SECTION 3. HAZARD IDENTIFICATION AND RISK ASSESSMENT

3.1 HAZARD ASSESSMENT

Nassau County has focused solely on natural hazards for the purpose of mitigation. Nassau County has re-assessed the full range of hazards addressed in the original Multi-Jurisdictional Hazard Mitigation Plan. These hazards were identified in collaboration with the Planning Group and Nassau County Department of Public Works Planning Section.. Online information and data resources from federal and state agencies were also evaluated to supplement information from these key sources.

The following tables and projections are based upon data provided to the Team from County sources. This section documents the evaluation process for the range of hazards considered. Each hazard considered denotes designation as a significant or non-significant hazard to be addressed in the plan along with how and why the determination was made. The table is designed to list hazards identified as pertinent to Nassau County as well as those that are not.

Table 9

Summary of Hazard Identification

Natural Hazards Considered	Significant hazard to be addressed in the plan?	How was this determination made?	Why was this determination made?
Avalanches	No	• Review of State Plan • Planning Group & County DPW Input	• While avalanches are possible in some parts of northern New York State, the topography and climate in Nassau County would not support conditions needed for an avalanche to occur.
Coastal Erosion	Yes	• Review of State Plan • Planning Group & County DPW Input • Data collected as a result of DR 1899, 1957, 4020, 4085	• Nassau County's north and south shores are bounded by coastal waters. • Coastal erosion hazard history, particularly on south shore barrier islands. • Wave action was ranked as a moderately high hazard is a major concern for the County.
Wave Action	Yes		
Earthquakes	Yes	• Review of State Plan • Planning Group & County DPW Input	• Earthquakes have occurred in and around the State of New York in the past, affecting Nassau County.

			• The State Plan notes that Nassau County falls within one of three areas in New York State with a relatively high seismic risk. It also notes that the soil classifications of much of Nassau County would tend to experience an amplification of ground motion and resulting higher risk to a given earthquake magnitude.
Expansive Soils	No	• Review of US Department of Transportation Federal Highway Authority Web site • Planning Group Input • Expansive soils are not in the State Plan. • Review of FEMA, ESRI, and NOAA NCDC Web sites	• Nassau County is located in a part of the country identified as generally non-expansive (the occurrence of expansive materials is extremely limited),according to USDOT FHA Report No. FHWA-RD-76-82. • No known historic occurrences. • Nassau County's north and south shores are bounded by coastal waters. There are also several inland water bodies.
Floods		• Review of State Plan	• A query of the NOAA NCDC Web site notes 57 flood events in Nassau County between 01/01/1950 and 12/31/2012, resulting in $12.25 Million in property damage.

		• Planning Group & County DPW Input	• Significant number of historical flood events. According to the NYS Plan, Nassau County has one of the highest number of flood disaster declarations in the state.
Geomagnetism	No	• Geomagnetism is not in the State Plan.	• No known historic impacts in Nassau County.
Ice Jams	No	• Review of State Plan • Review of NOAA NCDC Web site	• No known historic occurrences, as per USACE CRELL Ice Jam database and NYS archives (as reported in State Plan).
Land Failure: Landslides	Yes	• Review of State Plan • Planning Group & County DPW Input	• Generally low susceptibility and incidence on the southern 2/3 of Nassau County, but high susceptibility and low incidence on the northern 1/3 of the county. • The State Plan ranks Nassau County third highest in the state of counties most threatened by landslides and vulnerable to landslide losses.

			• The State Plan notes a certain amount of land subsidence hazard in New York, but also a very low risk to population and property.
Land Failure: Land Subsidence	Yes	• Review of State Plan • Planning Group & County DPW Input	• The State Plan notes a certain amount of land subsidence hazard in New York, but also a very low risk to population and property.
Severe Weather Including Events such as Drought, Extreme Temperatures, Hailstorms, Tornadoes, & Winter Storms/Ice Storms:	Yes	• See event-specific information below • Planning Group & County DPW Input	• Severe storms in general were ranked as moderately high hazards with a high rate of frequency.
Severe Weather: Drought	Yes	• Review of State Plan • Planning Group & County DPW Input	• Droughts have occurred in Nassau County in the past, with drought watches and warnings being issued by the NYSDEC in the past. • Droughts were ranked as a moderately low hazard by NYS although drought events occur regularly.
Severe Weather: Extreme Temperatures	No	• Review of data on the NOAA National Climatic Data Center website • Planning Group & County DPW Input	• Extreme temperatures were ranked as a moderately low hazard, serious injury or death is likely but not in large numbers; little or no damage to private property; and little or no structural damage to public facilities.

Severe Weather: Extreme Winds	Yes	• Review of State Plan • Planning Group & County DPW Input	• In the NYS Plan, Nassau County is ranked as the second most threatened county in the state to extreme winds and second most vulnerable to extreme wind losses.
Severe Weather: Hailstorms	No	• Hailstorms are not an identified hazard in the State Plan.	• Not identified as actionable for Nassau County.
Severe Weather: Hurricanes	Yes	• Planning Group & County DPW Input • Data from DR-4020 & 4085.	• Hurricanes occur regularly and are the highest ranked natural hazard in Nassau County by the State Plan.
Severe Weather: Tornadoes	Yes	• Review of State Plan • Review of NOAA website • Planning Group & County DPW Input	• Tornadoes were ranked as a moderately high hazard NYS. • Tornado events occur regularly. • In the NYS Plan, Nassau County is ranked as the second most threatened county in the state to extreme winds and second most vulnerable to extreme wind losses.
Severe Weather: Winter Storms/Ice Storms	Yes	• Review of State Plan • Review of NOAA website	• Ice storms and severe winter storms were ranked as moderately low hazards. • Winter storms occur frequently and ice storms occur regularly.

		• Planning Group & County DPW Input	• The NYS Plan notes that while Nassau County has relatively low average annual snowfall, it has been included in two past snow-related disaster declarations and is vulnerable to the effects of nor'easters.
Tsunamis	No	• Tsunamis are not in the State Plan.	• No known historic impacts in Nassau County.
Volcanoes	No	• Volcanoes are not in the State Plan.	• No known historic impacts in Nassau County.
Wildfires	No	• Planning Group & County DPW Input • Review of the NY State Plan • Review of data on the NCDC Web site (National Climatic Data Center)	• Wildfires were the lowest ranked natural hazard. Serious injury or death from wildfires is unlikely; that little or no damage to private property is expected; and that little or no structural damage to public facilities would be expected. • No past wildfires in Nassau County are recorded in the State Plan.

3.2 IDENTIFICATION & CHARACTERISTICS OF ASSETS IN HAZARD AREAS

Identification and characterization of assets in hazard areas is an important component of the mitigation planning process because it provides information regarding what is at risk. For this plan, five key types of assets were considered: improved property, emergency facilities, utilities, historic and cultural resources, and population. For each of these main categories of assets, the level of exposure was evaluated for each identified hazard, and for each community, as follows:

Improved Property - Impacts to improved property are presented as a percentage of each community's total assessed value of improvements that are exposed to each identified hazard. Where percentages are high, this means that a high percentage of the community's improved property is exposed and, as such, the degree of damages within that community could be high as well (with associated high impacts within the community). Data is presented for all incorporated and unincorporated areas of the county, regardless of whether or not the community has participated in this plan. This was done to provide the greatest level of detail, and also to allow for easier future incorporation of new jurisdictions into this plan during future plan maintenance cycles.

Emergency Facilities – Impacts to emergency facilities are presented as an indication of whether or not a specific emergency facility is exposed to each identified hazard. The community where each emergency facility is located is also noted. Where an emergency facility is exposed, the degree of damages to this facility could be high (with associated high impacts to the community because these types of facilities are critical during disaster response and recovery). Jurisdictions with more than one emergency facility exposed to the same hazard would likely be impacted to an even higher level because multiple emergency facilities could be impacted by the same event. Data is presented for all incorporated and unincorporated areas of the county, regardless of whether or not the community has participated in this plan. Where a community is not listed this means that no emergency facilities were identified for that particular community.

Utilities - Impacts to utilities are presented as an indication of whether or not a specific utility is exposed to each identified hazard. The community where each emergency facility is located is also noted. Where a utility facility is exposed, the degree of damages to this facility could be high (with associated high impacts to the community because utilities such as power, water, and communications are critical during disaster response and recovery and for continuity of operations). Jurisdictions with more than one utility exposed to the same hazard would likely be impacted to an even higher level because multiple emergency facilities could be impacted by the same event. Data is presented for all incorporated and unincorporated areas of the county, regardless of whether or not the community has participated in this plan. Where a community is not listed this means that no utility facilities were identified for that particular community.

Historic and Cultural Resources – Impacts to historic and cultural resources are presented as an indication of whether or not a specific historic or cultural resource is exposed to each identified hazard. The community where each resource is located is also noted. Where a historic or cultural resource is exposed, the degree of damages to this resource could be high (with associated high impacts to historic and cultural resources in that community). Jurisdictions with more than one historic and/or cultural resource exposed to the same hazard would likely be impacted to an even higher level because multiple resources could be impacted by the same event. Data is presented for all incorporated and unincorporated areas of the county, regardless of whether or not the community has participated in this plan. Where a community is not listed this means that no state or federally listed historic or cultural resources were identified for that particular community.

Population - Impacts to improved property are presented as a percentage of each community's total population that is exposed to each identified hazard. Where percentages are high, this means that a high percentage of the community's populace is exposed and, as such, the degree of damages (injuries, loss of life) to these people within that community could be high as well (with associated high impacts within the community). Data is presented for all incorporated and unincorporated areas of the county, regardless of whether or not the community has participated in this plan.

IMPROVED PROPERTY IN HAZARD AREAS

Improved property in hazard areas are one type of "asset" that were considered in the evaluation. This can include many types of development including residential, commercial, industrial, municipal, etc. Improved property was included in the asset identification and characterization to determine jurisdictions with particularly high values of improved property located in hazard areas which, in turn, may benefit from mitigation activities as part of the hazard mitigation strategy.

County parcel data was the source of information regarding improved property. Each parcel contained total assessed value, and assessed value for land only. The Assessor's Office indicated that the value of improvements on each parcel (including, but not limited to buildings) could be calculated by subtracting the assessed value of land only from the total assessed value.

Improvements in hazard areas were quantified on a community-specific basis, using GIS to overlay County parcel data with hazard boundaries, and create summary tables of the assessed value of improved property in hazard areas by type. For each parcel, it was assumed that if any portion of the parcel was within a given hazard area then the entire parcel was counted as within the hazard area. Only parcels that were 100% outside of hazard areas were counted as outside of the hazard area

Resultant data is depicted in the following tables to present an overview of information in general terms for each community in the county. For earthquakes, severe weather, and extreme winds, the hazards are county-wide and therefore all assets could be impacted; thus, columns for these hazards have been excluded from the table.

Table 10

Assessed Value of Improved Property and Percent in Hazard Areas

Hempstead Area

Jurisdiction	Total Assessed Value of Improvements	Flood 100 Yr	Flood Cat1 Surge	Flood Cat2 Surge	Flood Cat3 Surge	Flood Cat4 Surge
Atlantic Beach	$2,676,756.00	99.5%	61.1%	83.4%	22.6%	14.0%
Baldwin	$9,968,552.00	8.3%	9.7%	30.9%	39.9%	26.6%
Baldwin Harbor	$4,457,149.00	56.5%	87.1%	64.6%	20.9%	0.0%
Barnum Island	$3,837,968.00	96.6%	99.7%	11.8%	0.6%	0.4%
Bay Park	$4,351,062.00	96.4%	96.8%	69.5%	41.3%	40.9%
Bellerose	$665,689.00	0.0%	0.0%	0.0%	0.0%	0.0%
Bellerose Terrace	$596,783.00	0.0%	0.0%	0.0%	0.0%	0.0%
Bellmore	$9,879,334.00	42.5%	17.7%	63.1%	39.2%	18.9%
Cedarhurst	$5,562,876.00	32.7%	30.2%	34.4%	27.8%	48.7%

East Atlantic Beach	$1,613,539.00	100.0%	75.2%	60.2%	17.2%	13.6%
East Garden City	$32,986,604.00	8.7%	0.0%	0.0%	0.0%	0.0%
East Meadow	$28,904,421.00	0.1%	0.0%	0.0%	0.0%	0.0%
East Rockaway	$4,933,091.00	34.0%	46.5%	52.6%	16.4%	10.3%
Elmont	$12,437,458.00	0.0%	0.0%	0.0%	0.0%	0.0%
Floral Park	$7,917,609.00	0.0%	0.0%	0.0%	0.0%	0.0%
Franklin Square	$13,645,691.00	0.0%	0.0%	0.0%	0.0%	0.6%
Freeport	$23,150,463.00	41.1%	41.4%	42.7%	39.8%	21.3%
Garden City	$34,642,896.00	0.0%	0.0%	0.0%	0.0%	0.0%
Garden City South	$1,958,293.00	0.0%	0.0%	0.0%	0.0%	0.0%
Harbor Isle	$531,759.00	94.5%	100.0%	8.9%	0.0%	0.0%
Hempstead	$24,934,718.00	0.0%	0.0%	0.0%	0.0%	0.0%
Hewlett	$4,908,593.00	13.7%	4.8%	43.7%	62.6%	53.9%
Hewlett Bay Park	$1,624,956.00	35.7%	35.0%	81.4%	61.8%	50.1%
Hewlett Harbor	$3,297,119.00	88.1%	86.9%	44.9%	10.3%	2.2%
Hewlett Neck	$2,657,607.00	92.6%	89.0%	7.4%	8.6%	0.1%
Inwood	$7,822,472.00	65.0%	54.2%	73.7%	32.2%	12.6%
Island Park	$3,360,989.00	99.8%	99.4%	12.1%	0.1%	0.0%
Jones Beach	$8,926,942.00	100.0%	100.0%	99.2%	83.8%	83.8%
Lakeview	$2,695,557.00	0.0%	21.6%	22.3%	49.5%	58.5%
Lawrence	$8,960,862.00	50.4%	49.8%	34.8%	37.8%	40.5%
Levittown	$24,383,613.00	0.0%	0.0%	0.0%	0.0%	0.0%
Lido Beach	$10,053,460.00	100.0%	99.5%	83.4%	62.0%	30.8%
Long Beach	$25,827,392.00	99.9%	93.3%	35.5%	11.6%	1.6%
Lynbrook	$10,801,591.00	0.3%	1.0%	21.9%	74.9%	36.0%
Malverne	$4,939,018.00	1.3%	0.0%	15.0%	20.5%	50.1%
Malverne Park - Oaks	$181,403.00	0.0%	0.0%	0.0%	6.1%	13.7%
Merrick	$25,526,859.00	61.0%	53.5%	42.0%	15.8%	13.4%
New Hyde Park	$5,020,934.00	0.0%	0.0%	0.0%	0.0%	0.0%
North Bellmore	$10,522,929.00	0.0%	0.0%	0.0%	7.9%	23.1%
North Lynbrook	$352,555.00	0.0%	0.0%	0.0%	25.6%	94.2%
North Merrick	$5,693,105.00	12.6%	0.0%	0.0%	0.2%	3.6%
North Valley Stream	$6,664,514.00	4.6%	0.0%	0.0%	4.9%	28.5%
North Wantagh	$6,049,127.00	0.0%	0.0%	0.0%	0.0%	0.0%
Oceanside	$23,252,337.00	54.9%	61.7%	55.8%	25.3%	5.2%
Point Lookout	$1,876,299.00	100.0%	52.0%	72.7%	16.4%	1.0%
Rockville Centre	$23,073,867.00	3.3%	7.5%	18.9%	38.0%	43.4%
Roosevelt	$5,373,978.00	7.4%	0.0%	0.6%	1.6%	11.8%
Salisbury	$5,814,710.00	0.0%	0.0%	0.0%	0.0%	0.0%
Seaford	$16,190,304.00	57.9%	51.7%	41.3%	22.6%	16.0%
South Floral Park	$336,401.00	0.0%	0.0%	0.0%	0.0%	0.0%
South Hempstead	$1,181,247.00	0.0%	0.0%	0.0%	0.0%	0.0%
South Valley Stream	$6,208,931.00	97.0%	52.7%	85.5%	38.3%	1.4%
Stewart Manor	$1,012,520.00	0.0%	0.0%	0.0%	0.0%	0.0%
Uniondale	$12,097,981.00	10.9%	0.0%	0.0%	0.0%	0.0%

Valley Stream	$17,586,834.00	28.2%	7.8%	32.2%	63.1%	30.7%
Wantagh	$14,546,823.00	34.9%	30.6%	45.0%	45.2%	42.9%
West Hempstead	$11,501,899.00	0.0%	0.0%	0.0%	10.4%	11.8%
Woodmere	$11,248,952.00	72.6%	60.5%	52.0%	16.8%	18.7%
Woodsburgh	$708,241.00	38.0%	38.7%	85.2%	52.0%	11.1%
Hempstead Area Totals	**$561,935,632.00**	**29.9%**	**26.5%**	**24.6%**	**19.3%**	**14.3%**

Table 10

Assessed Value of Improved Property and Percent in Hazard Areas

North Hempstead Area

Jurisdiction	Total Assessed Value of Improvements	Flood 100 Yr	Flood Cat1 Surge	Flood Cat2 Surge	Flood Cat3 Surge	Flood Cat4 Surge
Albertson	$3,004,042.00	0.0%	0.0%	0.0%	0.0%	0.0%
Baxter Estates	$1,268,341.00	16.4%	11.5%	19.9%	19.6%	20.1%
Carle Place	$5,716,207.00	0.0%	0.0%	0.0%	0.0%	0.0%
East Hills	$9,702,580.00	0.0%	0.0%	0.0%	0.0%	0.0%
East Williston	$2,043,531.00	0.0%	0.0%	0.0%	0.0%	0.0%
Flower Hill	$5,709,627.00	0.3%	0.1%	0.3%	0.3%	0.3%
Garden City Park	$5,414,313.00	0.0%	0.0%	0.0%	0.0%	0.0%
Great Neck	$8,951,840.00	5.8%	5.3%	6.2%	5.5%	5.8%
Great Neck Estates	$4,141,748.00	23.6%	23.2%	24.7%	25.8%	13.9%
Great Neck Gardens	$835,028.00	0.0%	0.0%	0.0%	0.0%	0.0%
Great Neck Plaza	$7,285,957.00	2.8%	0.0%	0.0%	0.0%	0.0%
Greenvale	$1,322,494.00	0.0%	0.0%	0.0%	0.0%	0.0%
Harbor Hills	$631,347.00	26.2%	17.2%	17.6%	20.8%	23.2%
Herricks	$3,038,509.00	0.0%	0.0%	0.0%	0.0%	0.0%
Kensington	$1,799,175.00	11.9%	12.3%	12.7%	11.9%	11.7%
Kings Point	$12,901,382.00	30.4%	18.9%	24.9%	40.9%	42.9%
Lake Success	$16,830,047.00	0.0%	0.0%	0.0%	0.0%	0.0%
Manhasset	$16,527,257.00	1.5%	1.6%	10.7%	11.3%	12.6%
Manhasset Hills	$2,601,788.00	0.0%	0.0%	0.0%	0.0%	0.0%
Manorhaven	$3,199,216.00	41.3%	26.1%	57.1%	50.7%	24.7%
Mineola	$16,250,030.00	0.0%	0.0%	0.0%	0.0%	0.0%
Munsey Park	$3,495,645.00	0.0%	0.0%	0.0%	0.0%	0.0%
New Cassel	$5,645,590.00	0.0%	0.0%	0.0%	0.0%	0.0%
North Hills	$8,679,643.00	0.0%	0.0%	0.0%	0.0%	0.0%
North New Hyde Park	$10,911,521.00	0.0%	0.0%	0.0%	0.0%	0.0%
Old Westbury	$20,801,488.00	0.0%	0.0%	0.0%	0.0%	0.0%
Plandome	$1,634,861.00	5.9%	4.2%	5.2%	5.9%	7.2%
Plandome Heights	$936,817.00	21.1%	13.5%	21.2%	17.1%	12.2%
Plandome Manor	$1,623,265.00	37.1%	27.5%	31.9%	35.2%	35.2%
Port Washington	$17,021,425.00	7.1%	5.9%	11.1%	12.9%	12.3%
Port Washington North	$4,049,732.00	8.8%	6.3%	16.7%	30.8%	36.1%
Roslyn	$3,836,394.00	24.8%	14.1%	25.4%	31.6%	28.2%

