Highway, leading to a road closure. A mesonet station measured a 60-mph wind gust near Belle Terre at 1105 pm on the 29th. Northwest Suffolk reported \$500K in property damage.</p>
<p>January 4, 2018</p>	<p>Nor'Easter, Winter Storm, Blizzard</p>	<p>N/A</p>	<p>N/A</p>	<p>Suffolk County</p>	<p>The development of the blizzard/winter storm began along the southeast coast on Wednesday January 3, 2018. An amplifying upper level trough spawned the development of low pressure off the coast of Florida. The low pressure rapidly intensified on Wednesday night through Thursday January 4, 2018 as it moved north-northeast along the coast. The low passed just east of the 40 degrees N 70 degrees W benchmark Thursday afternoon. The central pressure when the storm developed was around 1004 millibars at 1 pm Wednesday. 24 hours later, the central pressure fell to around 950 mb, approximately a 54 millibar drop. The rapid intensification of the storm led to heavy snow, strong winds, and blizzard conditions over Long Island. Thundersnow was also observed across eastern Long Island.</p> <p>Thousands of flights were cancelled on January 4, 2018 and nearly 900 were cancelled the day after the blizzard. System-wide delays and cancellations occurred on the Long Island Railroad and Metro North Railroad. There were also numerous accidents on across southeast New York. Thousands of homes and businesses also lost power.</p> <p>CoCoRaHS observers, trained spotters, and the public reported 10 to 16 inches of snowfall. The nearby Republic Airport ASOS in East Farmingdale measured a 59 MPH wind gust at 12:06 PM. Winds frequently gusted 40 to 50 MPH during the peak of the winter storm.</p>



Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Location	Description
					<p>The FAA Contract Observer at Long Island MacArthur Airport (Islip, NY) reported 15.8 inches of snow. Trained spotters, CoCoRaHS observers, and the public reported 10 to 16 inches of snow. Winds frequently gusted 40 to 50 MPH during the peak of the winter storm at the Long Island MacArthur Airport.</p> <p>The NWS Office in Upton, NY reported 12.3 inches of snow. Trained spotters, CoCoRaHS observers, and the public reported 10 to 14 inches of snow. The nearby Brookhaven Airport ASOS (Shirley, NY) measured a 54 MPH wind gust at 3:24 PM. The nearby Gabreski Airport ASOS (Westhampton Beach, NY) measured a 49 MPH wind gust at 5:59 PM. Winds also frequently gusted 40 to 50 MPH during the peak of the winter storm.</p> <p>Trained spotters and CoCoRaHS observers, and the public reported 10 to 14 inches of snowfall. The nearby Brookhaven Airport ASOS (Shirley, NY) measured a 54 MPH wind gust at 3:24 PM. Winds also frequently gusted 40 to 50 MPH during the peak of the winter storm.</p>
March 2-3, 2018	Nor'Easter, High Wind	N/A	N/A	Northwest Suffolk, Southeast Suffolk, Southwest Suffolk, Northeast Suffolk	<p>On March 2-3, a nor'easter moved along the east coast, rapidly strengthening as it crossed the warm waters of the Gulf Stream. Due to the slow-moving nature of the storm, water levels across the Northeast remained elevated for multiple tidal cycles.</p> <p>The mesonet station at Eatons Neck reported a 69-mph wind gust at 320 pm. At 215 pm, a trained spotter reported a large tree down on the corner of Roundtree Drive and Beaumont Drive in Melville. Around 220 pm in Smithtown, the Department of Highways reported a tree down on NY 25A at Sunken Meadow Road, with all lanes closed. In Mount Sinai, the public reported a tree down on Mead Avenue around 430 pm. Northwest Suffolk reported \$100K in property damage.</p> <p>The mesonet station in Napeague measured a 62-mph wind gust at 350 pm. At Montauk Airport, a 58-mph wind gust was reported at 7 pm. Southeast Suffolk reported \$10K in property damage. A trained</p>



Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Location	Description
					<p>spotter in Babylon measure a 61-mph wind gust around 535 pm. At 430 pm, the public reported trees down in Babylon and West Islip causing power lines to come down and power outages along Montauk Highway in both towns. Southwest Suffolk reported \$100K in property damage.</p> <p>The mesonet station measured a 65-mph wind gust at 745 pm at Great Gull Island. A trained spotter measured a 58-mph wind gust in Orient at 525 pm. At 7 pm, a trained spotter reported a tree down causing wires to come down in the town of Orient. Northeast Suffolk reported \$50K in property damage.</p>
March 12-13, 2018	Nor'Easter, Heavy Snow	N/A	N/A	Suffolk County	<p>A strong area of low pressure tracked well offshore of the eastern seaboard, but tracked close enough to eastern Long Island to bring heavy snow bands during the morning and early afternoon on Tuesday, March 13, 2018. Snowfall rates were 1 to 2 inches per hour at times in the morning across eastern Long Island.</p> <p>Trained spotters, COOP observers, CoCoRaHS observers, and the public reported 6 to 12.5 inches of snow. The highest amount was reported by a trained spotter in Orient with 12.5 inches of snow. An NWS Employee in Stony Brook reported 8.3 inches of snow.</p> <p>Trained spotters, CoCoRaHS observers, and the public reported 6 to 11 inches of snow. A trained spotter reported 18.3 inches of snow in Southampton. The public reported 10.3 inches of snow in East Hampton. The FAA Contract Observer at the Islip Airport reported 6.4 inches of snow. Trained spotters and the public reported 5 to 8 inches of snow.</p>
March 21-22, 2018	Nor'Easter, Winter Storm	N/A	N/A	Suffolk County	<p>A large and slow-moving low pressure developed along the Middle Atlantic coast on Wednesday, March 21st and moved slowly north and east along the coast through Thursday, March 22nd. Moderate to heavy snow bands moved across Long Island and New York City with lighter snow across the Lower Hudson Valley. The heaviest snow occurred in New York City and Long Island Wednesday night into early Thursday morning. The highest snowfall rates occurred on Long Island with generally 2 to 4 inches per hour at times. The</p>



Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Location	Description
					<p>NWS official observation at the Islip Airport indicated a snowfall rate of 5 inches per hour between 9pm and 10pm on March 21st with around 9 inches of snow falling from 8pm to 10pm. Within these heavier bands, near-blizzard conditions occurred with visibilities one quarter mile or less and winds gusting 30 to 35 mph.</p> <p>The Official NWS Observation at Islip Airport was 18.4 inches of snow. The FAA Contract Observer at the Airport reported snowfall rates 2 to 4 inches per hour during the night of March 21st with a one hour rate of 5 inches. NWS Employees reported similar snowfall rates in Ronkonkoma, Patchogue, and Sayville. Snowfall amounts ranged from 9 to 20 inches across Southwest Suffolk as reported by NWS Employees, trained spotters, social media, and the public. Near-blizzard conditions occurred with visibility falling below one quarter mile at times and winds gusting 30 to 35 mph during the highest snowfall rates.</p> <p>Trained spotters, social media, broadcast media, and the public reported 10 to 20 inches of snowfall. Near-blizzard conditions occurred at times during the evening of March 21st with visibility falling below one quarter of a mile at times and winds gusting 25 to 30 mph.</p>
July 21-22, 2018	Nor'Easter	N/A	N/A	Suffolk County	<p>A rare summertime nor'easter that developed off the coast of North Carolina along the warm front of a powerful upper level low during July 21 and retrograded to the west into Delaware and Pennsylvania then rapidly weakened in Upstate New York on the morning of July 22. An extremely rare summertime Wind Advisory was issued for parts of New Jersey, New York City, Long Island, and Connecticut. The storm produced strong to damaging winds that created tropical storm conditions for much of New Jersey, New York City, and Long Island. The western side of the storm also brought excessive rainfall and extensive flooding in several metropolitan areas in the Mid-Atlantic States while the tail of the storm channeled a huge moisture feed into Southern New England along with the threat for waterspouts and tornadoes, though none were reported.</p>



Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Location	Description
October 27, 2018	Nor'Easter, High Wind	N/A	N/A	Suffolk County	<p>A coastal storm moved to the east of the area.</p> <p>Social media reported a tree down in West Babylon on 17th street in West Babylon around 630 am. Later in the day in the town of West Islip, wires and branches were reported down on Higbie Lane at 2 pm. This report was from the public. Southwest Suffolk reported \$50K in property damage. The public reported a wind gust up to 66 mph around 955 am in Amagansett. The mesonet station at Shinnecock, a gust up to 60 mph was reported at 1018 am. Southeast Suffolk reported \$50K in property damage. The mesonet station at Great Gull Island reported a wind gust to 65 mph at 1045 am. The site is at an elevation of 53 ft. Northeast Suffolk reported \$10K in property damage.</p>

Sources: NOAA-NCEI 2020, FEMA 2020, NOAA 2018, Spectrum News 2018, SHELDUS 2020

Note: With documentation for New York State and Suffolk County being so extensive, not all sources have been identified or researched. Therefore, Table 5.4.12-3 may not include all events that have occurred in the County. Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of inflation.