Roslyn Estates	$1,413,723.00	0.0%	0.0%	0.0%	0.0%	0.0%
Roslyn Harbor	$1,910,948.00	12.8%	6.4%	8.0%	8.8%	11.3%
Roslyn Heights	$5,814,205.00	0.0%	0.0%	0.0%	0.0%	0.0%
Russell Gardens	$1,125,282.00	4.4%	0.0%	0.0%	0.0%	0.0%
Saddle Rock	$1,561,207.00	30.0%	25.2%	29.8%	37.5%	55.2%
Saddle Rock Estates	$557,672.00	0.0%	0.0%	0.0%	15.6%	21.1%
Sands Point	$8,953,358.00	44.4%	24.3%	18.0%	28.7%	27.2%
Searingtown	$5,110,586.00	0.0%	0.0%	0.0%	0.0%	0.0%
Thomaston	$2,574,465.00	2.9%	2.1%	2.1%	3.5%	4.6%
University Gardens	$3,579,821.00	0.0%	0.0%	3.6%	4.5%	7.1%
Westbury	$8,639,954.00	0.0%	0.0%	0.0%	0.0%	0.0%
Williston Park	$3,711,388.00	0.0%	0.0%	0.0%	0.0%	0.0%
North Hempstead Area Totals	**$252,763,449.00**	**6.3%**	**4.2%**	**6.2%**	**7.9%**	**7.7%**

Table 10						
Assessed Value of Improved Property and Percent in Hazard Areas						
Oyster Bay Area						
Jurisdiction	**Total Assessed Value of Improvements**	**Flood 100 Yr**	**Flood Cat1 Surge**	**Flood Cat2 Surge**	**Flood Cat3 Surge**	**Flood Cat4 Surge**
Bayville	$5,242,690.00	45.8%	33.6%	35.6%	22.3%	0.150792
Bethpage	$14,644,988.00	0.0%	0.0%	0.0%	0.0%	0
Brookville	$11,037,010.00	0.0%	0.0%	0.0%	0.0%	0
Centre Island	$1,418,480.00	85.4%	74.2%	47.5%	60.4%	0.629678
Cove Neck	$972,358.00	65.8%	51.1%	54.6%	57.1%	0.584682
East Massapequa	$19,712,849.00	45.6%	38.2%	34.8%	40.6%	0.252916
East Norwich	$2,081,482.00	0.0%	0.0%	0.0%	0.0%	0
Farmingdale	$5,620,033.00	0.0%	0.0%	0.0%	0.0%	0
Glen Cove	$22,033,714.00	13.6%	10.2%	13.8%	13.0%	0.130682
Glen Head	$3,858,850.00	0.0%	0.0%	0.0%	0.0%	0
Glenwood Landing	$2,687,407.00	7.0%	4.9%	9.8%	12.1%	0.11113
Hicksville	$27,563,292.00	0.0%	0.0%	0.0%	0.0%	0
Jericho	$15,277,063.00	0.0%	0.0%	0.0%	0.0%	0
Lattingtown	$7,256,894.00	35.9%	34.8%	37.0%	31.0%	0.321378
Laurel Hollow	$4,154,781.00	14.8%	11.6%	12.2%	13.1%	0.139579
Locust Valley	$2,104,639.00	0.0%	0.0%	0.0%	0.0%	0
Massapequa	$13,655,487.00	37.0%	20.0%	53.0%	26.0%	0.149784
Massapequa Park	$8,568,468.00	5.9%	1.8%	17.8%	29.7%	0.348925
Matinecock	$3,714,102.00	0.0%	0.0%	0.0%	0.0%	0
Mill Neck	$3,054,522.00	13.9%	9.1%	11.1%	14.2%	0.169809
Muttontown	$8,220,630.00	0.0%	0.0%	0.0%	0.0%	0
North Massapequa	$9,101,292.00	6.0%	0.0%	6.0%	6.0%	0.059918
Old Bethpage	$9,725,128.00	0.0%	0.0%	0.0%	0.0%	0

Old Brookville	$4,430,986.00	0.0%	0.0%	0.0%	0.0%	0
Oyster Bay	$7,153,074.00	18.4%	17.1%	21.4%	25.1%	0.137614
Oyster Bay Cove	$3,766,662.00	4.2%	3.0%	4.5%	6.2%	0.119864
Plainedge	$5,492,703.00	0.0%	0.0%	0.0%	0.0%	0
Plainview	$21,219,561.00	0.0%	0.0%	0.0%	0.0%	0
Sea Cliff	$4,020,626.00	7.1%	4.0%	6.0%	5.0%	0.054859
South Farmingdale	$8,522,490.00	34.8%	0.0%	0.0%	0.0%	0.114538
Syosset	$19,681,722.00	0.0%	0.0%	0.0%	0.0%	0
Tobay Beach Park	$521,424.00	100.0%	100.0%	100.0%	100.0%	0.072693
Upper Brookville	$6,719,684.00	0.0%	0.0%	0.0%	0.0%	0
Woodbury	$13,886,412.00	0.0%	0.0%	0.0%	0.0%	0
Oyster Bay Area Totals	**$297,121,503.00**	**10.6%**	**7.2%**	**9.6%**	**8.9%**	**7.4%**

Sources: Nassau County GIS Database; Assessment Data 2014, 2009 FEMA Flood Map, NOAA SLOSH, NY2

EMERGENCY FACILITIES IN HAZARD AREAS

Emergency facilities (such as schools, hospital, police/fire stations, etc.) in Nassau County are other types of "assets" that have been evaluated. Emergency facilities were included in the asset identification and characterization to determine jurisdictions with particularly high numbers of key facilities located in hazard areas which, in turn, may benefit from mitigation activities as part of the hazard mitigation strategy. As this information is not intended for distribution the associated data tables are contained in Appendix F.

UTILITIES IN HAZARD AREAS

Utilities in hazard areas are another type of asset important to consider in the evaluation, to identify any sites which may be susceptible to damage from various hazards and, in turn, may benefit from special treatments to protect them from specific hazards. As this information is not intended for distribution the associated data tables are contained in Appendix G.

HISTORIC AND CULTURAL RESOURCES IN HAZARD AREAS

Historic and cultural resources are other types of assets located throughout Nassau County. They were included in the asset identification and characterization to determine any sites which may be susceptible to hazard effects and, in turn, may benefit from special treatments to protect them from specific hazards.

- **Cultural Resources:** As defined by the National Park Service in its "Cultural Resources Management Guidelines," cultural resources are: "*Those tangible and intangible aspects of cultural systems, both living and dead, that are valued by or representative of a given culture or that contain information about a culture . . . and [they] include but are not limited to sites, structures, districts, objects and artifacts, and historic documents associated with or representative of peoples, cultures, and human activities and events, either in the present or in the past. Cultural resources also can include the primary written and verbal data for interpreting and understanding those tangible resources.*"

- **Historic Resources:** Historic resources are any cultural resource dating from the period between the onset of written records (which on Long Island is typically placed around the time of first European contact in the sixteenth century) and 50 years ago.

At the State and Federal levels, official listings of historic resources are established and maintained to foster the preservation of particular cultural resources. The State and National Registers of Historic Places are the official listings of buildings, structures, districts, objects, and sites significant in the history, architecture, archaeology, engineering, and culture of the State and the nation.

In New York State, the State Historic Preservation Office (SHPO) – a Bureau of the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) – helps communities identify, evaluate, preserve, and revitalize their historic and cultural resources.

Table 11 Historic and Cultural Resources in Hazard Areas						
Site Name	**Community**	**Coastal Erosion**	**Wave Action**	**Flood (100 yr)**	**Flooding (surge)**	**Landslides****
Jones Beach State Park, Causeways and Parkways		■	■	■	■	
St. Mary's Chapel	Carle Place					
James Alfred Roosevelt Estate	Cove Neck			■	■	■
Mackay Estate Dairyman's Cottage	East Hills					■
Mackay Estate Gate Lodge	East Hills					■
Mackay Estate Water Tower	East Hills					■
The Shell House	East Island	■	■	■	■	■
Haviland-Davison Grist Mill	East Rockaway				■	
East Williston Village Historic District	East Williston					
Long Island Railroad Station at Farmingdale	Farmingdale					
George W. Denton House	Flower Hill					■
US Post Office – Freeport	Freeport				■	
Bldg. at 107 Fifth Street	Garden City					
Bldg. at 109 Fifth Street	Garden City					
Bldg. at 111 Fifth Street	Garden City					
Bldg. at 115 Fifth Street	Garden City					
Bldg. at 295 Stewart Ave	Garden City					
Bldg. at 32 Cathedral Ave.	Garden City					
Bldg. at 37 Cathedral Ave.	Garden City					
Bldg. at 86 Fifth Street	Garden City					
Bldg. at 89 Fifth Street	Garden City					
Bldg. at 94 Fifth Street	Garden City					
Building at 104 Ninth Street	Garden City					
Building at 104 Sixth Street	Garden City					
Building at 105 Hilton Ave	Garden City					
Building at 105 Ninth Street	Garden City					
Building at 106 Ninth Street	Garden City					
Building at 106 Sixth Street	Garden City					
Building at 108 Ninth Street	Garden City					
Building at 109 Ninth Street	Garden City					
Building at 110 Ninth Street	Garden City					
Building at 110 Sixth Street	Garden City					

Table 11 Historic and Cultural Resources in Hazard Areas						
Site Name	**Community**	**Coastal Erosion**	**Wave Action**	**Flood (100 yr)**	**Flooding (surge)**	**Landslides****
Building at 111Hilton Ave	Garden City					
Building at 112 Hilton Ave	Garden City					
Building at 112 Ninth Street	Garden City					
Building at 113 Hilton Ave	Garden City					
Building at 113 Ninth Street	Garden City					
Building at 114 Sixth Street	Garden City					
Building at 15 Rockaway Ave	Garden City					
Building at 24 Rockaway Ave	Garden City					
Building at 40 Hilton Ave	Garden City					
Building at 41 Hilton Ave	Garden City					
Building at 42 Hilton Ave	Garden City					
Building at 43 Hilton Ave	Garden City					
Building at 44 Hilton Ave	Garden City					
Building at 45 Hilton Ave	Garden City					
Building at 46 Hilton Ave	Garden City					
Building at 47 Hilton Ave	Garden City					
Building at 48 Hilton Ave	Garden City					
Building at 49 Hilton Ave	Garden City					
Building at 53-55 Hilton Ave	Garden City					
Building at 82 Sixth Street	Garden City					
Building at 84 Sixth Street	Garden City					
Building at 86 Sixth Street	Garden City					
Building at 93 Ninth Street	Garden City					
Building at 94 Sixth Street	Garden City					
Building at 95 Ninth Street	Garden City					
Cathedral of the Incarnation	Garden City					
Garden City Waterworks	Garden City					
Old Nassau County Courthouse	Garden City					
US Post Office – Garden City	Garden City					
Justice Court Building	Glen Cove					■
Sea Cliff Railroad Station	Glen Cove					■
US Post Office – Glen Cove	Glen Cove					■
Woolworth Estate	Glen Cove					■
Grace and Thomaston Buildings	Great Neck Plaza					
US Post Office – Great Neck	Great Neck Plaza					
Toll Gate House	Greenvale					■
Rectory of St. George's Episcopal Church	Hempstead					
St. George's Church	Hempstead					
US Post Office – Hempstead	Hempstead					

Table 11 Historic and Cultural Resources in Hazard Areas						
Site Name	**Community**	**Coastal Erosion**	**Wave Action**	**Flood (100 yr)**	**Flooding (surge)**	**Landslides****
Heitz Place Courthouse	Hicksville					
Jericho Friends Meeting House Complex	Jericho					■
Stepping Stones Light Station	Kings Point			■	■	
Aldred, John E., Estate	Lattingtown	■	■	■	■	■
Cold Spring Harbor Laboratory	Laurel Hollow		■	■	■	■
Rock Hall	Lawrence				■	
Jerusalem District No. 5 School	Levitton					
George Underhill House	Locust Valley				■	■
Matinecock Friends Meeting House	Locust Valley					■
Granada Towers	Long Beach			■	■	
Pauline Felix House	Long Beach				■	
Samuel Vaisberg House	Long Beach				■	
US Post Office – Long Beach	Long Beach			■	■	
Horatio Gates Onderdonk House	Manhasset					
Valley Road Historic District	Manhasset					
Grace Church Complex	Massapequa				■	
Cock-Cornelius House	Matinecock					■
Lillian Sefton Dodge Estate	Mill Neck					■
US Post Office - Mineola	Mineola					
Benjamin Moore Estate	Muttontown					■
Saddle Rock Grist Mill	North Hempstead			■	■	
A. Conger Goodyear House	Old Westbury					■
Adam-Derby House	Oyster Bay					■
Beekman, James William, House	Oyster Bay			■	■	■
Edward H. Swan House	Oyster Bay					■
Elmwood	Oyster Bay					■
First Presbyterian Church of Oyster Bay	Oyster Bay					■
Moore's Building	Oyster Bay					■
Oyster Bay Long Island Railroad Station	Oyster Bay			■	■	■
Oyster Bay Long Island Railroad Turntable	Oyster Bay			■	■	■
Planting Fields Arboretum	Oyster Bay					■
Raynham Hall	Oyster Bay				■	■
Sagamore National Historic Site	Oyster Bay		■	■	■	■
Seawanhaka Corinthian Yacht Club	Oyster Bay		■	■	■	■
US Post Office – Oyster Bay	Oyster Bay				■	■

Table 11 Historic and Cultural Resources in Hazard Areas						
Site Name	**Community**	**Coastal Erosion**	**Wave Action**	**Flood (100 yr)**	**Flooding (surge)**	**Landslides****
John Philip Sousa House	Port Washington	■				
Main Street School	Port Washington					
Monfort Cemetery	Port Washington					■
Sands-Willets Homestead	Port Washington					
Thomas Dodge Homestead	Port Washington			■	■	
US Post Office – Rockville Centre	Rockville Centre				■	
Eastman Cottage	Roslyn					■
Hicks Lumber Company Store	Roslyn			■	■	■
Rescue Hook & Ladder Co. No. 1 Firehouse	Roslyn					■
Roslyn Cemetery	Roslyn					■
Roslyn Grist Mill	Roslyn			■	■	■
Roslyn National Bank and Trust Co. Building	Roslyn					■
Roslyn Savings Bank Building	Roslyn					■
Roslyn Village Historic District	Roslyn			■	■	■
Samuel A. Warner House	Roslyn					■
Trinity Church Complex	Roslyn					■
Willet Titus House	Roslyn					■
Cedarmere-Clayton Estates	Roslyn Harbor		■	■	■	■
Clapham-Stern House	Roslyn Harbor		■	■	■	■
Clifton	Roslyn Harbor		■	■	■	■
Greenridge	Roslyn Harbor					■
Mudge Farmhouse	Roslyn Harbor					■
Springbank	Roslyn Harbor					■
Stephen & Charles Smith House	Roslyn Harbor				■	■
Willowmere	Roslyn Harbor					■
Roslyn House	Roslyn Heights					■
Sands Family Cemetery	Sands Point	■			■	
Central Hall	Sea Cliff					■
Crowell House	Sea Cliff					■
House at 103 Roslyn Ave	Sea Cliff					■

Table 11
Historic and Cultural Resources in Hazard Areas

Site Name	Community	Coastal Erosion	Wave Action	Flood (100 yr)	Flooding (surge)	Landslides**
House at 112 Sea Cliff Ave	Sea Cliff					■
House at 115 Central Ave	Sea Cliff					■
House at 137 Prospect Ave	Sea Cliff					■
House at 162 Sixteenth Ave	Sea Cliff					■
House at 173 Sixteenth Ave	Sea Cliff					■
House at 176 Prospect Ave	Sea Cliff					■
House at 18 Seventeenth Ave	Sea Cliff					■
House at 19 Locust Place	Sea Cliff					■
House at 195 Prospect Ave	Sea Cliff					■
House at 199 Prospect Ave	Sea Cliff					■
House at 207 Carpenter Ave	Sea Cliff					■
House at 240 Sea Cliff Ave	Sea Cliff					■
House at 285 Glen Avenue	Sea Cliff					■
House at 285 Sea Cliff Ave	Sea Cliff					■
House at 290 Eighth Ave.	Sea Cliff					■
House at 332 Franklin Ave	Sea Cliff					■
House at 362 Sea Cliff Ave	Sea Cliff					■
House at 378 Glen Ave	Sea Cliff					■
House at 52 Eighteenth Ave	Sea Cliff					■
House at 65 Twentieth Ave	Sea Cliff					■
House at 9 Locust Place	Sea Cliff					■
Sea Cliff Firehouse	Sea Cliff					■
Sea Cliff Village Hall, Library, and Museum Complex	Sea Cliff					■
St. Luke's Protestant Episcopal Church	Sea Cliff					■
Schenck-Mann House	Syosset					■
Pagan-Fletcher House	Valley Stream				■	
Wantagh Railroad Complex	Wantagh				■	
John S. Phipps Estate (Old Westbury Gardens)	Westbury					■

POPULATION IN HAZARD AREAS

People living, working, commuting through, and visiting Nassau County are other types of "assets" that have been evaluated. Population was included in the asset identification and characterization to determine jurisdictions with particularly high numbers of people living in hazard areas which, in turn, may benefit from enhanced and/or targeted public outreach activities as part of the hazard mitigation strategy.

Census 2010 data was used to update total numbers of population by town. Corresponding with the negligible population increase of .37% in Nassau County between 2000 - 2010, there were no appreciable shifts or changes in the population percentage data for each hazard. As such while the population data in Table 12 has been updated the percentage numbers have not been recalculated due to the fact that changes in their values are diminutive. Block-level GIS data for people working, commuting through, and visiting Nassau County communities was not readily available and thus was not incorporated in to the analysis at this time. If such information should become available in the future, the analysis could be modified accordingly during future updates of this plan.

Using GIS, population data was overlaid upon hazard area boundaries. In many cases, hazard area boundaries crossed through only a portion of a given Census block. Because data was not available to identify population distribution within a given Census block, in order to estimate population (residents) in hazard areas, it was assumed that population distribution within a given Census block was uniform and therefore the percentage of block size within the hazard area would be equivalent to the percentage of block population with that hazard area (i.e., 40 percent of a Census block's land area fell within the 100-year flood hazard area, it was assumed that 40 percent of the population for that block was also within the 100-year flood hazard area).

Using this methodology yielded the following results presented in the following tables. For earthquakes, severe weather, and extreme winds, the hazards are county-wide and therefore all assets could be impacted; thus, columns for these hazards have been excluded from the table.

Table 12 Percent Population in Hazard Areas Hempstead Area									
Jurisdiction	Total Population	Coastal Erosion ***	Wave Action	Flood 100 Yr	Flood Cat1 Surge	Flood Cat2 Surge	Flood Cat3 Surge	Flood Cat4 Surge	Landslides **
Atlantic Beach	1,891	2.16%	2.64%	11.44%	3.33%	83.37%	0.00%	0.00%	0.00%
Atlantic Beach West	0	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Baldwin	24,033	0.00%	0.00%	0.92%	0.72%	12.06%	10.32%	19.14%	0.00%
Baldwin Harbor	8,102	0.00%	0.91%	12.19%	12.38%	65.19%	0.00%	0.00%	0.00%
Barnum Island	2,414	0.00%	0.00%	20.28%	63.13%	16.40%	0.00%	0.00%	0.00%
Bay Park	2,212	0.00%	0.00%	36.95%	26.69%	52.18%	0.37%	0.00%	0.00%
Bellerose	1,193	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bellerose Terrace	2,198	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bellmore	16,218	0.00%	0.12%	14.60%	26.21%	30.35%	15.79%	17.82%	0.00%
Cedarhurst	6,592	0.00%	0.00%	7.37%	2.53%	25.76%	23.67%	29.93%	0.00%
East Atlantic Beach	2,049	13.59%	2.58%	34.90%	30.82%	60.16%	0.00%	0.00%	0.00%
East Garden City	6,208	0.00%	0.00%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%
East Meadow	38,132	0.00%	0.00%	0.30%	0.00%	0.00%	0.00%	0.00%	0.00%
East Rockaway	9,818	0.00%	0.00%	13.99%	1.88%	56.71%	14.51%	8.02%	0.00%
Elmont	33,198	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
Floral Park	15,863	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Franklin Square	29,320	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.62%	0.00%
Freeport	42,860	0.00%	0.00%	15.91%	20.61%	15.15%	21.13%	24.23%	0.00%
Garden City	22,371	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Garden City South	4,024	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Harbor Isle	1,301	0.00%	0.00%	30.72%	76.72%	17.70%	0.00%	0.00%	0.00%
Hempstead	53,891	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hewlett	6,819	0.00%	0.00%	0.42%	0.00%	19.26%	22.94%	26.60%	0.00%
Hewlett Bay Park	404	0.00%	0.00%	1.39%	2.21%	22.16%	11.39%	11.28%	0.00%