- DR Disaster Declaration
- EM Emergency Declaration
- FEMA Federal Emergency Management Agency
- K Thousand (\$)
- M Million (\$)
- N/A Not Applicable
- NCDC National Climatic Data Center
- NOAA National Oceanic and Atmospheric Administration
- NWS National Weather Service
- PA Public Assistance



Climate Change Impacts

Climate change is beginning to affect both people and resources in New York State, and these impacts are projected to continue growing. Impacts related to increasing temperatures and sea level rise are already being felt in the State. ClimAID: the Integrated Assessment for Effective Climate Change in New York State (ClimAID) was undertaken to provide decision-makers with information on the State’s vulnerability to climate change and to facilitate the development of adaptation strategies informed by both local experience and scientific knowledge (New York State Energy Research and Development Authority [NYSERDA] 2011).

Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Suffolk County is part of Region 4, New York City and Long Island. Some of the issues in this region, affected by climate change, include: the area contains the highest population density in the State; sea level rise and storm surge increase coastal flooding, erosion, and wetland loss; challenges for water supply and wastewater treatment; increase in heat-related deaths; illnesses related to air quality increase; and higher summer energy demand stresses the energy system (NYSERDA 2011).

In Region 4, it is estimated that temperatures will increase by 4.1°F to 5.7°F by the 2050s and 5.3°F to 8.8°F by the 2080s (baseline of 54.6 °F, mid-range projection). Precipitation totals will increase between 4 and 11-percent by the 2050s and 5 to 13-percent by the 2080s (baseline of 49.7 inches, mid-range projection) (NYSERDA 2014). Average annual precipitation is projected to increase in the region by four to 11-percent by the 2050s and five to 13-percent by the 2080s (New York City Panel on Climate Change [NPCC] 2015).

Table 5.4.12-4 displays the projected seasonal precipitation change for the New York City and Long Island ClimAID Region (NYSERDA 2011).

Table 5.4.12-5. Projected Seasonal Precipitation Change in Region 4, 2050s (Percent change)

Winter	Spring	Summer	Fall
0 to +15%	0 to +10%	-5 to +10%	-5 to +10%

Source: NYSERDA 2011

Based on historical data, it is expected that the following will occur at least once per 100 years:

- Up to eight inches of rainfall in the rain band near the coast over a 36-hour period
- Up to four inches of freezing rain in the ice band near central New York State, of which between one and two inches of accumulated ice, over a 24-hour period
- Up to two feet of accumulated snow in the snow band in northern and western New York State over a 48-hour period (NYSERDA 2011)

New York State is already experiencing the effects of climate change during the winter season. Winter snow cover is decreasing and spring comes, on average, about a week earlier than it did a few years ago. Nighttime temperatures are measurably warmer, even during the colder months (NYSDEC Date Unknown). Overall winter temperatures in New York State are almost five degrees warmer than in 1970 (NYSDEC Date Unknown). The State has seen a decrease in the number of cold winter days (below 32°F) and can expect to see a decrease in snow cover, by as much as 25 to 50% by end of the next century. The lack of snow cover may jeopardize opportunities for skiing, snowmobiling and other types of winter recreation; and natural ecosystems will be affected by the changing snow cover (Cornell University College of Agriculture and Life Sciences 2011).

Some climatologists believe that climate change may play a role in the frequency and intensity of Nor’Easters. Two ingredients are needed to produce strong Nor’Easters and intense snowfall: (1) temperatures which are just





below freezing, and (2) massive moisture coming from the Gulf of Mexico. When temperatures are far below freezing, snow is less likely. As temperatures increase in the winter months they will be closer to freezing rather than frigidly cold. Climate change is expected to produce more moisture, thus increasing the likelihood that these two ingredients (temperatures just below freezing and intense moisture) will cause more intense snow events. The impacts of climate change on the track and intensity of nor'easters is still undetermined at this time (NYSERDA 2014)

Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable to the identified hazard. All assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are exposed to the Nor'Easter hazard.

Impact on Life, Health and Safety

The impact of a Nor'Easter on life, health and safety is dependent upon several factors including the severity of the event and whether or not adequate warning time was provided to residents. Typically, a Nor'Easter has a longer duration (potentially lasting days) than a hurricane or tropical storm event, which normally pass through an area in a matter of hours.

The entire Suffolk County population (1,488,179) can be impacted by a Nor'Easter. Vulnerable populations, including the elderly and low-income populations, are considered most susceptible to the Nor'Easter hazard. Socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Low-income residents may not have adequate housing able to withstand high winds, rain, and snow associated with Nor'Easters. Refer to Section 4 (County Profile) for population statistics for each participating municipality.

Impact on General Building Stock

A Nor'Easter surge inundation zone does not exist to estimate assets exposed. To estimate the buildings exposed to storm surge from a Nor'Easter, the SLOSH model Category 1 through 4 zones may be used for planning purposes. Refer to Tables 5.4.10-10 and 5.4.10-11 in Section 5.4.10 (Hurricane) which summarizes the number of buildings and their replacement cost value located in the Category 1 through 4 SLOSH zones, by jurisdiction.