Table 12 Percent Population in Hazard Areas Hempstead Area									
Jurisdiction	Total Population	Coastal Erosion ***	Wave Action	Flood 100 Yr	Flood Cat1 Surge	Flood Cat2 Surge	Flood Cat3 Surge	Flood Cat4 Surge	Landslides **
Hewlett Harbor	1,263	0.00%	0.00%	3.83%	5.07%	47.84%	13.17%	2.11%	0.00%
Hewlett Neck	445	0.00%	0.03%	4.19%	8.71%	30.83%	29.80%	0.00%	0.00%
Inwood	9,792	0.00%	0.00%	4.67%	4.04%	50.04%	28.17%	11.31%	0.00%
Island Park	4,655	0.00%	0.00%	45.21%	39.67%	49.35%	0.00%	0.00%	0.00%
Jones Beach	0	0.00%	12.70%	42.41%	42.30%	0.00%	0.00%	0.00%	0.00%
Lakeview	5,615	0.00%	0.00%	0.00%	0.00%	0.00%	7.28%	15.64%	0.00%
Lawrence	6,483	0.00%	0.03%	6.19%	11.54%	29.34%	11.31%	26.49%	0.00%
Levittown	51,881	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Lido Beach	2,897	0.00%	4.75%	73.33%	50.29%	40.97%	0.00%	0.00%	0.00%
Long Beach	33,275	3.38%	7.62%	66.89%	42.63%	56.23%	0.00%	0.00%	0.00%
Lynbrook	19,427	8.52%	0.00%	0.00%	0.00%	10.39%	36.16%	39.53%	0.00%
Malverne	8,514	0.00%	0.00%	0.71%	0.00%	0.00%	0.64%	30.73%	0.00%
Malverne Park - Oaks	505	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%	0.00%
Merrick	22,097	0.00%	0.45%	7.10%	18.66%	34.78%	14.41%	15.17%	0.00%
New Hyde Park	9,712	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
North Bellmore	19,941	0.00%	0.00%	0.00%	0.00%	0.00%	0.19%	7.72%	0.00%
North Lynbrook	793	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	63.42%	0.00%
North Merrick	12,2722	0.00%	0.00%	0.53%	0.00%	0.00%	0.36%	7.20%	0.00%
North Valley Stream	16,628	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	4.22%	0.00%
North Wantagh	11,960	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.09%	0.00%
Oceanside	32,109	0.00%	0.01%	9.46%	20.08%	57.63%	10.97%	3.43%	0.00%
Point Lookout	1,219	6.91%	1.71%	43.88%	91.97%	0.00%	0.00%	0.00%	0.00%
Rockville Centre	24,023	0.00%	0.00%	0.38%	0.79%	5.70%	16.84%	28.58%	0.00%
Roosevelt	16,258	0.00%	0.00%	0.92%	0.00%	0.32%	0.68%	5.66%	0.00%
Salisbury	12,093	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Seaford	15,294	0.00%	0.12%	24.90%	16.58%	28.03%	16.96%	10.13%	0.00%
South Floral Park	1,764	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 12 Percent Population in Hazard Areas* Hempstead Area									
Jurisdiction	**Total Population**	**Coastal Erosion *****	**Wave Action**	**Flood 100 Yr**	**Flood Cat1 Surge**	**Flood Cat2 Surge**	**Flood Cat3 Surge**	**Flood Cat4 Surge**	**Landslides ****
South Hempstead	3,243	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
South Valley Stream	5,962	0.00%	0.00%	11.13%	16.09%	65.19%	0.00%	0.00%	0.00%
Steward Manor	1,896	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Uniondale	24,759	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.00%
Valley Stream	37,511	0.00%	0.00%	4.24%	3.75%	30.28%	21.47%	19.07%	0.00%
Wantagh	18,871	0.00%	0.03%	8.32%	7.73%	16.89%	13.16%	19.16%	0.00%
West Hempstead	18,862	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Woodmere	17,121	0.00%	0.00%	16.77%	13.26%	46.35%	10.65%	10.60%	0.00%
Woodsburgh	778	0.00%	0.00%	1.67%	4.33%	30.16%	5.62%	0.46%	0.00%
Totals	**911,479**	**0.40%**	**0.36%**	**7.14%**	**7.07%**	**15.31%**	**7.04%**	**8.51%**	**0.00%**

Table 12 Percent Population in Hazard Areas\ North Hempstead Area									
Jurisdiction	**Total Population**	**Coastal Erosion *****	**Wave Action**	**Flood 100 Yr**	**Flood Cat1 Surge**	**Flood Cat2 Surge**	**Flood Cat3 Surge**	**Flood Cat4 Surge**	**Landslides ****
Albertson	5,182	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	32.32%
Baxter Estates	999	0.00%	0.00%	2.24%	0.48%	1.02%	2.09%	3.72%	0.00%
Carle Place	4,981	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
East Hills	6,955	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.30%
East Williston	2,556	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.61%
Flower Hill	4,665	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	29.08%
Garden City Park	7,806	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Great Neck	9,989	0.00%	0.01%	0.21%	0.06%	0.03%	0.25%	0.37%	0.00%
Great Neck Estates	2,761	0.00%	0.03%	3.29%	1.67%	0.64%	1.63%	1.20%	0.00%
Great Neck Gardens	1,186	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Great Neck Plaza	6,707	0.00%	0.00%	0.33%	0.00%	0.00%	0.00%	0.00%	0.00%
Greenvale	1,094	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	70.91%
Harbor Hills	575	0.00%	0.00%	2.12%	0.36%	0.45%	1.47%	0.39%	0.00%
Herricks	4,295	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Kensington	1,161	0.00%	0.00%	0.20%	0.00%	0.06%	0.08%	0.03%	0.00%
Kings Point	5,005	3.70%	1.54%	5.21%	1.34%	1.56%	2.95%	3.77%	0.00%
Lake Success	2,934	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manhasset	8,080	0.00%	0.03%	0.11%	0.20%	0.14%	0.36%	0.57%	1.11%
Manhasset Hills	3,592	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manorhaven	6,556	0.00%	0.00%	8.56%	1.77%	2.54%	27.73%	31.74%	0.00%
Mineola	18,799	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Munsey Park	2,693	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.05%
New Cassel	14,059	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
North Hills	5,075	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.80%
North New Hyde Park	14,899	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Old Westbury	4,671	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	38.41%
Plandome	1,349	0.00%	0.05%	0.69%	0.10%	0.42%	0.86%	0.75%	0.00%
Plandome Heights	1,005	0.00%	0.67%	2.89%	0.64%	0.60%	3.88%	1.52%	0.00%
Plandome Manor	872	0.00%	0.60%	2.09%	0.85%	0.92%	3.00%	2.90%	0.00%
Port Washington	15,846	0.00%	0.10%	0.67%	0.07%	0.30%	1.05%	1.44%	11.28%

Table 12 Percent Population in Hazard Areas North Hempstead Area									
Jurisdiction	**Total Population**	**Coastal Erosion *****	**Wave Action**	**Flood 100 Yr**	**Flood Cat1 Surge**	**Flood Cat2 Surge**	**Flood Cat3 Surge**	**Flood Cat4 Surge**	**Landslides ****
Roslyn	2,770	0.00%	0.29%	1.72%	0.08%	0.06%	1.15%	2.09%	70.91%
Roslyn Estates	1,251	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	49.08%
Roslyn Harbor	1,051	0.00%	0.28%	0.90%	0.26%	0.41%	0.40%	0.65%	54.73%
Roslyn Heights	6,577	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	66.24%
Russell Gardens	945	0.00%	0.00%	0.25%	0.00%	0.00%	0.00%	0.00%	0.00%
Saddle Rock	830	0.00%	0.00%	2.03%	0.67%	0.29%	1.24%	0.74%	0.00%
Saddle Rock Estates	466	0.00%	0.00%	0.00%	0.00%	0.19%	1.41%	13.30%	0.00%
Sands Point	2,675	5.38%	0.45%	2.63%	0.94%	1.02%	1.06%	0.56%	5.43%
Searingtown	4,915	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.04%
Thomaston	2,617	0.00%	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.00%
University Gardens	4,226	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.61%	0.00%
Westbury	15,146	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.43%
Williston Park	7,287	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.12%
Totals	**220,257**	**0.29%**	**0.08%**	**0.68%**	**0.18%**	**0.21%**	**1.02%**	**1.38%**	**10.64%**

Table 12 Percent Population in Hazard Areas Oyster Bay Area									
Jurisdiction	**Total Population**	**Coastal Erosion *****	**Wave Action**	**Flood 100 Yr**	**Flood Cat1 Surge**	**Flood Cat2 Surge**	**Flood Cat3 Surge**	**Flood Cat4 Surge**	**Landslides ****
Bayville	6,669	4.98%	1.71%	42.90%	8.18%	29.27%	7.83%	4.98%	91.66%
Bethpage	16,429	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Brookville	3,465	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	38.54%
Centre Island	410	4.09%	5.71%	27.10%	6.98%	9.08%	9.20%	6.31%	83.89%
Cove Neck	286	0.00%	3.19%	7.16%	3.98%	2.47%	1.55%	1.27%	31.38%
East Massapequa	19,069	0.00%	0.00%	15.84%	2.91%	28.05%	29.58%	8.43%	0.00%
East Norwich	2,709	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	58.86%
Farmingdale	8,189	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Glen Cove	26,964	1.64%	0.14%	1.72%	0.32%	0.68%	0.54%	1.11%	91.24%
Glen Head	4,697	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	60.76%
Glenwood Landing	3,779	0.00%	0.10%	0.19%	0.00%	0.00%	0.04%	0.31%	77.72%
Hicksville	41,547	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.16%
Jericho	13,567	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	63.04%
Lattingtown	1,739	5.48%	0.35%	6.41%	1.27%	1.86%	1.52%	2.75%	56.29%
Laurel Hollow	1,952	0.00%	0.57%	0.72%	0.33%	0.23%	0.11%	0.13%	43.21%
Locust Valley	3,406	0.00%	0.00%	2.07%	0.65%	0.27%	0.34%	0.38%	62.86%
Massapequa	21,685	0.00%	0.00%	32.25%	11.35%	39.80%	10.74%	12.60%	0.00%
Massapequa Park	17,008	0.00%	0.00%	0.55%	0.95%	8.01%	18.02%	28.11%	0.00%
Matinecock	810	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	45.88%
Mill Neck	997	0.00%	1.23%	2.34%	0.51%	0.50%	0.67%	0.93%	44.12%
Muttontown	3,497	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	57.88%
North Massapequa	17,886	0.00%	0.00%	0.42%	0.00%	0.00%	0.01%	0.14%	0.00%
Old Bethpage	5,523	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Old Brookville	2,134	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	45.32%

Table 12 Percent Population in Hazard Areas Oyster Bay Area									
Jurisdiction	**Total Population**	**Coastal Erosion *** **	**Wave Action**	**Flood 100 Yr**	**Flood Cat1 Surge**	**Flood Cat2 Surge**	**Flood Cat3 Surge**	**Flood Cat4 Surge**	**Landslides ** **
Oyster Bay	6,707	0.00%	1.87%	3.03%	0.36%	3.68%	5.69%	3.93%	73.16%
Oyster Bay Cove	2,197	0.00%	0.16%	0.40%	0.05%	0.18%	0.18%	0.20%	41.60%
Plainedge	8,817	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Plainview	26,217	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.13%
Sea Cliff	4,995	0.00%	0.35%	1.00%	0.18%	0.62%	0.59%	0.72%	69.47%
South Farmingdale	14,486	0.00%	0.00%	1.36%	0.00%	0.00%	0.00%	0.00%	0.00%
Syosset	18,829	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	72.42%
Upper Brookville	1,698	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	36.31%
Woodbury	8,907	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	70.50%
Totals	**317,270**	**0.27%**	**0.14%**	**4.19%**	**1.15%**	**5.10%**	**3.45%**	**2.88%**	**30.65%**

Source: Nassau County GIS Database

3.3 ESTIMATED DAMAGES IN HAZARD AREAS

ESTIMATED DAMAGES IN HAZARD AREAS

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Methodology

The team attempted to assess vulnerability to various hazards within the limitations of the available data, where generally accepted measures of vulnerability are established. Parcel data included assessed values for land and total assessed values; assessed values for improvements were calculated by subtracting the land value from the total value. Expanding upon the parcel data in the county's GIS to include such information as building square footage, year built, type, foundation type, and condition, would allow for a more accurate assessment of vulnerability. Including market values would also be helpful. Therefore, the Planning Group has considered actions in this regard. Please see further sections of this plan for additional information on actions considered and ultimately selected.

Estimated Damages – Coastal Erosion

Sufficient data was not available at the time of the study to estimate coastal erosion damages. At this time, vulnerability is being expressed as the value of improvements in the current mapped CEHA as presented in the "Identification and Characterization of Assets" section of this plan.

Estimated Damages – Wave Action

Sufficient data was not available at the time of the study to estimate damages due to wave action. At this time, vulnerability is being expressed as the value of improvements in the current mapped V-zone. In order to employ methodologies for estimating damages due to flooding in V-zones, specific information is required for buildings such as first floor elevation, type of construction, foundation type, and details on any existing protective features. This data was not available as a part of the County GIS during this study. In general terms, estimated damages due to wave action could be severe, but are most likely only in the portions of the coastal communities with mapped V-zones.

Estimated Damages – Earthquakes

As stated previously in the plan in the Profile section, according to the Earthquake Hazard Map of New York State, there is a 10 percent chance over 50 years that an earthquake with a PGA of greater than 3%g will be centered within Nassau County and/or its participating jurisdictions. This earthquake, if it were to occur, would likely have associated with it light to moderate perceived shaking and little to no damage. Therefore, a full earthquake loss estimation was not conducted at this time.

Examples of the types of damages that could be observed include:

- Felt indoors by many, outdoors by few during the day
- At night, some awakened
- Dishes, windows, doors disturbed and possibly broken
- Walls make cracking sounds
- Unstable objects could be overturned
- Sensation like heavy truck striking building
- Standing automobiles rocked noticeably

For earthquakes, the hazard is uniform county-wide and therefore all assets could be impacted. At this time, vulnerability is being expressed as the assessed value of improvements in the mapped earthquake hazard area.

HAZUS-MH was originally used to estimate building exposure and potential earthquake losses for various return periods (2500-, 1000-, 500-, and 250-years) in each of the State's counties and data. Results of the State's analysis for Nassau County are presented in the following table. The term "total exposure" is used in HAZUS; this represents an estimation of building replacement value, using estimates for typical buildings in a given census block.

Table 13
Earthquake Loss Estimation For Nassau County

Community	Total Exposure	2500-Year Losses	1000-Year Losses	500-Year Losses	250-Year Losses
Nassau County, per HAZUS	$109,313,341,000	$5,723,355,000	$1,583,463,000	$429,131,000	$84,883,000
Percentage	=Losses/Exposure *100	5.24%	1.45%	0.39%	0.08%

Estimated Damages – Flood

Sufficient data was not available at the time of the study to estimate damages due to flooding. At this time, vulnerability is being expressed as the value of improvements in the current mapped flood hazard areas as presented in the "Identification and Characterization of Assets" section of this plan. While FEMA methodologies do exist to estimate damages due to flooding, specific information is required for buildings in order to employ these methodologies, such as first floor elevation, type of construction, foundation type, and details on any existing protective features. This data was not available as a part of the County GIS during this study.

<u>Flooding (for the FEMA Mapped 100-Year Floodplain: Zones A, AE, V, VE)</u>. In general terms, estimated damages due to flooding could be severe, but are most likely only in the portions of the communities with mapped 100-year floodplains. On a county-wide basis roughly 39,510 acres fall within FEMA Q3-mapped 100- year flood zones. Out of a total of 602 emergency facilities, 43 fall within mapped 100-year flood zones. Of 37 utilities, seven are within a mapped 100-year flood zone. Twenty-one (out of a total of 165) historic and cultural resources could be impacted during a 100-year flood. And, of the total population of Nassau County approximately 53,000 or 4 percent live within mapped 100-year flood zones.

<u>Storm Surge Flooding (Category 1, 2, 3 and 4 Hurricanes).</u> Based on mapping in the 1993 Hurricane Evacuation study, in general terms, estimated flood damages due to storm surge for even a Category 1 hurricane could be severe and widespread, particularly if the storm were to make landfall at high tide. Flood damages due to storm surge are most likely in communities with mapped surge zones. Table 14 summarizes exposure in the various surge zones, on a county-wide basis.

It is worthy to note that the percent of improved property, in terms of cumulative assessed value, has dropped consistently throughout the SLOSH zones (Cat 1 – 4) between 2007 and 2014. This trend may be due to a combined effect of repressed property coastal property values following Irene and Sandy, as well as an increase in assessed value generated from new higher-density residential and commercial development further inland.

Table 14
Summary of Assets Exposed to Storm Surge

	Total, Countywide	Category 1	Category 2	Category 3	Category 4
Number of Parcels	416,419	29,827	81,311	105,437	133,717
Percent of Land	--	12.39%	20.71%	25.69%	29.32%
Assessed Value of Improved Property	$1,072,020,081	$40,323,347	$112,598,320	$174,031,557	$221,231,424
Percent of Improved Property (by assessed value)	--	3.76%	10.50%	16.23%	20.63%
Number of Emergency Facilities	602	31	104	166	222
Number of Utilities	37	9	15	18	20
Number of Historic and Cultural Resources	165	9	24	30	35
Estimated Population	1,339,532	44,692	157,226	240,375	321,732
Percent of Population	--	3.33%	11.73%	17.94%	24.01%

Sources: US Census Bureau, 2010 Census Files, Nassau County GIS 2014 Assessment Data, NOAA Slosh GIS

National Flood Insurance Program (NFIP)

The Flood Insurance Administration (FIA) in its management of the National Flood Insurance Program (NFIP) collects and stores a vast quantity of information on insured structures, including the number and location of flood insurance policies, number of claims per insured property, dollar value of each claim and aggregate value of claims, repetitive flood loss properties, etc. The NFIP also tracks properties that file several claims of a certain value over a specific period of time. Because the definition for these properties changes from time to time, no definition will be offered. Suffice it to say, properties meeting any of the definitions are termed "repetitive loss properties." FEMA mitigation efforts that are directed at NFIP-insured structures target repetitive loss properties as a means of reducing payout from the NFIP and reducing the impact on the insured and the community. Repetitive Loss Properties presents the total number of repetitive flood loss properties (RFLP) and repetitive dollar losses in the NFIP by municipality. Nassau County OEM will continue to disseminate information regarding repetitive loss and severe repetitive loss properties in as depicted in the New York State Plan so that jurisdictions can gauge their risks, both in terms of their own community and with regard to their neighbors. Nassau County Repetitive Loss Data is contained in Appendix E of this plan.

Estimated Damages – Landslides

Sufficient data was not available at the time of the study to estimate damages due to landslides. At this time, vulnerability is being expressed as the value of improvements in the current mapped landslide hazard area (of high susceptibility, low incidence) presented in the "Identification and Characterization of Assets" section of this plan.

On a county-wide basis 54,814 acres of land within the county fall within mapped landslide hazard areas of high susceptibility and low incidence. The assessed value of improved property on these parcels is equal to nearly $138 million. Out of a total of 602 emergency facilities, 89 fall within mapped landslide hazard areas of high susceptibility and low incidence. Of 37 utilities, five are within a mapped landslide hazard area. Eighty-three (out of a total of 165) historic and cultural resources could be impacted by a landslide. Approximately 9.46 percent of the Nassau County population live within a mapped landslide hazard area.

Estimated Damages – Drought

Crop failure is one common effect of drought. According to the 2002 Agriculture Census for Nassau County, only 495 acres in Nassau County represents cropland (0.77 square miles). Of this, 483 acres (0.75 square miles) are used for harvesting crops and 12 acres (0.02 square miles) are used for pastureland or grazing. Losses to crops in Nassau County would be minimal.

Water supply shortages are a second effect of drought. Nassau County gets most of its water from underground aquifers. Because underground aquifers are fairly resistant to the impacts of short- term droughts (the most likely type of drought to occur in Nassau County), the expected likelihood of future losses associated with reductions in water supply would be low.

A third common effect of drought is fish and wildlife mortality. Because so much of the land area in Nassau County is developed, fish and wildlife habitat is fairly low and therefore losses to fish and wildlife would likely be low.

A fourth common effect of drought is wildfires. Wildfires are not likely to occur in Nassau County. Small brushfires are possible, however. The expected likelihood of future losses during a drought as a result of brushfires is relatively low on a county or community level. However, losses in the particular location of the fire could be quite severe, particularly in areas where transportation or utilities are located.

Estimated Damages – Extreme Winds

Sufficient data was not available at the time of the study to estimate damages due to extreme winds. At this time, vulnerability is being expressed as the value of improvements exposed to the hazard, as presented in the "Identification and Characterization of Assets" section of this plan.

While FEMA methodologies do exist to estimate damages due to extreme wind, specific information is required for buildings in order to employ these methodologies, such as first floor elevation, type of construction, foundation type, and details on any existing protective features. This data was not available as a part of the County GIS during this study.

Estimated Damages – Severe Weather Events: Hurricanes/Tropical Storms, Tornadoes, Winter Storms/Ice Storms

Severe weather 'events' have certain hazards associated with them, as discussed throughout the Hazard Profile section of this plan. Please see Estimated Damages for the specific hazards associated with a given event.

Because in many cases sufficient information was not available to perform detailed assessments of estimated losses for a certain hazard, the following table is a useful tool to summarize vulnerability in terms of assets exposed. Data for hazards marked with an * is from the original 2007 plan and will be updated from HAZUS to be performed in the near future.

Table 15 Summary of Assets Exposed to Identified Hazards						
Hazard	**Percent of Improved Property Exposed**	**Number of Emergency Facilities Exposed**	**Number of Utilities Exposed**	**Number of Historic/Cultural Resources Exposed**	**Population Exposed**	**Percent Area Exposed**
Coastal Erosion (mapped CEHA)*	2.1%	2	0	5	5,689	1.49%
Wave Action (100yr)*	1.6%	0	1	9	4,100	1.35%
Earthquakes*	100%	602	37	165	1,653,549	100%
Flooding (100yr)	12.84%	43	7	21	52,698	17.55%
Surge, Cat1	3.76%	31	9	9	44,692	12.39%
Surge, Cat2	10.50%	104	15	24	157,226	20.71%
Surge, Cat3	16.23%	166	18	30	240,375	25.69%
Surge, Cat4	20.63%	222	20	35	321,732	24.01%
Landslides*	9.53%	89	5	83	156,542	30.19%
Drought*	100%	602	37	165	1,339,532	100%
Extreme Winds*	100%	602	37	165	1,339,532	100%

Sources: US Census Bureau, 2010 Census Files; Nassau County GIS, NOAA SLOSH GIS

3.4 SUMMARY OF LAND USES AND DEVELOPMENT TRENDS IN HAZARD AREAS

The *Nassau County Comprehensive Plan* is a guide for the overall future growth and development of the County in support of local land use planning and decision-making. It was first prepared in 1998; a draft update was prepared in 2010. The Comprehensive Plan was reviewed for information regarding land uses and development trends, and is the source of information provided within this section.

Historic

The most significant surge of population and development in Nassau County occurred after World War II. Veterans returned home and sought safe, affordable, pleasant communities in which to raise their families. New housing developments began to proliferate throughout Nassau County at an astounding rate. The construction of east-west oriented roads and parkways during the 1920-1940s made much of Nassau County accessible by automobile. Many new land uses were oriented towards automobile access, and land use developments which did not need the density of uses required by other modes of transportation. The availability and construction of centralized water and sewer services enable an intensification of land use development throughout the central and southern portion of the County – including office parks, industrial uses and other higher density commercial uses. Most of the north shore communities relied upon (and continue to rely on) wells and septic systems which were not able to support high concentrations of land use development.

By the 1950, Nassau County held the distinction of having the largest population and being the fastest-growing suburban county in the nation. Since the late 1950s, building activity has slowed considerably. The County's current land use arrangement largely reflects the development pattern of its past. Many of the north shore communities continue to maintain strict zoning and land use regulations which limit land use densities. These areas also continue to lack centralized sewer systems which can support more intensive development. The central and southern portions of the County have an established roadway and infrastructure system which continue to support a greater intensification of land uses.

Existing Land Use

Nassau County contains a wide variety of land uses and densities. Generally, the north shore communities consist of low density residential uses, supplemented by small-scale commercial and office uses, typically located in villages. In contrast, the central and southern portions of the County tend to be more diverse both in terms of types and densities of land uses. As a whole, the County land area is generally comprised of commercial, industrial, institutional, residential, public and semi-public areas, facilities, sewage systems and parklands, including critical natural resources such as wetlands, aquifers, shorelines, water bodies, open spaces, vegetation and nature preserves.

Land use within the County is predominantly single-family residential housing, commercial and industrial. Because many of the communities within Nassau County are built-out, one of the opportunities to create new housing and mixed uses is in the redevelopment of vacant or underutilized parcels.

Residential development is the predominant land use in Nassau County. In 2009, approximately 60% of the total land area in the County was classified as residential. Singe-family homes represent the most dominant housing type within the overall residential land use category, followed by two-family and multi-family housing units. Since households in Nassau County have higher than average disposable incomes, market research generally supports the need for and sustainability of additional retail development.

Five percent of the total parcels in the County were classified as commercial uses, excluding commercial uses with a residential component, such as apartments.

The land area in the County which is devoted to office uses is expected to increase somewhat in the future due to growth in the County's employment, combined with the further expansion of service industries in the economy and the relocation of companies from New York City to the suburbs. Demand for such office space should be modest and is not likely to increase until existing office space has been more fully utilized and vacancy rates decline.

While most industrial areas are scattered throughout the County, several concentrations of industrial activity are prevalent in communities such as: Freeport, Plainview, Bethpage, New Cassel, Floral Park, Glen Cove, Mineola and Port Washington.

Future Development Trends - Overview

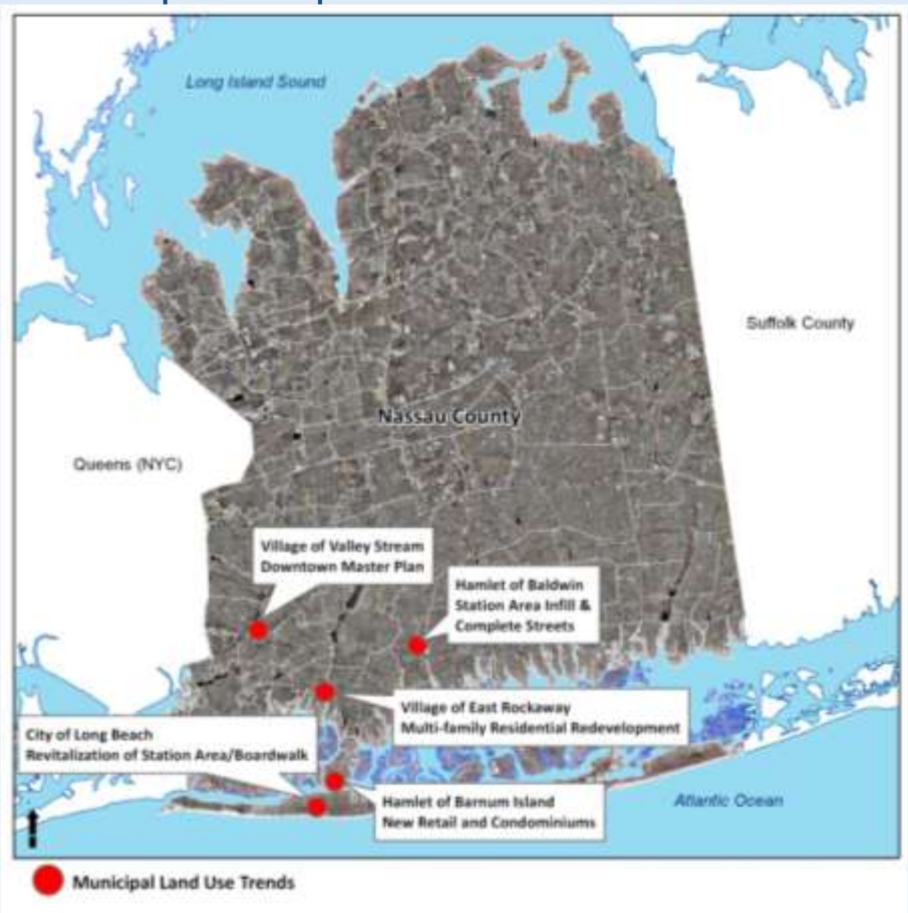
The future land use plan for Nassau County is based on the County's existing and established downtowns and Centers, preferred development patterns, existing and proposed transportation systems and environmental features in the County. For the future, the County Comprehensive Plan recommends, in general:

- Higher intensity development generally located in areas which currently have a more dense or suburbanized character and contain adequate infrastructure, especially where such areas have access to mass transit, major roads, public sanitary sewers and water supply. (Downtown Center revitalization/development)
- Development of vacant parcels located adjacent to transit
- Redevelopment of currently developed parcels (wherein a site with existing buildings and/or other infrastructure is developed with new uses, new buildings, new infrastructure, or new activities)
- Redevelopment of Brownfields sites
- Transit Oriented Development
- Development of the Nassau Hub
- Grumman Property development
- Increased retail redevelopment to complement new residential development in transit served areas. Households in Nassau County have higher than average disposable incomes, and market research generally supports the need for and sustainability of additional retail development.
- Preservation of open space and sensitive environmental lands (tidal wetlands, woodlands, steep slopes)

<u>Municipal and Regional Land Use Plans and Initiatives</u>

Several local municipalities along the south shore of Nassau County have undertaken planning initiatives and implemented zoning changes to accommodate growth and development, in light of the national recession and stale real estate market. The Villages of East Rockaway, Valley Stream, the City of Long Beach and the Hamlet of Baldwin in the Town of Hempstead have all taken steps to attract and incentivize new residential and commercial development concentrated around the respective Long Island Rail Road (LIRR) station as depicted in the figure below. Redevelopment in these areas is being driven by the unmet need for young adult and senior housing, increasing the property tax base and creating places to live that have convenient access to entertainment, recreation and jobs. In general, the following projects and initiatives all constitute the components of Transit-Oriented Development (TOD).

Map of Municipal Land Use Plans and Initiatives



Source: Nassau County DPW

The Village of East Rockaway is currently considering proposals for the redevelopment of several parcels adjacent to the LIRR East Rockaway Station and Mill River. Proposals seek to convert underutilized retail and warehouse uses into multiple-family housing and complementary retail amenities. While the area is prone to tidal flooding, its proximity to the LIRR East Rockaway Station (access to NYC) and the central business district along Atlantic Avenue makes it attractive for redevelopment.

The Village of Valley Stream recently adopted a downtown master plan that seeks to incentivize new multi-family residential development adjacent to the LIRR Valley Stream Station, also known as downtown Valley Stream. Recently, two new multi-family developments have been constructed totaling over 300 units. Both projects are within a quarter-mile from the LIRR Valley Stream Station and are walkable to the Rockaway Avenue commercial district. The Village expects additional residential development to occur within the station area, particularly through the conversion of underutilized municipal parking fields.

The City of Long Beach has undergone a major transformation in terms of land use and development, particularly in the central part of the City. Many buildings along and just inland from the boardwalk have been either expanded or rebuilt to accommodate rental and ownership residential units. In addition, formerly vacant and single-family parcels along East and West Broadway have been the site of new multi-story residential developments in the range of 20-40 units/acre. Proximity to the ocean, the Park Avenue central business district and the LIRR Long Beach Station has been the driver of redevelopment in this area of the City. This redevelopment activity is consistent with the recommendations set forth in the City's 2007 Comprehensive Plan.

The Hamlet of Baldwin, Town of Hempstead, has been the subject of several efforts by the Town, County and the local civic organization to revitalize and redevelopment one mile stretch of Grand Avenue between Merrick Road to the south and Milburn Avenue to the north. The area consists of several large vacant and underutilized parcels that are being recommended by the local civic organization for multi-family residential development. The County is also considering a traffic calming and complete streets project along Grand Avenue that would further attract developers to the area. Redevelopment in Baldwin will rely on continued coordination between the Town, the County and local stakeholders.

The Hamlet of Barnum Island, Town of Hempstead, has experienced a conversion of approximately 10 acres of waterfront property adjacent to Reynolds Channel from catering and nightlife-related uses to retail and residential condominiums. The Town has recently approved the change of zone to allow for multiple family residential development in this area. While the land use in this area is changing, it is generally consistent with existing retail along Austin Boulevard and residential condominium development directly to the east. The property is also within a quarter mile of the LIRR Island Park Station.

Future Development Trends – Coastal Erosion.

Development within mapped CEHAs is currently regulated because in these areas buildings and structures could be damaged by erosion and flooding. NYCRR Part 505 provides procedural requirements for development, new construction, and erosion protection structures.

The Nassau County Planning Commission had previously indicated that there has been, and continues to be, a high demand for shorefront and canal areas, where development and redevelopment pressures are high for multi-family dwellings (such as townhouses and row houses). This means that over time, assets at risk in coastal erosion hazard areas could increase given existing regulations and development trends. However, the jurisdictions which were noted as tending to have the most new development were not communities with mapped CEHAs, with the exception of the City of Long Beach. And, while an increased number of assets could be susceptible, they will be built to a code that will offer a certain degree of protection from most frequent events.

Vacant parcels in hazard areas could theoretically be developed in the future under existing regulations. It is important to note that many of the parcels that are within the CEHA are either municipal parkland or private summer beach-club/cabana establishments. While municipal parkland may not be converted without two sessions of the New York State Legislature, private beach clubs are susceptible to redevelopment due to declining membership and revenue.

Future Development Trends – Wave Attack

Development within mapped V-zones is currently regulated for communities participating in FEMA's National Flood Insurance Program.

The Nassau County Planning Commission had previously indicated that there has been, a high demand for shorefront and canal areas, where development and redevelopment pressures are high for multi-family dwellings (such as townhouses and row houses). This means that over time, assets at risk in wave action hazard areas could increase given existing regulations and development trends. However, the jurisdictions which were noted as tending to have the most new development were not communities with mapped V-zones. And, while an increased number of assets could be susceptible, they will be built to a code that will offer a certain protection from most frequent events.

Future Development Trends – Earthquake

The earthquake hazard area encompasses the entire County and is uniform from one jurisdiction to the next. Therefore, future development trends for the earthquake hazard area would be the same as those county-wide, as discussed under "Overview" earlier in this section.

Softer soils can exacerbate the effects of earthquakes. Nassau County contains soil classifications B through E. Class B soils have a moderately low likelihood of amplifying the effects of an earthquake. Class C soils and Class D soils both have a moderate likelihood of amplifying the effects of an earthquake. Areas of Class E soils (soft soil, including fill, loose sand, waterfront, or lake bed clays) are most likely to amplify the effects of an earthquake. Vacant parcels in these areas could theoretically be developed in the future under existing regulations. The New York State Building Code does have provisions for earthquake resistant design for new construction. While an increased number of assets could be susceptible, they will be built to a code that will offer a certain protection from most frequent events.

Future Development Trends – Flood

Flood hazard areas (for flooding and storm surge) are often areas where development pressures are high, particularly in areas such as Nassau County where the amount of undeveloped land is small and the density of development is high. Individuals, and larger developers, often look toward land along rivers, canals, bays, and the ocean for development because of the passive and active recreational opportunities that they offer.

Development within mapped flood hazard areas is currently regulated for communities participating in FEMA's National Flood Insurance Program.

Through coordination in preparation of this mitigation plan, the Nassau County Planning Commission indicated that there continues to be, a high demand for shorefront and canal areas, where development and redevelopment pressures are high for multi-family dwellings (such as townhouses row houses). This means that over time, assets at risk in flood hazard areas could increase given existing regulations and development trends. Jurisdictions which were noted by the Commission as tending to have the most new development were south shore areas of Freeport, East Rockaway, Oceanside, Bellmore, Merrick and Wantagh, all of which have FEMA-mapped flood hazard areas. While an increased number of assets could be susceptible, they will be built to a code that will offer a certain protection from most frequent events.

Since Tropical Storm Irene and Superstorm Sandy, many of the municipalities mentioned above have amended their zoning and building codes to discourage development within the 100yr flood plain. New multiple-family residential development still planned or under construction in these areas will be designed to meet minimum flood elevations and in many cases, will provide several feet of freeboard as a precaution. The County and south shore municipalities also continue to review privately-owned vacant parcels along the waterfront for preservation. As an example, Nassau County, under its 2006 Environmental Bond Act Program, purchased 4 acres of private undeveloped waterfront land in south Baldwin to aid in wetland restoration efforts and provide flood control/waive attenuation for the adjacent single-family residential neighborhood. If not preserved, the property would of yielded 20 additional single-family homes that would have been severely impacted by recent storm events.

Future Development Trends – Landslides

In Nassau County, the mapped landslide hazard area (high susceptibility, low incidence) covers roughly one-third of the land in the northern part of Nassau County in the Towns of North Hempstead and Oyster Bay. There are no mapped areas of high susceptibility within the Town of Hempstead. Many communities within the mapped area of high landslide susceptibility have previously adopted steep slope ordinances, establishing requirements for new construction that will offer a certain degree of protection from most likely events.

Future Development Trends – Drought

The drought hazard area encompasses the entire County and is uniform from one jurisdiction to the next. Therefore, future development trends for the drought hazard area would be the same as those county-wide.

Future Development Trends – Extreme Winds

The wind hazard area encompasses the entire County and is uniform from one jurisdiction to the next. Therefore, future development trends for the wind hazard area would be the same as those county-wide.

Maximum sustained wind speeds are estimated to be approximately 10-20 miles per hour higher in southern Nassau County than in northern Nassau County. While northern areas of the county have more vacant land, development pressures have tended to be higher along southern areas of the County so it is likely that future development in the wind hazard area will increase, and will increase to the greatest extent in areas in southern Nassau County. However, new development will be built to a code which provides some degree of protection from the effects of high winds. As a result of Superstorm Sandy, the County will be reviewing its list of approved street trees and plantings to determine if more wind-resistant species can be utilized. The findings of this review will be shared with all municipalities.

3.5 HAZARD PROFILES

Coastal Erosion

Erosion is defined as the group of natural processes by which material is worn away from the earth's surface. According to the U.S. Geological Survey, high waves and strong ocean currents work to erode coastlines. Waves work to suspend smaller particles, and dislodge larger particles. These particles then work with the waves to mechanically wear down other surfaces. Note that while wave action is a cause of erosion, it is also a unique hazard, addressed separately in this plan.

Coastal erosion processes are expedited during storm periods, when wave action is high and water levels and coastal currents tend to increase rapidly. Over time, erosive forces acting upon coastal shorelines may result in a landward retreat of the shoreline.

Erosion is only one factor contributing to net shoreline change over time. At the same time that erosion is working to wear away a shoreline, the process of accretion (the deposition of sediments) works to build it back up. When erosion rates exceed accretion rates, a horizontal retreat of the shoreline is observed. The converse is also true. And, when erosion rates and accretion rates are equal, the shoreline is said to be 'stable.'

Erosion rates vary over time. When considering erosion hazards at any location, it is important to note that any year's observed erosion rate could be reflective of a high occurrence of severe storms in that particular year. A beach that may have been eroding one year could accrete the next. For a more accurate representation of whether the overall trend in shoreline change at any location is eroding, accreting, or is stable, it is important to expand the period of observation and consider long-term rates.

Location – Coastal Erosion

Coastal erosion is an ongoing process for any community with coastal frontage. There are 188 miles of coastline in Nassau County. Nassau County's entire northern shoreline is exposed to coastal erosion from the Long Island Sound. The north shore is characterized by an irregular shoreline and includes high bluffs, inlets, bays and harbors.

The County's south shore is exposed to the effects of coastal erosion from the Atlantic Ocean and the waters of its many back bays. Most of Nassau County's south shore is offered some degree of protection by its barrier beaches and tidal wetlands in the back bay areas; however, erosion has still been a historic problem in some back bay areas along the south shore.

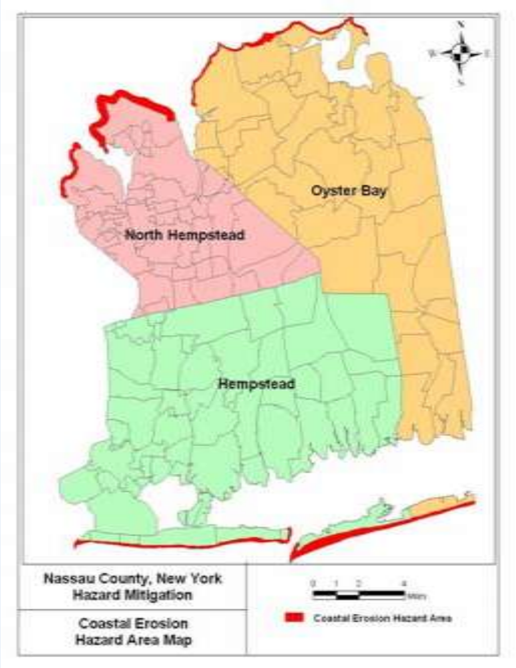
The New York State Department of Environmental Conservation Coastal Erosion Management Unit administers the state's Coastal Erosion Hazard Area (CEHA) management and regulatory programs. According to the New York State Hazard Mitigation Plan (2011), DEC has estimated that a significant portion of Long Island's coastline is in high erosion hazard areas. Due to the erosion-prone nature of parts of the New York coastline, the Coastal Erosion Hazard Areas Act (CEHA) (Article 34 of the Environmental Conservation Law) regulates construction in areas where buildings and structures could be damaged by erosion and flooding. NYCRR Part 505 provides procedural requirements for development, new construction, and protection structures.

The responsibilities for NYSDEC regarding towns, counties, and regulation of coastal erosion hazard areas are defined by these regulations. Towns within an area determined by NYSDEC are required to submit erosion hazard area ordinances for approval and public review. Counties can submit erosion hazard area regulations upon failure of a town to do so. NYSDEC enforces the regulations if the city and county do not provide CEHA regulations. The standards and criteria for erosion protection structures are based on a 30-year life of the structure or system. The Commissioner of NYSDEC is required to review the CEHA maps every 10 years and after the occurrence of major events, both human and natural, including coastal storms. If the CEHA boundary changes by 25 feet or more, the maps must be revised. In addition, NYSDEC has the authority to revoke certification of local CEHA management programs, if local administration is not consistent with statewide minimum standards, and to assert regulatory jurisdiction over these areas.

There are two categories of areas regulated by the CEHA:
1. Natural Protective Features (NPFs)
2. Structural Hazard Areas (SHAs).