Impact on Critical Facilities

All critical facilities are considered vulnerable to the Nor'Easter hazard (i.e., associated wind, ice, snow). Similar to building exposure, the SLOSH model Category 1 through 4 zones may be used to estimate which buildings may be impacted by surge. The critical facilities located in the Category 1 through 4 inundation zones are summarized in Section 5.4.10 (Hurricane) in Tables 5.4.10-13 through Table 5.4.10-16, by jurisdiction. Because power interruption can occur due to high winds and ice that may be associated with these events, backup power is recommended for all critical facilities and community lifelines.

Impact on Economy

Damages to buildings and infrastructure, utility outages, and roadways impassable due to snow or flood/surge can lead to closures of municipal or County buildings. These closures impact the services they provide and hinder response time for critical emergency services. Refer to Section 5.4.10 (Hurricane) for a detailed discussion on potential losses to County buildings, critical facilities, and infrastructure due to winds and storm-surge flooding.



Impact on the Environment

Nor'Easter events can cause great impacts to the environment and natural resources. Flood/surge can cause beach and dune erosion, wetland loss, and barrier island breaching that disrupts coastal habitats and migration patterns of species (NYC 2019). Flooding caused by surge may breach structures containing hazardous wastes, which can contaminate water resources and soil resources. Debris caused by surge may also be hazardous to aquatic habitats and species.

Cascading Impacts on Other Hazards

Nor'Easter events can escalate the impacts of flooding and coastal erosion. Storm surge may increase erosion along the shoreline, which alters the extent of flooding. Further, the associated high winds, snow and ice may impact the continuity of utility services. The structures most at risk of coastal erosion and flooding can be reviewed in Section 5.4.1 (Coastal Erosion) and Section 5.4.8 (Flood).

Future Changes That May Impact Vulnerability

Understanding future changes that effect vulnerability in the County can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. Changes in the natural environment and built environment and how they interact can also provide insight about ways to plan for the future.

Projected Development

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth located in the storm surge areas could be potentially impacted by Nor'Easters. Refer to Section 5.4.10 (Hurricane) for the number of development project areas that are exposed to the storm surge areas, SLOSH Categories 1 through 4.

It is recommended that the County and municipal partners implement design strategies that mitigate against the risk of Nor'Easters. For example, New York City has developed a zoning plan for coastal resiliency in 2019 that can be referenced for development projects (NYC Department of Planning 2019). This plan recommends greater zoning flexibility to allow developers to remove components of the structure out of the flood inundation areas and storm surge hazard areas. The plan also recommends solutions to make reconstruction repairs easier and more affordable for structures built in coastal flooding areas.

Projected Changes in Population

According to the Suffolk County Department of Economic Development and Planning's February 2017 Annual Report update, the population of the County is growing. The report indicates that slow population growth is expected to continue in the future. Any growth can create changes in density throughout the County. Higher density can, not only create issues for local residents during evacuation of a natural hazard event, but can also impact tourists that travel to or through Suffolk County for vacation. Historically, flood and storm events with associated surge have severely impacted transportation corridors as well as infrastructure. Refer to Section 4 (County Profile), which includes a discussion on population trends for the County.

Climate Change

As discussed above, most studies project that the State of New York will experience an increase in average annual temperatures and precipitation. Annual precipitation amounts in the region are projected to increase, primarily in the form of heavy rainfalls, which have the potential to increase the risk of storm surge, and flood critical transportation corridors and infrastructure. Increases in precipitation may alter and expand the floodplain boundaries of storm surge areas and runoff patterns, resulting in the exposure of populations, buildings, and



critical facilities and infrastructure that were previously outside the floodplain. This increase in exposure would result in an increased risk to life and health, an increase in structural losses, a diversion of additional resources to response and recovery efforts, and an increase in business closures affected by future flooding events due to loss of service or access.

Furthermore, climate is defined not simply as average temperature and precipitation but also by the type, frequency and intensity of weather events. Both globally and at the local scale, climate change has the potential to alter the prevalence and severity of events like storm surge. While predicting changes to the prevalence or intensity of storm surge and the events affects under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society and the environment (USEPA 2006).

Change of Vulnerability Since the 2014 HMP

Since the 2014 analysis, population statistics have been updated using the 5-Year 2014-2018 ACS population estimates. The general building stock was also updated using RS Means 2019 building valuations that estimated replacement cost value for each building in the inventory. Updated building stock provided by the County was utilized to update the user-defined facility inventory and critical facility inventory dataset. In addition, NOAA's 2010 modeled SLOSH Categories 1 through 4 inundation areas were used to assess potential risk of future storm surge inundation (refer to Section 5.4.10 Hurricane). Overall, this vulnerability assessment uses a more accurate and updated building inventory which provides more accurate estimated exposure and potential losses for Suffolk County.