- NPFs include: the near shore, beaches, bluffs, primary dunes, and secondary dunes.
- SHAs include: areas landward of the NPFs and are found on shorelines which have a demonstrated long-term average annual recession rate of one foot per year or greater. The SHA is determined by multiplying the recession rate times 40 and is measured from the landward limit of the NPF. If the recession rate is less than one foot per year or cannot be accurately established, then there is no SHA.

Both regulated areas are depicted on CEHA maps, which depict the landward limit of the NPFs and SHAs and indicate the recession rate in feet per year, where applicable. The following figure illustrates the location of mapped Coastal Erosion Hazard Areas in Nassau County.



NYSDEC Coastal Erosion Hazard Areas

North shore communities with mapped CEHA zones are:

Bayville (Oyster Bay Area)
Centre Island (Oyster Bay Area)
Glen Cove (Oyster Bay Area)
Kings Point (North Hempstead Area)
Lattingtown (Oyster Bay Area)
Locust Valley (Oyster Bay Area)
Sands Point (North Hempstead Area)

South shore barrier island communities with mapped CEHA zones are:

Atlantic Beach (Hempstead Area)
Atlantic Beach West (Hempstead Area)
East Atlantic Beach (Hempstead Area)
Jones Beach (Hempstead Area)
Lido Beach (Hempstead Area)
Long Beach (Hempstead Area)
Point Lookout (Hempstead Area)
Tobay Beach Park (Oyster Bay Area)

There are no south shore mainland communities with mapped CEHA zones.

New York State administers the CEHA in the City of Long Beach, Town of Oyster Bay, and Village of Center Island while local jurisdictions administer the CEHA in Glen Cove, Town of Hempstead, Village of Atlantic Beach, Village of Bayville, Kings Point, Lattingtown, and Sands Point.

Extent – Coastal Erosion

Coastal erosion is more significant in north shore and south shore barrier island communities than for south shore mainland communities because of the protective effects of the barrier island. Nassau County's northern shoreline is exposed to coastal erosion and wave action from the Long Island Sound. The north shore is characterized by an irregular shoreline, with many inlets, bays and harbors. Generally sandy beaches are typically backed by high bluffs. The US Army Corps of Engineers New York District "North Shore of Long Island, New York, Storm Damage Protection and Beach Erosion Control reconnaissance Study" (September 1995) notes that historic erosion on the north shore has caused the loss of protective coastal structures, erosion of beaches and bluffs, and associated damages to buildings and roads. The Corps also notes that erosion is dominant along the north shore, with average rates of roughly 1 to 2 feet per year, and only isolated pockets of accretion. It is also explained in this same report that most shoreline recession, particularly bluff erosion, tends to be associated with storms.

The County's south shore is exposed to the effects of coastal erosion and wave action from the Atlantic Ocean and the waters of its many back bays. While much of Nassau County's south shore is offered some degree of protection by its barrier beaches and tidal wetlands in the back- bay areas, erosion and wave action have still been a historic problem on the south shore. In addition to natural affects such as offshore topography, erosion on the south shore is affected by various jetties and groins. Information on the New York Sea Grant web site notes that over the past one hundred years, the average erosion rate along much of Long Island's south shore has been on the order of one to two feet per year (however, this average can have a degree of error of anywhere from -6 feet to + 10 feet) while some of the highest erosion rates, which can exceed 20 feet a year, have been observed near stabilized inlets or stone groins.

Acreage and number of affected parcels was determined by using GIS to overlay a best-estimate line representing the mapped CEHA with the County parcel data. For the purposes of this hazard mitigation planning project, an attempt was made to translate the approximate location of the CEHA from the hard copy maps into the County's GIS for more efficient viewing, sharing, and estimation of assets within the CEHA. This data is a best-estimate, but is strictly an estimate using this rudimentary methodology. Results are presented in the following table.

Table 16
Estimated Parcel Acreage in the NYSDEC Mapped CEHA

Community	Estimated Acreage of CEHA- affected Parcel
Atlantic Beach	96
Atlantic Beach West	32
Bayville	183
Bayville Unincorporated	38
Centre Island	28
East Atlantic Beach	46
Glen Cove	73
Jones Beach	750
Kings Point	194
Lattingtown	166
Lido Beach	307
Locust Valley	121
Long Beach	271
Point Lookout	154
Sands Point	1,185
Tobay Beach	860

Nassau County's northern shoreline is exposed to coastal erosion and wave action from the Long Island Sound. The north shore is characterized by an irregular shoreline, with many inlets, bays and harbors. Generally sandy beaches are typically backed by high bluffs. The US Army Corps of Engineers New York District "North Shore of Long Island, New York, Storm Damage Protection and Beach Erosion Control reconnaissance Study" notes that historic erosion on the north shore has caused the loss of protective coastal structures, erosion of beaches and bluffs, and associated damages to buildings and roads. The Corps also notes that erosion is dominant along the north shore, with average rates of roughly 1 to 2 feet per year, and only isolated pockets of accretion. It is also explained in this same report that most shoreline recession, particularly bluff erosion, tends to be associated with storms.

The County's south shore is exposed to the effects of coastal erosion and wave action from the Atlantic Ocean and the waters of its many back bays. While much of Nassau County's south shore is offered some degree of protection by its barrier beaches and tidal wetlands in the back bay areas, erosion and wave action have still been a historic problem on the south shore. In addition to natural affects such as offshore topography, erosion on the south shore is affected by various jetties and groins. Information on the New York Sea Grant web site notes that over the past one hundred years, the average erosion rate along much of Long Island's south shore has been on the order of one to two feet per year (however, this average can have a degree of error of anywhere from -6 feet to + 10 feet) while some of the highest erosion rates, which can exceed 20 feet a year, have been observed near stabilized inlets or stone groins.

Acreage and number of affected parcels was determined by using GIS to overlay a best-estimate line representing the mapped CEHA with the County parcel data. For the purposes of this hazard mitigation planning project, an attempt was made to translate the approximate location of the CEHA from the hard copy maps into the County's GIS for more efficient viewing, sharing, and estimation of assets within the CEHA. This data is a best-estimate, but is strictly an estimate using this rudimentary methodology

Coastal erosion becomes most severe during storm periods, when water levels, wave action, and coastal currents tend to increase rapidly. The degree of severity can be marked, but will vary based upon several factors, including: soil properties, orientation of the shoreline, distance from the storm center, storm-surge heights, wave characteristics, direction of storm movement, angle of wave approach, forward speed and duration of the storm, and tidal stage during storm landfall. The New York State Hazard Mitigation Plan (2011) notes that the coastal erosion hazard on Long Island is especially severe due to its composition of a loose mixture of sand and gravel and its location facing the ocean in direct opposition to the prevailing wind and water currents moving up the Atlantic Coast.

Generally speaking, sand is transported from the eastern end of Long Island to its western end; this is called "long shore transport". Long shore transport is interrupted at inlets. Coastal erosion rates tend to be most severe near inlets and in areas immediately down gradient of protective features extending perpendicularly from the shoreline, such as jetties and groins.

According to the USACE NYD's Draft Feasibility Report for Long Beach Island, alternating erosive and accretive zones exist on Long Beach Island, with overall transport of sand being net westerly and an overall erosive trend. They note that slight accretion at the western end can be attributed in part to impoundment of sand by the East Rockaway jetty.

The most erosive zone is located adjacent to Jones Inlet.

According to the “North Shore of Long Island, New York, Storm Damage Protection and Beach Erosion Control Reconnaissance Study” (USACE NYD, September 1995), erosion is most severe on the north shore of Nassau County in the Town of Oyster Bay, although isolated areas where the hazard is severe in North Hempstead include Sands Point and Kings Point. The erosion hazard is reportedly moderate in the areas of Glenwood Landing, City of Glen Cove, Villages of Sea Cliff and Lattingtown; severe in the areas of Bayville, Mill Neck, and Centre Island; and minor in the areas of Oyster Bay and Villages of Oyster Bay, Cove Neck, Oyster Bay Cove, and Laurel Hollow as the area lies within the relatively protected area of Cold Spring and Oyster Bay Harbors.

Over time, erosive forces acting upon coastal shorelines can result in a landward retreat of the shoreline. In addition, continued short and long term erosion can erode protective beaches and damage structures built to offer protection from these hazards; severity is increased as damages are incurred to protective features, if not repaired.

Coastal erosion and wave action have historically been the most severe on south shore barrier island communities of Long Beach, Atlantic Beach, Lido Beach, and Point Lookout, and in Jones Beach State Park. In back-bay communities, wave action and coastal erosion are subsided by barrier beaches and tidal marshes and is a relatively minor problem. Through the years, communities along Nassau County’s shorelines have constructed coastal structures such as bulkheads, revetments, seawalls, breakwaters, groins, jetties, and gabions/rip rap protection. Soft structures include beach and dune nourishment projects, planting dune grasses, and erecting sand fencing, in an attempt to provide some degree of protection from coastal erosion and wave action.

Probability of Occurrence – Coastal Erosion

Probability of occurrence of specific short and long term coastal erosion rates for each community was not readily available at the time of this report. Erosion rates vary greatly over even short distances. Long-term erosion rates and short-term (or storm) erosion rates can differ greatly. There are no known, systematic attempts to monitor erosion rates along New York’s marine shoreline, including Nassau County, except for the incorporation of accepted rates greater than one foot per year into the CEHA mapping. Much of the information available is presented in reports from multiple sources over many years, and tends to be presented for a small area as opposed to a comprehensive set of results along the County’s coastal shorelines. Some of the data has been superseded by current or ongoing studies. Some information is available for particular regions, and this best readily available information on probabilities, as near to the jurisdictional level as possible at this time, are presented below. This information will be updated during future maintenance cycles of the plan as better information becomes available.

Long-term erosion is “ongoing”, and is therefore 100% probable, for the general locations and average rates shown in the following table. Note that these data are more recent than, and differ from the CEHA maps which show no “demonstrated long-term average annual recession rates of one foot per year or greater”. Severe storms can erode large quantities of sand in a relatively short amount of time. However, severe storms do not necessarily cause all beaches to erode. Some beaches will erode, and others will have sand deposited on them. Detailed short-term storm erosion rates for specific communities are not available at this time.

Wave Action

Wave zones are the regions in which a breaking wave of at least 3 feet can be expected. A 3-foot wave is generally accepted as the minimum wave that would cause damage to typical structures. FEMA refers to these areas as "Velocity Zones" (V-zones), or coastal high hazard areas. They are 100-year coastal floodplains where, generally speaking, high-energy waves can be expected inland to the point where the 100-year flood depth is insufficient to support a 3-foot breaking wave. V-zones are evident in north and south shore communities. Mapped V-zones are extensive in south shore barrier island coastal areas fronting the Atlantic, as well as north shore coastlines facing north and east, but are not particularly widespread in south shore back-bay communities. The following Table illustrates mapped V-zones in Nassau County as per FEMA data:

Table 17	
Nassau County Communities with Mapped V-zones	
Town	**Community**
North Hempstead	Flower Hill
North Hempstead	Glenwood Landing
North Hempstead	Great Neck
North Hempstead	Great Neck Estates
North Hempstead	Kings Point
North Hempstead	Manhasset
North Hempstead	Plandome
North Hempstead	Plandome Heights
North Hempstead	Plandome Manor
North Hempstead	Port Washington
North Hempstead	Roslyn
North Hempstead	Roslyn Harbor
North Hempstead	Sands Point
Oyster Bay	Bayville
Oyster Bay	Centre Island
Oyster Bay	Cove Neck
Oyster Bay	Glen Cove
Oyster Bay	Glenwood Landing
Oyster Bay	Lattingtown
Oyster Bay	Laurel Hollow
Oyster Bay	Locust Valley
Oyster Bay	Mill Neck
Oyster Bay	Oyster Bay
Oyster Bay	Oyster Bay Cove
Hempstead	Baldwin Harbor
Hempstead	Bellmore
Hempstead	Freeport

Hempstead	Hewlett Neck
Hempstead	Lawrence
Hempstead	Merrick
Hempstead	Oceanside
Hempstead	Seaford
Hempstead	Wantagh
Hempstead	Woodsburgh
Hempstead	Atlantic Beach
Hempstead	Atlantic Beach West
Hempstead	East Atlantic Beach
Hempstead	Jones Beach
Hempstead	Lido Beach
Hempstead	Long Beach
Hempstead	Point Lookout
Oyster Bay	Tobay Beach Park

Extent - Wave Action

Wave action is an ongoing process for any community with coastal frontage. However, the effects of wave action are exacerbated during storm events when water levels, wind driven waves, and coastal currents tend to increase rapidly. Wave action exerts strong hydrodynamic forces on any objects obstructing the flow of water. The effects of wave action can be quite severe. Wave action can induce erosion of beaches and dunes in some locations, while other locations experience the deposition of large quantities of sand. Wave action can damage or destroy boardwalks, seawalls, bulkheads, groins and jetties, residences and business, roadways and parking areas.

The magnitude and/or severity of wave damage depends on the height and velocity of the waves, how far inland they travel, and the conditions of the buildings or other structures they come into contact with. Other factors affecting the magnitude and/or severity of wave damage include: soil properties, orientation of the shoreline, distance from the storm center, storm-surge heights, wave characteristics, direction of storm movement, angle of wave approach, forward speed and duration of the storm, and tidal stage during storm landfall. Where obstructions exist, wave affects inland of the obstruction are reduced. Older, pre-FIRM buildings would be more susceptible to wave damage because they were built before ordinances were adopted requiring more stringent design requirements. Large masonry buildings (i.e. high rise condominiums, hotels, etc.) are not likely to experience failure by wave action.

Wave action is most severe in areas not protected by barrier island features, and in areas perpendicular to prevailing wind and water currents. Generally speaking, wave action is most severe for north shore communities and south shore barrier island communities. It is less severe for south shore mainland back-bay communities because of the protective effects of the barrier island.

Probability of Occurrence - Wave Action

There is a 1% chance per year of 3-foot breaking waves inundating Nassau County communities to the extent shown on the FEMA-mapped V-zones.

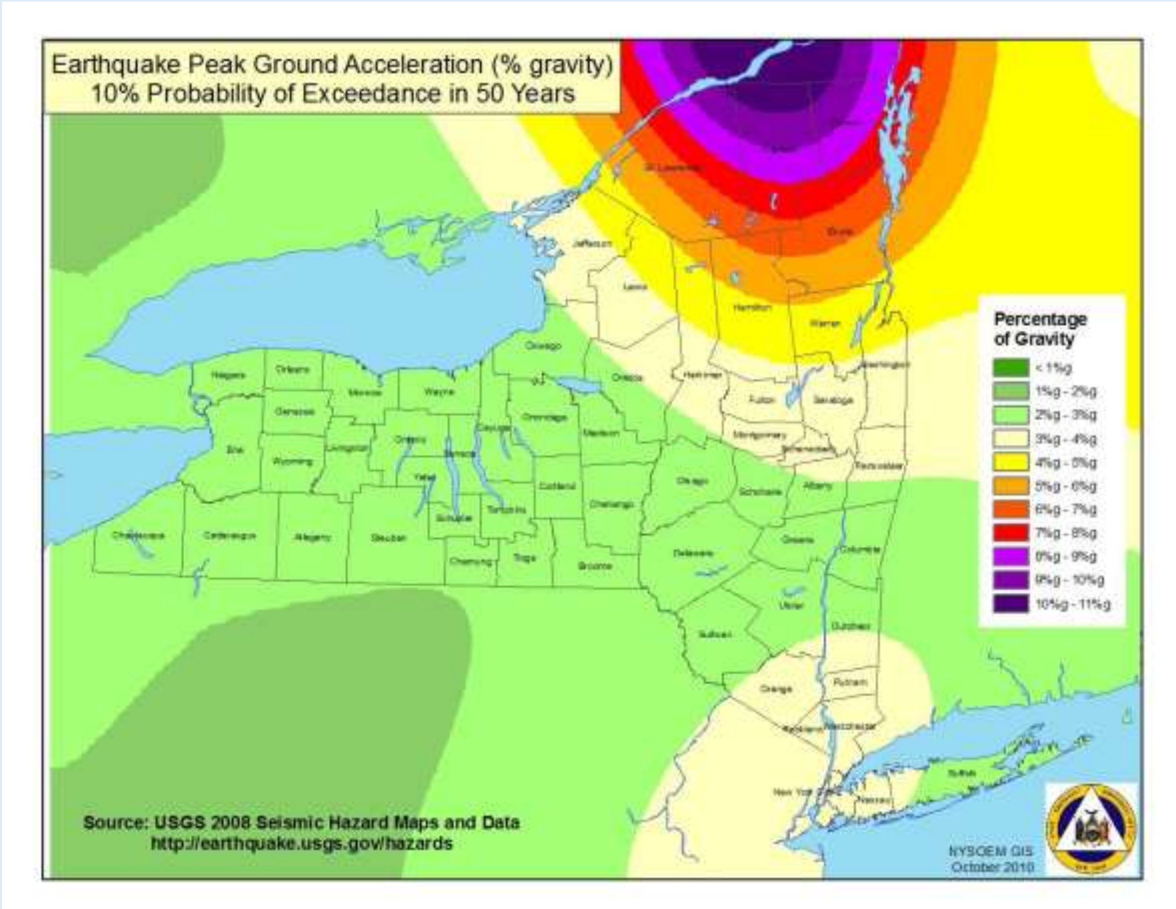
Earthquakes

FEMA defines the term “earthquake” as a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth’s surface. This movement forces the gradual buildup and accumulation of energy. Eventually, strain becomes so great that the energy is abruptly released, causing the shaking at the earth’s surface which we know as an earthquake. In addition to the effects of ground shaking, earthquakes can also cause landslides and liquefaction under certain conditions. Liquefaction occurs when unconsolidated, saturated soils exhibit fluid-like properties due to intense shaking and vibrations experienced during an earthquake. Together, ground shaking, landslides, and liquefaction can damage or destroy buildings, disrupt utilities (i.e., gas, electric, phone, water), and sometimes trigger fires.

Location – Earthquakes

Earthquakes are possible within any of Nassau County’s communities. As the following figure shows, Nassau County is located within one of three main regions in New York State that have a seismic risk that tends to be higher than in the rest of the state. For Nassau County and its participating jurisdictions, the earthquake hazard is uniform across Nassau County and its communities.

Earthquake Hazard Map of New York State

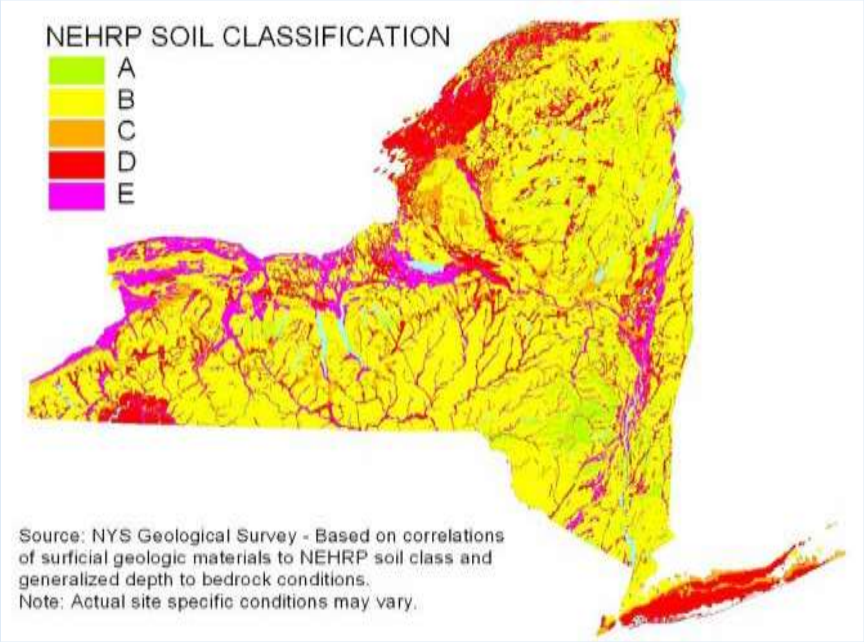

Earthquake Peak Ground Acceleration (% gravity)
10% Probability of Exceedance in 50 Years
Percentage of Gravity
< 1%g
1%g - 2%g
2%g - 3%g
3%g - 4%g
4%g - 5%g
5%g - 6%g
6%g - 7%g
7%g - 8%g
8%g - 9%g
9%g - 10%g
10%g - 11%g
Source: USGS 2008 Seismic Hazard Maps and Data
http://earthquake.usgs.gov/hazards
NYSOEM GIS
October 2010

Extent – Earthquakes

The severity of an earthquake at a given location depends on the amount of energy released at the epicenter, and the location's distance from the epicenter. The terms "magnitude" and "intensity" are two terms used to describe the severity of an earthquake. An earthquake's "magnitude" is a measurement of the total amount of energy released while its "intensity" is a measure of the effects of an earthquake at a particular place. Another way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Peak Ground Acceleration (PGA) measures the rate of change in motion of the earth's surface and expresses it as a percent of the established rate of acceleration due to gravity.

An earthquake with a 10 percent chance of exceedance over 50 years in Nassau County would have a PGA of 3-4%g and an intensity ranging from only IV to V, which would result in light to moderate perceived shaking and damages ranging from none to very light. *For comparison purposes,* an earthquake of intensity I on the Modified Mercalli Scale would most likely go unnoticed; a tremor of about intensity VI would probably be felt by everyone and cause slight damage; whereas, a quake of intensity XII would result in almost total destruction of buildings, objects thrown into the air and waves seen on the earth's surface

As noted in the New York State Hazard Mitigation Plan, soil type can have an impact on the severity of an earthquake at a given location. For example, soft soils (i.e., fill, sand) are more likely to amplify ground motion during an earthquake. Liquefaction is also more likely to occur in areas of soft soils. In contrast, harder soils (i.e., granite) tend to reduce ground motion during an earthquake. The State Plan includes a map prepared by the New York State Geological Survey showing five soil classifications in New York State, as shown in the following figure.



Nassau County Soil Classification

Nassau County contains soil classifications B through E. Class B soils are found in a band running generally along the northern third of the County. Class B soils are primarily rock or firm ground, and have a moderately low likelihood of amplifying the effects of an earthquake. A thin band of Class C soils is found south of the Class B band. Class C soils are primarily stiff clays, which have a moderate likelihood of amplifying the effects of an earthquake. The southern two thirds of Nassau County consists of Class D soils (soft to medium clays or sands), which have a moderate likelihood of amplifying the effects of an earthquake. Areas of Class E soils (soft soil, including fill, loose sand, waterfront, or lake bed clays), the type most likely to amplify the effects of an earthquake, are visible in the back bay areas in southern Nassau County in the Town of Hempstead, roughly in the vicinity of the Villages of Atlantic Beach and Long Beach.

Probability of Occurrence – Earthquakes

Earthquakes cannot be predicted. They strike without warning, at any time of the year, and at any time of the day or night. Earthquake hazard maps – sometimes referred to as "PGA maps" – are used as a tool to project the likelihood of a various intensity quake being exceed at a certain location over a given period of time. They depict the Peak Ground Acceleration (PGA), expressed as a percentage of the force of gravity that can be expected to be exceeded at a given location for a particular probability of exceedance over a specific time frame.

Nassau County is located within one of three main regions in New York State that have a seismic risk that tends to be higher than in the rest of the state. For Nassau County and its participating jurisdictions, a PGA value of 3-4%g has a 10 percent chance of being exceeded over 50 years.

The USGS has estimated that, over the next 100 years, the probability of a damaging earthquake of at least magnitude 5.0 and centered within 50 km of East Meadow is only between 0.12 and 0.15. At this level, perceived shaking would be strong to very strong and damage would be light to moderate.

Floods

The New York State Hazard Mitigation Plan defines flooding as the accumulation of water within a water body which results in the overflow of excess water onto adjacent lands, usually floodplains. The floodplain is the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding.

Floods are considered hazards when people and property are affected. Historically, development in floodplains was often a necessity, as water bodies provided a means of transportation, electricity, water supply, and often supported the livelihood of local residents (i.e., fishing, farming, etc.). Today, development in floodplains is more often spurred by the aesthetic and recreational value of the floodplain. Floods have occurred in Nassau County's communities in the past, and will continue to do so in the future. The following table represents incidents of flooding in Nassau County, along with the source of data.

Table 18 Incidents of Flooding in Nassau County		
Date	**Location and Description**	**Data Source**
August 1635	Long Island, first recorded hurricane in NY. Storm surge 14' above high tide.	NYSHMP
September 1815	Long Island, "Great September Gale of 1815". Many structures damaged.	NYSHMP
September 1821	Long Island, tropical storm. 21 deaths.	NYSHMP
September 1944	Long Island, tropical storm related. Damages in excess of $800,000.	NYSHMP
August 1954	Hurricane Carol, Long Island (DR-26). Property damage, road closures. Damages approximately $3 million.	NYSHMP
September 1960	Long Island, Hurricane Donna, $1.9 million in damages.	NYSHMP
June 1972	Statewide, Hurricane Storm Agnes. (DR -338) Statewide, 5000 homes destroyed or badly damaged, 24 deaths, damages $703 million.	NYSHMP
August 1976	Flooding in New York City, Nassau, and Suffolk Counties	NYSHMP
October 1985	Hurricane Gloria (DR-750), Long Island. Flooding, property damage, total damages $48.5 million.	NYSHMP
August 1991	Hurricane Bob (DR-918), Long Island. Flooding, property damage, total damages $11.7 million.	NYSHMP
December 1992	Coastal Storm, Nor'Easter, (DR-974) statewide damages $31.2 million.	NYSHMP
August 9, 1993	A rather violent rainstorm struck the village of Oyster Bay. A couple of inches of rain falling in a very short time lead to significant street flooding.	NOAA's NCDC
December 14, 1993	Countywide-coastal. A low pressure center generated tides about two feet above normal and very rough seas. Coastal flooding occurred during the morning set of high tides although it was relatively minor.	NOAA's NCDC
January 4, 1994	Countywide-coastal. A persistent onshore flow caused water to pile-up along the coast. Tides rose between three and five feet above normal and this lead to significant coastal flooding and serious beach erosion.	NOAA's NCDC
January 28, 1994	A combination of warm temperatures melting snow and the arrival of heavy rains caused significant and widespread urban flooding across the area. Many roads were closed for hours during this event. Numerous cars stalled out attempting to cross some of these flooded roads. Several of these motorists had to be rescued from their vehicles.	NOAA's NCDC
March 2, 1994	Countywide-coastal. Further information unavailable from NOAA NCDC.	NOAA's NCDC
August 22, 1994	Countywide urban flooding. Further information unavailable from NOAA NCDC.	NOAA's NCDC
February 4, 1995	Countywide-coastal. In advance of a winter storm, onshore winds began to increase and pile water up along coastal sections during the early morning hours. By late morning with the coming of high tides, some minor to moderate coastal flooding was observed along with minor to moderate beach erosion.	NOAA's NCDC
June 22, 1995	Torrential rain caused extensive urban flooding. Rainfall amounts generally ranged between three and four inches however isolated amounts of six inches occurred overnight.	NOAA's NCDC
July 23, 1995	Plainview flooding. Further information unavailable from NOAA NCDC.	NOAA's NCDC
November 14, 1995	Countywide-coastal. Further information unavailable from NOAA NCDC.	NOAA's NCDC
December 20, 1995	Tides rising to about two feet above normal in response to a coastal storm, caused minor flooding along the coast during the early morning high tides.	NOAA's NCDC
January 1996	Severe flooding (DR-1095), statewide. Road closures, property damages, closed businesses, and 10 deaths, statewide damages at $160 million	NYSHMP
July 3, 1996	Strong thunderstorms during late morning and again from late afternoon through early evening produced torrential rain that caused widespread flash flooding of low lying and poor drainage areas, small streams, and rivers. Cars were trapped in flooding on the Long Island Expressway in Queens and the Northern State Parkway in Nassau Counties.	NOAA's NCDC

July 13, 1996	As Tropical Storm Bertha moved northeast, passing east of Atlantic City, NJ around 11 am and over Long Island during the afternoon, it produced torrential rain and strong gusty winds. Torrential rain caused flooding of low lying and poor drainage areas, streams, and rivers across the area. Serious widespread flooding was reported along the Long Island Expressway in Nassau County. Rainfall totals of 1.80 inches were measured at Lynbrook and 1.82 inches at Levittown.	NOAA's NCDC
July 31, 1996	Thunderstorms produced torrential rains. From 2 to 5 inches of rain fell in 3-hour period. Serious widespread flash flooding of roads occurred and numerous basements were flooded. In Nassau County, the same events occurred. Water was up to 2 feet deep in several streets at Long Beach, where several basements flooded. The Wantagh and Meadowbrook State Parkways were closed near East Meadow as well as Bellmore Ave. Widespread street flooding was also reported in Wantagh.	NOAA's NCDC
August 29, 1996	Fringe effects from Hurricane Edouard. No significant rainfall, but minor to moderate coastal flooding, particularly during high tide. Along the south shore of Long Island, sections of Jones Beach, Robert Moses State Park and Hither Hills State Park were flooded during times of high tide from Friday through Monday.	NOAA's NCDC
October 19, 1996	Severe coastal storm, flooding, and wind (DR-1146), statewide damages $16.1 million (per NYSHMP). Widespread minor to major coastal flooding and beach erosion resulted during Saturday afternoon and evening high tides. Bayville of Nassau County, up to 3 feet of water covered many streets. More than 100 homes were damaged and dozens of cars were totally damaged in flood waters. The hardest hit areas in East Bayville were on 5th, 6th, 7th, 1st, and 2nd Streets. Water flooded the causeway to Centre Island, where major flooding also occurred. The streets of many south shore communities like the village of Freeport were under up to 3 feet of water and over 1400 homes suffered damage. Flooding was reported along parts of the LIE. Nassau County rainfall totals reported ranged from 1.66 inches at Levittown to 4.90 inches at Lynbrook.	NYSHMP and NOAA's NCDC
December 13, 1996	Severe flooding (DR-1148), statewide damages $25.6 million. Low pressure system with winds averaging 20 to 30 MPH combined with high astronomical tides and above normal tide anomalies caused minor to locally moderate coastal flooding along parts of the coastline. Tidal flooding was reported in Freeport in Nassau County and also in both Babylon and Lindenhurst in Suffolk County. It inundated parts of streets in the aforementioned and other areas.	NYSHMP and NOAA's NCDC
January 10, 1997	Low pressure system - high astronomical tides combined with brief easterly gales caused water to pile-up along sections of the coast during morning high tide. Tidal flooding submerged cars under 2 feet of water along Rockaway Blvd. in Brookville. Moderate tidal flooding occurred in Freeport.	NOAA's NCDC
August 20, 1997	Coastal flooding in Freeport; no further information available.	NOAA's NCDC
November 14, 1997	Coastal flooding; no further information available.	NOAA's NCDC
January 29, 1998	Low pressure system produced strong gusty northeast winds, high seas, large sea swells, heavy surf, and minor to moderate beach erosion and coastal flooding. Local emergency managers from Freeport reported moderate coastal flooding during the morning high tide. Some cars were towed to minimize damage.	NOAA's NCDC
February 5, 1998	Nor'easter caused strong gusty northeast winds, high seas, heavy surf, moderate beach erosion, and minor to moderate coastal flooding for three successive high tides starting with the early morning high tides on February 5th. During the first high tides, water inundated streets in Freeport and Massapequa. Up to 1 foot of water inundated Woodcleft Ave. in Freeport.	NOAA's NCDC
February 24, 1998	'or'Easter produced strong gusty northeast winds, high seas, heavy rain, moderate beach erosion, and minor to moderate coastal flooding mainly across the inland bays where water piled-up and remained trapped. Across Nassau County, streets and basements were flooded. Long Beach Police Department reported that flooding forced the closure of West Park Ave. from New York Ave. all through the West End from 6 am to 8 am (during high tide). Streets were also flooded in Freeport (Woodcleft Ave.) and Island Park (Brighton Road). People in Point Lookout were pumping out their basements.	NOAA's NCDC

June 12, 1998	Thunderstorms produced torrential flash flooding rains and frequent lightning. Torrential rains resulted in widespread serious flooding of streets, poor drainage and low-lying areas, home basements, and small streams. Lightning struck many homes and ignited fires that damaged them.	NOAA's NCDC
January 3, 1999	Rain fell on a frozen ground surface at rates as high as 3 inches per hour. This resulted in rapid runoff that caused widespread serious flooding of low-lying and poor drainage areas. Many locations throughout Long Island along the Belt and Southern State Parkways, the Long Island Expressway, and Northern State Parkway were closed due to serious flooding. Rainfall amounts across the County ranged from 3.69 inches at Sea Cliff to 5.02 inches at Merrick.	NOAA's NCDC
January 15, 1999	Heavy rain fell on a frozen ground surface with partially clogged storm	NOAA's NCDC
September 1999	Remnants of Hurricane Floyd, property damages and debris accumulation, statewide damages $62.2 million. Serious widespread flooding of low-lying and poor drainage areas resulted in the closure of many roads and basement flooding across the entire region. Downed trees and power lines Rainfall amounts ranged from 3.67 inches at Wantagh to 4.12 inches at Mineola.	NYSHMP and NOAA's NCDC
April 21, 2000	Thunderstorms were accompanied by torrential rainfall that produced widespread severe flooding of low-lying and poor drainage areas and frequent and intense lightning strikes. Rainfall amounts ranged from around 3 to 7 inches. Significant and widespread ponding of water caused the closure of several stretches of road. Severe urban flooding also occurred in the westbound lanes of Hempstead Turnpike near the Nassau Medical Center in East Meadow. Frequent and intense lightning strikes ignited fires and caused damage to many houses throughout Nassau and Suffolk Counties.	NOAA's NCDC
August 12, 2000	thunderstorms produced rainfall rates estimated at around 2 inches per hour, which caused significant flooding of low-lying and poor drainage areas. In Bayville, water quickly ponded and rose up to 3 feet, which caused a road closure near the Tide Motel. Nassau County Police reported severe flooding near the town beach. NWS radar estimated a 2 to 3 inch rainfall from 2:30 am to 3:30 am, with up to 5 inches during the preceding 24 hours.	NOAA's NCDC
August 28, 2000	Heavy rain along with embedded thunderstorms drifted very slowly north across Northeastern Queens and Northwestern Nassau Counties. National Weather Service radar estimated rainfall rates from 1.5 to 2 inches per hour with a Storm Total Precipitation amount from 3.5 to 4 inches across this area. Emergency managers reported numerous roads and stores flooded in Great Neck.	NOAA's NCDC
September 3, 2000	Nearly stationary thunderstorms produced torrential rain that caused significant flash flooding of low-lying and poor drainage areas across parts of the county, with roughly 3 inches of rain.	NOAA's NCDC
June 17, 2001	Remnants of Tropical Storm Allison. Rainfall rates of up to 3 inches per hour produced widespread street and highway flooding, in addition to some flash flooding of small streams. Some rivers approached or even slightly exceeded flood stage during this heavy rain event. Reports of street and highway flooding, which led to several major road and highway closings. Rainfall totals for the event were 2.51 inches at Wantagh and 5 inches at Lido Beach.	NOAA's NCDC
May 31, 2002	Thunderstorms produced rainfall rates between 1 and 2 inches per hour, which resulted in widespread flooding of streets and poor drainage areas in the Glen Cove and Farmingdale areas.	NOAA's NCDC
August 16, 2002	Torrential rain caused significant urban flooding from Valley Stream to Rockville Centre. In Valley Stream, water ponded up to 6 inches deep in low lying areas.	NOAA's NCDC
August 29, 2002	Wet antecedent conditions followed by periods of torrential rain resulted in widespread and significant flooding of low lying and poor drainage areas. Many spotters reported street flooding with road closures throughout these areas. In Nassau County, street flooding was reported in Lido Beach, Merrick, and Hicksville. High waters closed the Northern State Parkway at Routes 106 and 107. Storm total rainfall ranged from 3.05 inches in Hicksville to 5.15 inches in South Massapequa. In Wantagh, flooding was reported on Old Mill Road.	NOAA's NCDC

October 16, 2002	Strong east to northeast winds reached a peak just below storm force (48 knots) around noon. These strong winds resulted in tides of 2 to 3 feet above normal around the times of high tide between 5:30 pm and 7:30pm.	NOAA's NCDC
July 22, 2003	The Nassau County Office of Emergency Management reported flooding near Oyster Bay High School.	NOAA's NCDC
June 17, 2004	Thunderstorms developed and moved at a slow rate of speed. These storms passed over portions of New York City and Long Island and produced torrential downpours. This caused flash flooding at several locations. Several roadways in Roslyn experienced significant street flooding. Torrential rains resulted in flash flooding of several streets in Baldwin.	NOAA's NCDC
September 8, 2004	The remnants of Hurricane Frances produced torrential rainfall. Rainfall amounts ranging from an inch to up to 6 inches were common across the area, causing extensive flash flooding and resulting in rescues of people from homes and cars. Flash flooding was reported on the Long Island Expressway, causing lane closures.	NOAA's NCDC
September 18, 2004	The remnants of Hurricane Ivan produced torrential rains with storm total rainfall reports added up to over 5 inches in some areas. This caused extensive flash flooding of roads and highways across the region. Torrential rains flooded the Sunrise Highway, resulting in closure.	NOAA's NCDC
July 18, 2005	Thunderstorm rainfall rates of as high as 3 inches per hour. Flash flooding of streets reported in Oyster Bay.	NOAA's NCDC
September 15, 2005	Thunderstorms with torrential downpours caused by interaction of offshore Tropical Storm Ophelia and a cold front to the west of New York City. Torrential rains caused flash flooding of streets in Westbury.	NOAA's NCDC
October 2005	Heavy rains over a one week period caused shallow flooding in urban areas, riverine flooding, flooded basements, toppled trees, downed power lines, and caused coastal flooding as winds of 40-50 mph piled water up in the bays during high tide. Heavy rain resulted in significant flooding on some rivers, most small brooks and streams, and throughout urban areas in low lying and poor drainage areas Trained spotters reported up to 6 feet of water in basements throughout Massapequa. Property damages for this event were estimated at $11 million for Nassau County. This storm system resulted in record setting monthly and daily rainfall, and set a record for 24-hour rainfall with 9 inches on October 14th at Brookhaven National Laboratory in nearby Suffolk County.	*The Bulletin*, Volume 59 Number 37, published by Brookhaven National Laboratory and NOAA's NCDC
December 2008	Low pressure tracked northeast from the Gulf of Mexico and over the local area along a stationary boundary from December 11 through December 12. A prolonged period of rain, which was heavy at times, caused widespread flooding across Southeast New York with total rainfall amounts ranging from 2.5 inches to 5 inches. The Southern State Pkwy. was closed at the Cross Island Pkwy. due to extensive roadway flooding.	NOAA's NCDC
March 2010	A Nor'easter developed off the Delmarva peninsula which produced an extended period of heavy rainfall across the area as it tracked very slowly to the northeast. This caused widespread flooding across portions of southeast New York. Feeks Ln. and Cleft Rd. were flooded and impassible with approximately 2 ft. of water covering the road from Mill Neck Creek flowing into Beaver Pond. Glen Cove High School was evacuated due to flooding. Several roads were closed in Bayville due to flooding. Some residents also had basement flooding. Total rainfall amounts received ranged from 2.92 inches in Malverne to 5.31 inches in East Meadow.	NOAA's NCDC
March 2010	Heavy rain caused a mudslide and property damage between 119 Shore Rd. in Glen Cove and 11 Prospect Ave. in Sea Cliff. Total rainfall amounts reported across Nassau County were between 4.66 inches in Levittown and 6.18 inches in Lynbrook.	NOAA's NCDC

October 2010	Hempstead Tpke. in East Meadow, the Southern State Pkwy. in Lakeview, the Long Island Expressway in Jericho and the Northern State Pkwy. in Lake Success were all closed due to flooding. Numerous streets throughout the town of Westbury were also flooded. Total rainfall ranged from 3.21 inches in Wantagh to 4.64 inches in Lynbrook. The Meadowbrook Pkwy. was flooded at exit M7 in Merrick.	NOAA's NCDC
August 2011	A slow moving area of low pressure passed to the south of the Tri-State Area. High precipitable water values caused very heavy rain which resulted in flash flooding in Kings, Nassau and Suffolk Counties. The basements of several residences in Freeport were flooded with four to five feet of water.	NOAA'S NCDC
August 2011	Irene made landfall locally as a tropical storm around 900 am EDT August 28, 2011 over New York City. Irene then moved across Southeast New York and Western Connecticut before dissipating over Northern New England near the Canadian Border later that evening. Copious amounts of tropical moisture within the storm produced extended periods of heavy rainfall, which resulted in widespread moderate to major flooding across the area.	NOAA's NCDC
September 2011	An approaching cold front stalled near the area as waves of low pressure moved from south to north along it. A deep southwest flow extended down the East Coast of the United Stated and aided in the transport of tropical moisture from the Gulf of Mexico and Western Atlantic Ocean, which resulted in heavy rain and flash flooding in Westchester and Nassau Counties. Brookside Ave. was closed at Centennial Ave. due to flooding in Roosevelt.	NOAA's NCDC
October 2012	Hurricane Sandy was the largest Atlantic hurricane on record, as well as the second-costliest Atlantic hurricane in history, only surpassed by Hurricane Katrina in 2005. Hurricane Sandy affected at least 24 states, from Florida to Maine (Figure 2) and west to Michigan and Wisconsin, with particularly severe damage in New Jersey and New York.	NOAA

Flooding Locations

Flooding in Nassau County and its jurisdictions includes all types of flooding, from coastal and riverine flooding to shallow flooding resulting from urban drainage issues. FEMA's Nassau County Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) identify the following flooding sources:

Coastal/Tidal		
• Atlantic Ocean	• Baldwin Bay	• Broad Channel
• Brosewere Bay	• Cold Spring Harbor	• East Bay
• Head of Bay	• Hempstead Harbor	• Jones Inlet
• Little Neck Bay	• Long Island Sound	• Manhassett Bay
• Middle Bay	• Reynolds Channel	• Sloop Channel
• South Oyster Bay	• Hewlett Bay *(including Mill River, Powell Creek, and Rockaway Creek)*	• Oyster Bay Harbor *(including Beaver Brook, Beaver Lake, Mill Neck Creek, and Oak Neck Creek)*
Riverine		
• Massapequa Creek	• Massapequa Creek Tributary No. 1	• Massapequa Creek Tributary No. 2
• Motts Creek	• Russells Creek	• Valley Stream

FEMA studied the following flood sources (all, or portions of) by approximate methods:

• Roslyn Pond	• Smith Pond	• East Meadow Brook
• Several unnamed tributaries and streams	• Areas having a low development potential	• Areas having minimal flood hazards

FEMA's Q3 Flood Data was used to identify the location of flood hazard areas in Nassau County. Mapped flood zones exist in most, but not all, Nassau County communities. Most mapped flood hazard areas are located along the south shore and barrier island communities along the Atlantic Ocean and various back bays along the north shore of the County along the Long Island Sound.

The following jurisdictions are not considered to be flood prone according to the FEMA:

• Bellerose	• East Hills	• East Williston
• Farmingdale	• Floral Park	• Garden City
• Lake Success	• Lynbrook	• Matinecock
• Mineola	• Munsey Park	• Muttontown
• New Hyde Park	• North Hills	• Old Brookville
• Old Westbury	• Roslyn Estates	• South Floral Park
• Steward Manor	• Upper Brookville	• Westbury
• Williston Park		

Source: FEMA Website

Storm surge represents an additional flood impact that can be experienced in Nassau County communities. Because storm surge can extend well beyond mapped flood hazard areas, storm surge zones have been mapped separately in the New York State Hurricane Evaluation Study. This study was conducted jointly by the New York State Emergency Management Office (NYSEMO), the Federal Emergency Management Agency (FEMA), and the US Army Corps of Engineers (USACE). As part of the study, maps were prepared noting areas inundated during different categories of hurricanes. The original source inundation maps developed by the Army Corps were based on surge height projections as calculated by the National Weather Service's Sea, Lake Overland Surge from Hurricanes (SLOSH) model. Using SLOSH, surge heights were calculated for set locations throughout the region for a number of category 1 - 4 hurricanes, varying in forward speed, landfall location and track. The maximum values obtained for all hurricanes of a particular category were then transferred to a 1:24,000 base map (contour interval 10 feet) to delineate surge zones. Hurricane inundation zones are based on SLOSH model projections and may be subject to error.

Generally speaking, surge would be contained relatively close to the shoreline in most communities along the north shore. This is due to shoreline bluffs and generally high ground elevations. However, on the south shore, where low-lying areas are predominant, the case would be quite different. A Category 4 storm surge could inundate nearly everything seaward of a general line halfway between the Southern State Parkway and Sunrise Highway. A Category 2-3 storm surge could inundate to approximately Sunrise Highway in many locations; and a Category 1 storm surge could inundate approximately halfway to Sunrise Highway in many locations.

Flooding Extent

The extent of flooding associated with a 1% probability of occurrence – the "100-year flood" or "base flood" – is used as regulatory boundaries by a number of federal, state and local agencies. Also referred to as the "special flood hazard area", this boundary is a convenient tool for assessing vulnerability and risk in flood prone communities since many communities in Nassau County have maps that show the extent of the base flood and the likely depths that will be experienced.

FEMA considers:

High Risk Coastal Areas: 100-year floodplain with wave affects (V-Zones)

High Risk Areas: 100-year floodplain without wave affects (A-Zones)

Moderate Risk Areas: Areas between the 100-year and 500-year floodplains

Low Risk Areas: Areas outside of the 500-year floodplain

The following table depicts Nassau Flood risk acreage and percentages for various Nassau communities. Data is rounded to the nearest whole number, totals may not match due to rounding.

Table 19
Summary of Nassau Flood Data by Community

Municipality Name	Total Acres	Acres High Coastal Flood Risk	Acres High Flood Risk	Acres Moderate Flood Risk	Acres Little or No Flood Risk	Percent of Land in High or Moderate Flood Risk
Hempstead, Town of						
Atlantic Beach	316	16%	80%	1%	3%	97%
Atlantic Beach West	129	25%	71%	0%	4%	96%
Baldwin	1,899	0%	5%	0%	95%	5%
Baldwin Harbor	724	2%	41%	3%	54%	46%
Barnum Island	400	0%	84%	11%	5%	95%
Bay Park	310	1%	77%	4%	18%	82%
Bellerose	77	0%	0%	0%	100%	0%
Bellerose Terrace	85	0%	0%	0%	100%	0%
Bellmore	1,459	0%	26%	1%	73%	27%
Cedarhurst	437	0%	24%	6%	70%	30%
East Atlantic Beach	214	18%	81%	0%	1%	99%
East Garden City	1,942	0%	2%	0%	98%	2%
East Meadow	3,211	0%	1%	0%	99%	1%
East Rockaway	667	0%	28%	9%	63%	37%
Elmont	2,214	0%	0%	0%	100%	0%
Floral Park	916	0%	0%	0%	100%	0%
Franklin Square	1,836	0%	0%	0%	100%	0%
Freeport	2,909	0%	35%	1%	64%	36%
Garden City	3,420	0%	0%	0%	100%	0%
Garden City South	258	0%	0%	0%	100%	0%
Harbor Isle	111	0%	91%	7%	2%	98%
Hempstead	2,359	0%	0%	0%	100%	0%
Hewlett	569	0%	13%	9%	78%	22%
Hewlett Bay Park	232	0%	21%	3%	76%	24%
Hewlett Harbor	432	1%	50%	12%	37%	63%
Hewlett Neck	128	4%	41%	0%	55%	45%
Inwood	1,014	0%	62%	11%	27%	73%
Island Park	250	0%	97%	1%	2%	98%
Jones Beach Barrier Is.	3,284	28%	59%	0%	13%	87%

Lakeview	751	0%	0%	0%	100%	0%
Lawrence	1,506	1%	48%	2%	49%	51%
Levittown	4,365	0%	0%	0%	100%	0%
Lido Beach	1,160	19%	80%	0%	1%	99%
Long Beach	1,431	12%	87%	1%	0%	100%
Lynbrook	1,290	0%	0%	9%	91%	9%
Malverne	681	0%	1%	4%	95%	5%
Malverne Oaks	71	0%	0%	0%	100%	0%
Merrick	2,519	1%	33%	0%	66%	34%
North Bellmore	1,684	0%	0%	0%	100%	0%
North Lynbrook	53	0%	0%	0%	100%	0%
North Merrick	1,089	0%	2%	0%	98%	2%
North Valley Stream	1,199	0%	0%	0%	100%	0%
North Wantagh	1,201	0%	0%	0%	100%	0%
Oceanside	3,167	1%	44%	8%	47%	53%
Point Lookout	140	1%	98%	0%	1%	99%
Rockville Centre	2,124	0%	3%	0%	97%	3%
Roosevelt	1,169	0%	7%	0%	93%	7%
Salisbury	1,979	0%	0%	0%	100%	0%
Seaford	1,571	0%	28%	1%	71%	29%
South Floral Park	65	0%	0%	0%	100%	0%
South Hempstead	374	0%	0%	0%	100%	0%
South Valley Stream	549	0%	91%	3%	6%	94%
Stewart Manor	128	0%	0%	0%	100%	0%
Uniondale	1,721	0%	0%	0%	100%	0%
Valley Stream	2,268	0%	24%	15%	61%	39%
Wantagh	2,452	0%	14%	1%	85%	15%
West Hempstead	1,777	0%	0%	0%	100%	0%
Woodmere	1,662	0%	73%	2%	25%	75%
Woodsburgh	244	9%	46%	1%	44%	56%
Subtotal	**70779**	2%	28%	2%	67%	33%
North Hempstead, Town of						
Albertson	437	0%	0%	0%	100%	0%
Baxter Estates	107	0%	6%	3%	91%	9%
Carle Place	622	0%	0%	0%	100%	0%
East Hills	1,436	0%	0%	0%	100%	0%
East Williston	364	0%	0%	0%	100%	0%
Flower Hill	1,050	0%	0%	0%	100%	0%
Garden City Park	637	0%	0%	0%	100%	0%
Great Neck	243	1%	5%	3%	91%	9%
Great Neck Estates	486	5%	8%	1%	86%	14%
Great Neck Gardens	141	0%	0%	0%	100%	0%
Great Neck Plaza	196	0%	0%	0%	100%	0%
Greenvale	171	0%	0%	0%	100%	0%
Harbor Hills	79	6%	0%	0%	94%	6%
Herricks	371	0%	0%	0%	100%	0%
Kensington	146	0%	3%	0%	97%	3%
Kings Point	2,207	6%	6%	2%	86%	14%
Lake Success	1,206	0%	0%	0%	100%	0%
Manhasset	1,538	1%	1%	0%	98%	2%
Manhasset Hills	381	0%	0%	0%	100%	0%

Manorhaven	312	4%	15%	12%	69%	31%
Mineola	1,197	0%	0%	0%	100%	0%
Munsey Park	321	0%	0%	0%	100%	0%
New Cassel	938	0%	0%	0%	100%	0%
New Hyde Park	545	0%	0%	0%	100%	0%
North Hills	1,773	0%	0%	0%	100%	0%
North New Hyde Park	1,289	0%	0%	0%	100%	0%
Old Westbury	5,442	0%	0%	0%	100%	0%
Plandome	322	1%	1%	1%	97%	3%
Plandome Heights	114	3%	4%	3%	90%	10%
Plandome Manor	359	9%	6%	1%	84%	16%
Port Washington	2,621	3%	3%	1%	93%	7%
Port Washington North	313	1%	6%	3%	90%	10%
Roslyn	430	0%	6%	3%	91%	9%
Roslyn Estates	269	0%	0%	0%	100%	0%
Roslyn Harbor	752	1%	2%	1%	96%	4%
Roslyn Heights	939	0%	0%	0%	100%	0%
Russell Gardens	112	0%	2%	0%	98%	2%
Saddle Rock	172	6%	8%	2%	84%	16%
Saddle Rock Estates	49	0%	0%	0%	100%	0%
Sands Point	2,725	6%	7%	1%	86%	14%
Searingtown	600	0%	0%	0%	100%	0%
Thomaston	263	0%	2%	0%	98%	2%
University Gardens	121	0%	0%	0%	100%	0%
Westbury	1,491	0%	0%	0%	100%	0%
Williston Park	393	0%	0%	0%	100%	0%
Subtotal	**35277**	1%	2%	1%	96%	4%
Oyster Bay, Town of						
Bayville	900	8%	31%	4%	57%	43%
Bayville (unincorporated)	100	5%	43%	9%	43%	57%
Bethpage	2,349	0%	0%	0%	100%	0%
Brookville	2,565	0%	0%	0%	100%	0%
Centre Island	683	8%	21%	3%	68%	32%
Cove Neck	798	4%	9%	1%	86%	14%
East Massapequa	2,171	0%	20%	3%	77%	23%
East Norwich	668	0%	0%	0%	100%	0%
Farmingdale	701	0%	0%	0%	100%	0%
Glen Cove	4,261	2%	4%	2%	92%	8%
Glen Head	1,050	0%	0%	0%	100%	0%
Glenwood Landing	647	5%	2%	1%	92%	8%
Hicksville	4,339	0%	0%	0%	100%	0%
Jericho	2,824	0%	0%	0%	100%	0%
Lattingtown	2,459	4%	12%	1%	83%	17%
Laurel Hollow	1,857	1%	0%	0%	99%	1%
Locust Valley	588	0%	7%	1%	92%	8%
Massapequa	2,285	0%	22%	14%	64%	36%
Massapequa Park	1,386	0%	1%	1%	98%	2%
Matinecock	1,700	0%	0%	0%	100%	0%
Mill Neck	1,727	2%	8%	0%	90%	10%
Muttontown	3,889	0%	0%	0%	100%	0%
North Massapequa	1,930	0%	13%	1%	86%	14%

Old Bethpage	2,609	9%	4%	2%	85%	15%
Old Brookville	2,538	0%	0%	0%	100%	0%
Oyster Bay	812	0%	0%	0%	100%	0%
Oyster Bay Cove	2,669	0%	0%	0%	100%	0%
Plainedge	910	0%	0%	0%	100%	0%
Plainview	3,655	0%	0%	0%	100%	0%
Sea Cliff	710	3%	2%	1%	94%	6%
South Farmingdale	1,413	0%	3%	1%	96%	4%
Syosset	3,203	0%	0%	0%	100%	0%
Upper Brookville	2,753	0%	0%	0%	100%	0%
Woodbury	3,243	0%	0%	0%	100%	0%
Subtotal	**66389**	2%	6%	1%	91%	9%
TOTAL NASSAU COUNTY	**172,445**	2%	12%	1%	85%	15%

Sources: Nassau County Land Parcels GIS Database, 2014; Nassau County FEMA 2009 Flood Map GIS Database, 2014

Several factors determine the magnitude or severity of floods, as discussed below:

Velocity of Water and Terrain: High velocity floodwaters are more damaging than lower velocity floodwaters. Floodwaters flow more quickly in areas of steep topography.

Size of a Watershed: In large watersheds, it is often possible to predict flooding hours or even days in advance as conditions are observed building over time. In small watersheds in areas of steep terrain, flooding may come with little or no advance warning because of the speed of the water.

Volume of Water: As rainfall volume and intensity increase, so does the likelihood for flooding as the capacity of natural and man-made conveyances is exceeded. This is also true for higher volumes and rates of snowmelt.

Ground Cover: According to the Nassau County Flood Insurance Study, Nassau County soils have a low runoff potential, which means more rainwater and/or snowmelt is likely to infiltrate the soils. However, developed areas with higher proportions of impervious surfaces (paved areas, buildings, etc.) would have a much higher runoff potential. The highest percentages of impervious area exist in communities within the boundary of the Town of Hempstead, followed next by communities in the Town of North Hempstead and finally by communities in the Town of Oyster Bay.

Topography: Runoff will reach natural and man-made conveyance channels more rapidly in areas of steeper terrain.

Tides: The timing of storms as they relate to the tidal cycle often has a drastic effect on the severity of flooding in coastal areas. The level of coastal waters and tidally affected water courses increases at the time of high tide. The coincidence of a severe storm at the time of a high tide can exacerbate the effects of flooding. These effects can be combined with high intensity rainfall and urban runoff as storm sewer outlets become blocked by high tidal waters and runoff backs up through the system onto roadways.

Storm Surge Extent

Storm surge impacts can be severe in coastal regions of Nassau County. According to USACE mapping of storm surge under worst case conditions surge events surge would not come very far inland in most communities on the north shore due to the local topography characterized in many locations by steep bluffs near the shoreline. On the south shore, because the topography is generally flat and closer to sea level, a Category 4 storm surge could inundate nearly everything seaward of a general point halfway between the Southern State Parkway and Sunrise Highway. A Category 2-3 storm surge could inundate to approximately Sunrise Highway in many locations; and a Category 1 storm surge could inundate approximately halfway to Sunrise Highway in many locations. Previous Figures show SLOSH mapping for the Town of Hempstead, North Hempstead, and Oyster Bay, respectively. The following table illustrates areas inundated for each scenario, for each community in Nassau County.

Table 20

Summary of Potential Surge Inundation Areas by Community

Municipality Name	Total Acres	% in Cat 1 Surge Zone	% in Cat 2 Surge Zone	% in Cat 3 Surge Zone	% in Cat 4 Surge Zone
Hempstead, Town of					
Atlantic Beach	316	41%	97%	99%	99%
Atlantic Beach West	129	67%	95%	97%	98%
Baldwin	1899	5%	21%	40%	55%
Baldwin Harbor	724	64%	98%	100%	100%
Barnum Island	400	93%	99%	100%	100%
Bay Park	310	78%	96%	99%	100%
Bellerose	76	0%	0%	0%	0%
Bellerose Terrace	84	0%	0%	0%	0%
Bellmore	1458	7%	63%	87%	99%
Cedarhurst	437	19%	36%	65%	99%
East Atlantic Beach	213	47%	96%	99%	100%
East Garden City	1941	0%	0%	0%	0%
East Meadow	3211	0%	0%	0%	0%
East Rockaway	666	39%	80%	92%	100%
Floral Park	915	0%	0%	0%	0%
Elmont	2213	0%	0%	0%	0%
Franklin Square	1836	0%	0%	0%	0%
Freeport	2909	34%	54%	75%	88%
Garden City	4320	0%	0%	0%	0%
Garden City South	257	0%	0%	0%	0%

Harbor Isle	111	100%	100%	100%	100%
Hempstead	2359	0%	0%	0%	0%
Hewlett	569	6%	31%	66%	100%
Hewlett Bay Park	231	25%	63%	97%	100%
Hewlett Harbor	432	58%	80%	97%	100%
Hewlett Neck	127	45%	63%	100%	100%
Inwood	1013	39%	81%	94%	100%
Island Park	249	98%	100%	100%	100%
Jones Beach Barrier Island	3283	45%	96%	100%	100%
Lakeview	751	0%	3%	13%	27%
Lawrence	1506	48%	66%	84%	96%
Levittown	4364	0%	0%	0%	0%
Lido Beach	1159	74%	97%	100%	100%
Long Beach	1430	87%	100%	100%	100%
Lynbrook	1289	0%	15%	70%	99%
Malverne	681	0%	2%	5%	40%
Malverne Oaks	71	0%	0%	1%	10%
Merrick	2518	18%	65%	83%	95%
North Bellmore	1683	0%	0%	0%	9%
North Lynbrook	53	0%	0%	9%	85%
North Merrick	1089	0%	0%	0%	4%
North Valley Stream	1198	0%	0%	3%	20%
North Wantagh	1201	0%	0%	0%	0%
Oceanside	3166	54%	82%	94%	96%
Point Lookout	140	42%	99%	100%	100%
Rockville Centre	2124	3%	11%	30%	50%
Roosevelt	1168	0%	3%	10%	15%
Salisbury	1979	0%	0%	0%	0%
Seaford	1571	10%	50%	71%	83%
South Floral Park	0	0%	0%	0%	0%
South Hempstead	0	0%	0%	0%	0%
South Valley Stream	548	51%	97%	99%	100%
Stewart Manor	0	0%	0%	0%	0%
Uniondale	0	0%	0%	0%	0%
Valley Stream	2268	6%	30%	71%	92%
Wantagh	2451	3%	35%	57%	72%
West Hempstead	1777	0%	0%	0%	1%
Woodmere	1662	47%	77%	89%	97%
Woodsburgh	244	54%	84%	99%	100%
Subtotal	**70779**	**24%**	**40%**	**49%**	**56%**
North Hempstead, Town of					

Albertson	436	0%	0%	0%	0%
Baxter Estates	107	4%	13%	20%	26%
Carle Place	621	0%	0%	0%	0%
East Hills	1436	0%	0%	0%	0%
East Williston	363	0%	0%	0%	0%
Flower Hill	1050	0%	0%	0%	0%
Garden City Park	637	0%	0%	0%	0%
Great Neck	243	4%	5%	15%	22%
Great Neck Estates	486	12%	16%	20%	23%
Great Neck Gardens	141	0%	0%	0%	0%
Great Neck Plaza	196	0%	0%	0%	0%
Greenvale	170	0%	0%	0%	0%
Harbor Hills	79	3%	4%	6%	9%
Herricks	370	0%	0%	0%	0%
Kensington	146	3%	4%	5%	5%
Kings Point	2207	5%	11%	20%	31%
Lake Success	1205	0%	0%	0%	0%
Manhasset	1538	1%	2%	3%	5%
Manhasset Hills	380	0%	0%	0%	0%
Manorhaven	311	8%	41%	78%	83%
Mineola	1196	0%	0%	0%	0%
Munsey Park	321	0%	0%	0%	0%
New Cassel	938	0%	0%	0%	0%
New Hyde Park	545	0%	0%	0%	0%
North Hills	1773	0%	0%	0%	0%
North New Hyde Park	1289	0%	0%	0%	0%
Old Westbury	5442	0%	0%	0%	0%
Plandome	322	1%	2%	5%	7%
Plandome Heights	114	4%	10%	14%	17%
Plandome Manor	359	5%	11%	19%	27%
Port Washington	2621	3%	7%	10%	13%
Port Washington North	313	3%	10%	18%	33%
Roslyn	430	2%	7%	11%	14%
Roslyn Estates	269	0%	0%	0%	0%
Roslyn Harbor	752	1%	3%	4%	6%
Roslyn Heights	939	0%	0%	0%	0%
Russell Gardens	112	0%	0%	0%	0%
Saddle Rock	172	5%	14%	23%	34%
Saddle Rock Estates	49	0%	0%	20%	43%
Sands Point	2725	6%	11%	14%	16%
Searingtown	600	0%	0%	0%	0%

Thomaston	263	1%	2%	3%	3%
University Gardens	121	0%	0%	0%	0%
Westbury	1491	0%	0%	0%	0%
Subtotal	**35277**	**2%**	**4%**	**7%**	**9%**
Oyster Bay, Town of					
Bayville	900	24%	41%	46%	49%
Bayville (unincorporated)	100	27%	54%	66%	66%
Bethpage	2349	0%	0%	0%	0%
Brookville	2565	0%	0%	0%	0%
Centre Island	683	19%	29%	37%	45%
Cove Neck	798	8%	13%	17%	20%
East Massapequa	2171	4%	38%	64%	75%
East Norwich	668	0%	0%	0%	0%
Farmingdale	701	0%	0%	0%	0%
Glen Cove	4261	2%	7%	10%	11%
Glen Head	1050	0%	0%	0%	0%
Glenwood Landing	647	5%	9%	12%	14%
Hicksville	4339	0%	0%	0%	0%
Jericho	2824	0%	0%	0%	0%
Lattingtown	2459	12%	16%	19%	22%
Laurel Hollow	1857	1%	1%	2%	2%
Locust Valley	588	4%	8%	10%	12%
Massapequa	2285	3%	55%	73%	84%
Massapequa Park	1386	0%	13%	32%	59%
Matinecock	1700	0%	0%	0%	0%
Mill Neck	1727	5%	8%	11%	14%
Muttontown	3889	0%	0%	0%	0%
North Massapequa	1930	0%	0%	5%	10%
Old Bethpage	2609	0%	0%	0%	0%
Old Brookville	2538	0%	0%	0%	0%
Oyster Bay	812	9%	18%	22%	26%
Oyster Bay Cove	2669	0%	1%	2%	3%
Plainedge	910	0%	0%	0%	0%
Plainview	3655	0%	0%	0%	0%
Sea Cliff	710	3%	6%	8%	9%
South Farmingdale	1413	0%	0%	0%	0%
Syosset	3203	0%	0%	0%	0%
Upper Brookville	2753	0%	0%	0%	0%
Woodbury	3243	0%	0%	0%	0%
Subtotal	**66389**	**4%**	**9%**	**13%**	**15%**
TOTAL NASSAU COUNTY	**172,445**	**10%**	**18%**	**23%**	**27%**

Sources: Nassau County Land Parcels GIS Database, 2014; Nassau County SLOSH GIS Database, 2014

The **National Flood Insurance Program (NFIP)** was established by Congress with the passage of the National Flood Insurance Reform Act of 1968. Through this program, Federally-backed flood insurance is made available to homeowners, renters, and businesses in a community if that community adopts and enforces a floodplain management ordinance to reduce future flood damages within its floodplains. This includes not only preventative measures for new development, but also corrective measures for existing development. In addition to providing flood insurance, the NFIP also studies and maps the nation's floodplains, preparing its findings in Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies (FISs). FEMA also prepares digital Q3 Flood Data files, which contain digital flood hazard mapping. Using GIS, these digital maps can be overlaid upon a community's existing GIS base map.

Table 21
FEMA NFIP Policy and Claim Information for Nassau County Jurisdictions
(Claims from January 1, 1978 as of November 30, 2012) Source:www.fema.gov

Community	Policies in Force	Insurance in force	Total Losses	Total Payments
Atlantic Beach, Village Of	355	$112,970,800	206	1,231,996.18
Baxter Estates, Village Of	16	$5,351,300	5	15,911.88
Bayville, Village Of	861	$206,390,000	1,231	9,764,847.50
Cedarhurst, Village Of	370	$109,777,500	334	1,774,647.91
Centre Island, Village Of	35	$9,224,800	50	311,960.94
Cove Neck, Village Of	11	$4,044,300	7	7,636.74
East Hills, Village Of	87	$30,022,000	12	104,268.02
East Rockaway, Village Of	825	$230,485,000	1,127	8,000,891.97
East Williston, Village Of	13	$4,340,000		
Floral Park, Village Of	54	$15,832,000	2	3,922.90
Flower Hill, Village Of	32	$9,610,000	1	6,036.46
Freeport, Village Of	3,069	$770,791,600	5,949	58,306,193.68
Garden City, Village Of	48	$13,360,000	4	4,849.08
Glen Cove, City Of	149	$45,124,300	159	1,239,462.78
Great Neck Estates, Village Of	64	$20,813,300	32	364,302.92
Great Neck Plaza, Village Of	5	$1,020,000		
Great Neck, Village Of	102	$33,014,100	125	957,214.85
Hempstead, Town Of	20,319	$5,878,400,300	20,446	154,847,066.04
Hempstead, Village Of	33	$9,327,000	7	74,447.59
Hewlett Bay Park, Village Of	39	$13,289,900	29	189,595.29
Hewlett Harbor, Village Of	214	$69,573,900	230	1,759,898.17
Hewlett Neck, Village Of	61	$19,143,500	68	358,257.00
Island Park, Village Of	923	$248,830,800	1,898	22,203,261.93
Kensington, Village Of	14	$4,550,000	4	10,997.63
Kings Point, Village Of	164	$52,201,500	120	725,487.14
Lake Success, Village Of	15	$5,040,000	13	240,839.15
Lattingtown, Village Of	47	$14,956,400	37	194,591.81
Laurel Hollow, Village Of	19	$6,171,400	7	21,797.24
Lawrence, Village Of	564	$185,938,000	414	3,367,176.04
Long Beach, City Of	7,669	$1,901,347,800	8,205	51,684,314.64
Lynbrook, Village Of	235	$50,962,000		

Malverne, Village Of	93	$25,667,800	2	9,650.63
Manorhaven, Village Of	182	$50,967,500	81	316,229.84
Massapequa Park, Village Of	554	$165,566,600	648	4,926,673.20
Mill Neck, Village Of	14	$4,599,300	9	12,533.55
Munsey Park, Village Of	15	$4,263,000		
New Hyde Park, Village Of	26	$6,945,000	2	1,000.00
North Hempstead, Town Of	561	$174,120,000	217	2,019,951.79
North Hills, Village Of	61	$18,705,000	12	41,565.43
Old Brookville, Village Of	4	$1,400,000		
Oyster Bay Cove, Village Of	21	$6,673,400	23	163,647.85
Oyster Bay, Town Of	4,039	$1,145,708,300	5,034	54,924,615.43
Plandome Heights, Village Of	17	$4,841,000	8	12,590.75
Plandome Manor, Village Of	36	$11,246,500	18	108,847.22
Plandome, Village Of	20	$6,143,300	17	81,907.52
Port Washington North, Village	82	$25,820,200	31	173,474.37
Rockville Centre, Village Of	279	$87,927,700	69	257,785.52
Roslyn Estates, Village Of	8	$2,660,000		
Roslyn Harbor, Village Of	22	$8,291,000	19	75,028.96
Roslyn, Village Of	25	$7,263,500	39	142,113.28
Russell Gardens, Village Of	9	$2,440,000	2	1,554.70
Saddle Rock, Village Of	18	$5,948,100	22	206,650.80
Sands Point, Village Of	120	$40,816,700	95	949,451.89
Sea Cliff, Village Of	33	$10,610,900	29	132,507.28
Stewart Manor, Village Of	3	$630,000		
Thomaston, Village Of	17	$5,530,000	11	21,919.30
Valley Stream, Village Of	1,672	$517,946,900	284	1,729,585.49
Westbury, Village Of	17	$5,778,000	1	0.00
Woodsburgh, Village Of	81	$27,122,700	48	383,241.92
Total Nassau County	44441	$12,457,535,900	47443	$384,464,400.20

Source: FEMA website

Repetitive Loss Property Information for Nassau County Jurisdictions

Some communities in Nassau County have high number of properties which have recurrent losses (that is, “repetitive loss properties” – those properties which have incurred at least two NFIP insured flood losses of greater than $1,000 each in any rolling ten-year period since 1978. FEMA’s NFIP terms these communities “Repetitive Loss Communities”. Nassau County has 35 Repetitive Loss Communities. Together, these communities contain a total of 1,312 Repetitive Loss Properties. Of the total of approximately $81 million in total claims paid through the NFIP, approximately $42 million represent losses to Repetitive Loss Properties. The Repetitive Loss Data shows that historically, roughly 75% of losses represent building damages and 25% of losses represent damages to contents. Nassau County Repetitive Loss data is contained in Appendix G.

Nassau County Jurisdictions’ Participation in NFIP Community Rating System

The NFIP’s Community Rating System (CRS), first implemented nationwide in 1990, provides discounts on flood insurance premiums in those communities that establish floodplain management programs that go beyond NFIP minimum requirements. Communities participating in the CRS program receive ‘points’ for various activities and initiatives they undertake. As more points are accrued, the community's CRS Class increases. There are 10 CRS classes: Class 1 requires the most credit points and gives the largest premium reduction, while Class 10 requires not credit points and gives no premium reduction. CRS premium discounts on flood insurance range from 5 percent for Class 9 communities up to 45 percent for Class 1 communities. Nationwide, there are over 900 communities receiving flood insurance premium reductions due to their participation in the CRS program. A total of six communities in Nassau County participate in the CRS, achieving benefits in the form of premium discounts for their efforts to exceed the minimum requirements of the NFIP as depicted in the following table.

Table 22

Jurisdictions Participation in the NFIP's Community Rating System

Community ID	Community Name	Number of Flood Insurance Policies	CRS Class
360467	Hempstead, Town Of	20083	Not Participating
365338	Long Beach, City Of	7696	8
360483	Oyster Bay, Town Of	4049	Not Participating
365338	Long Beach, City Of	7696	8
360483	Oyster Bay, Town Of	4049	Not Participating
360464	Freeport, Village Of	3051	7
360495	Valley Stream, Village Of	1619	Not Participating
360471	Island Park, Village Of	937	Not Participating
360988	Bayville, Village Of	872	8
360463	East Rockaway, Village Of	825	9
360482	North Hempstead, Town Of	593	Not Participating
360480	Massapequa Park, Village Of	571	Not Participating
360476	Lawrence, Village Of	560	7
360460	Cedarhurst, Village Of	374	Not Participating

Source: www.FEMA.gov

Probability of Occurrence

The probability of occurrence of a flood at a given location (the odds of being flooded) is expressed in percentages as the chance of a flood of a specific magnitude occurring in any given year. The "100-year flood" has a 1% chance of occurring in any given year. The 100-year flood is often also referred to as the "base flood". This probability of occurrence might imply that a 100-year flood would reoccur only once every 100 years; in reality, this is not the case. A 100- year flood can happen multiple times in a single year, or not at all for more than 100 years. Properties located in FEMA-mapped A and V Zones are within the footprint of the 100-year floodplain. FEMA A-Zones represent the 100-year floodplain. FEMA V-Zones represent that portion of the 100-year floodplain inland as far as a 3-foot breaking wave would propagate (the 3- foot breaking wave represents the minimum size wave capable of causing major damage to conventional wood frame or brick veneer structures).

For all floodplains, there is an associated water surface elevation. This elevation is unique to any given location on the map (in other words, 100-year flood levels vary from one community to the next throughout Nassau County, and also within individual communities).

Within the 100-year floodplain, flooding can occur at less than 100-year flood level, and also more than the 100-year flood level. The 100-year flood represents a flood of high magnitude – it is a deep and widespread event. The 500-year flood is of a greater magnitude, and would be deeper and more widespread than a 100-year event. However, it is not as likely to occur. Smaller floods, with magnitudes of 10-years or 50-years for example, are also possible within the 100- year floodplain. These are not as deep or as widespread as a 100-year flood would be, however, they are much more likely to occur.

The term "100-year flood" can often be confusing to someone not intimately familiar with flooding or statistics. FEMA's *NFIP Floodplain Management Requirements: a Study Guide and Desk Reference for Local Officials* (FEMA-480), suggests that another way to look at flood risk is to think of the odds that a 100-year flood will happen sometime during the life of a 30-year mortgage of a home in the floodplain. Figure 11 illustrates these odds, over various time periods for different size floods. In any given year, a property in the 100-year floodplain has a 10 percent chance of being flooded by a 10-year flood, and a 1 percent chance of being flooded by a 100- year flood. This may not sound terribly risky at first glance. However, over a 30 –year period, that same location has a 96% chance of being flooded by a 10-year flood and a 26% chance of being flooded by a 100-year flood.

Landslides

According to the USGS National Landslide Information Center (NLIC), the term "landslide" is defined as the movement of a mass of rock, debris, or earth down a slope. The force of gravity acting upon a steep (or sometimes, even a moderately steep) slope is the primary cause of a landslide. Slope failure occurs when the force of gravity pulling the slope downward exceeds the strength of the earth materials that comprise the slope to hold it in place. In addition to the force of gravity, other contributing factors to landslides can include rainfall and/or rapid snowmelt, earthquakes, volcanic activity, changes in groundwater, and human-induced modifications to existing slopes.

The potential for a landslide to occur exists in every state in the country wherever very weak or fractured materials are resting on a moderate to steep slope (typically, a slope steep enough to make walking difficult). However, not all moderate to steep slopes are prone to landslides. As slope stability increases, the susceptibility to landslides decreases. Key factors in slope stability are:

Soil Type. Certain types of soil are more stable on slopes than others. For example, as noted in the New York State Hazard Mitigation Plan, glacial till is one type of soil that tends to stand up well to the landslide tendency while glacial lake clay soils tend to have a higher risk for landslides.

Terrain. The degree of the slope and the height from top of the slope to its toe also affect slope stability. The New York State Hazard Mitigation Plan indicates that the steeper the slope the higher the risk for landslides to occur (all other things being equal). They note that minor landslides called "slumps" can occur with very minor slopes, and that landslides are most likely on slopes greater than or equal to 10 degrees. In terms of the height of the slope, the State Plan notes that relief greater than 40 feet is generally accepted to be the threshold where the potential becomes more significant.

Vegetative Cover. Slopes with little or no vegetative cover are more prone to landslides than other more vegetated slopes.

Soil Water Content. As soil water content increases, slope stability decreases. Periods of sustained above-average precipitation, short duration rainfall events with significant precipitation, and snowmelt events can all add to soil water content and increase susceptibility to landslides.

Landslides can be triggered by natural events or by humans. Natural events include erosion, decreases in vegetative cover to do natural causes and/or seasonal changes, and ground shaking from earthquakes. Human caused triggers include altering the slope gradient, increasing the soil water content, and removal of vegetative cover.

Location – Landslides

Areas that are commonly considered to be safe from landslides include areas that have not experienced landslides in the past, areas of minimal slope, and areas set back from the tops of slopes. Conversely, areas that are commonly considered to be more prone to landslides tend to be areas where a landslide has occurred in the past, bases of steep slopes or drainage channels, and developed hillsides where leach field septic systems are used.

The USGS has published a landslide overview map of the conterminous United States. Data from this map is available on NationalAtlas.gov. Figure 12 illustrates this data for Nassau County. It shows that roughly the northern 30 percent of the County that falls within a mapped area of high susceptibility and low incidence, rather than in areas further south (roughly the remaining 70 percent that falls within a mapped area of low susceptibility and low incidence). This coincides generally with the topography of the County, with areas along the southern portion being relatively flat and areas along the northernmost areas exhibiting a certain degree of relief.

Landslide Extent

The severity of a landslide depends in large part on the degree of development in the area in which it occurs and the geographic area of slide itself. Generally speaking, landslides often result in devastating consequences, but in very localized areas. A landslide occurring in an undeveloped area would be less severe because lives and property would not be affected; the only impacts would be to land, vegetation, and possibly some wildlife. On the contrary, a landslide occurring in a developed area could have devastating affects, ranging from structure and infrastructure damage to injury and/or loss of life. Structures or infrastructure built on susceptible land would likely collapse as their footings slide downhill, while those below the land failure would likely be crushed.

Landslide Probability of Occurrence

Landslides have occurred in Nassau County's past, and are highly probable to occur there in the future. Using documented historical occurrences to estimate the probability of future landslides, Nassau County can expect on average approximately one landslide every 14 years. Based on the location of historic landslides and the local landslide susceptibility map for Nassau County, it is more likely that future landslides will occur generally north of the Long Island Expressway in the Town of North Hempstead or the Town of Oyster Bay (that is, roughly the northern 30 percent of the County that falls within a mapped area of high susceptibility and low incidence).

Drought

The general term "drought" is defined by the US Geological Survey (USGS) as, "a prolonged period of less-than-normal precipitation such that the lack of water causes a serious hydrologic imbalance." As stated in FEMA's, "Multi-Hazard Identification and Risk Assessment " (1997), drought is the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length.

According to the National Oceanic and Atmospheric Administration's (NOAA's) Drought Information Center, there are four types of drought:

- Meteorological Drought – A measure of precipitation departure from normal.
- Agricultural Drought – When the amount of moisture in soil does not meet the needs of a particular crop.
- Hydrological Drought – When both surface and subsurface water supplies are below normal.
- Socioeconomic Drought – When a water shortage begins to affect people. *(The New York State Hazard Mitigation Plan expands upon NOAA's definition of Socioeconomic Drought by explaining that socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply.)*

Groundwater is the primary source of water supply on Long Island. According to the USGS Hydrologic Atlas 730-M for Segment 12 (which includes New York State, in addition to the states of Maine, Vermont, New Hampshire, Massachusetts, Connecticut and Rhode Island), published by Perry G. Olcott in 1995, precipitation is the source of all freshwater in New York State. Most of the precipitation that is not evapotranspired runs directly off the land surface to streams or reaches streams after temporary storage in lakes, reservoirs, wetlands, and soils. A small part of precipitation infiltrates the land surface and percolates downward to recharge aquifers. On Long Island, the aquifer is known as the Northern Atlantic Coastal Plain Aquifer System. Nassau County obtains its water supply from this aquifer system. The system consists of the Magothy aquifer and its underlying Lloyd aquifer. The aquifers are separated by a leaky confining unit of clays of the Raritan Formation. The Magothy aquifer provides most of the public water supply in Queens, Nassau, and western Suffolk Counties. The Lloyd aquifer provides most of the water for public supply for the northwest shore area of Long Island. In the report notes that in 1985, withdrawals of the Magothy and Lloyd aquifers of the Northern Atlantic Coastal Plain underlying Long Island were about 469 million gallons per day. For this same year (for all of Long Island) the report notes that nearly 71 percent of water withdrawals were for public supply. Withdrawals for industrial, mining, and thermoelectric power were estimated to be about 15 percent; while combined domestic, commercial, and agricultural uses accounted for the remaining 14 percent of total withdrawals.

Drought Location and Extent

Droughts can occur in any part of the country, at any time of the year, depending upon temperature and precipitation over time. The footprint of the drought hazard area would encompass the full planning area for this document thus a drought hazard area map has not been prepared.

Drought has the potential to affect nearly all sectors of the economy, environment, and government. Impacts of drought typically evolve gradually, and regions of maximum intensity change with time. Impacts of drought can be categorized as economic, environmental, or social. The New York State Hazard Mitigation Plan contains a comprehensive summary of drought impacts. In general, impacts of drought can include significant adverse consequences to:

- Public water supplies for human consumption
- Rural water supplies for livestock consumption and agricultural operations
- Water quality
- Natural soil water or irrigation water for agriculture
- Water for forests and for fighting forest fires
- Water for navigation and recreation.

The severity of these impacts depends not only on the duration, intensity, and geographic extent of a specific drought event, but also on the demands made by human activities and vegetation on regional water supplies. New York State's Drought Plan (as developed in 1982 and last revised in 1988) includes: (1) a state drought preparedness plan which focuses on monitoring and evaluating conditions and options to minimize drought impacts, and (2) a drought response plan that defines specific actions to be taken during various stages of drought. Drought severity is measured by the state using the Palmer Drought Index and the State Drought Index. Conditions monitored include climatological data, reservoir/lake storage, stream flow, and groundwater levels. The five stages of drought severity in New York State are Normal, Drought Alert, Drought Warning, Drought Emergency, and Drought Disaster.

According to the Nassau County Comprehensive Plan, the County contains 47 water districts which provide water service to over 90 percent of the County's residents. Approximately 3,550 residents of the less densely populated northern sections of the County draw their water from private wells. Nassau County has four aquifers which provide fresh water and are continuously being recharged by precipitation. Natural recharge to aquifers each day is reported to exceed average withdrawals from Long Island aquifers by 153 million gallons.

In summary, the magnitude and severity of drought in Nassau County is expected to be low, for the following reasons:

- Crop failure is one common affect of drought. According to the 2002 Agriculture Census for Nassau County, only 495 acres in Nassau County represents cropland. Losses to crops in Nassau County would be minimal.

- Water supply shortages are a second affect of drought. Nassau County gets most of its water from underground aquifers. Because underground aquifers are fairly resistant to the impacts of short-term droughts (the most likely type of drought to occur in Nassau County), the expected likelihood of future losses associated with reductions in water supply would be low.

- A third common affect of drought is fish and wildlife mortality. Because so much of the land area in Nassau County is developed, fish and wildlife habitat is fairly low and therefore losses to fish and wildlife would likely be low.

- A fourth common affect of drought is wildfires. Wildfires are not likely to occur in Nassau County. Small brushfires are possible, however. The expected likelihood of future losses during a drought as a result of brushfires is relatively low on a county or community level. However, losses in the particular location of the fire could be quite severe, particularly in areas where transportation or utilities are located.

Drought Probability of Occurrence

Past drought occurrences are expected to be a sound indicator of the probability of future drought occurrences for Nassau County. Certain parts of the country are more susceptible to being impacted by a drought than others are. Arid parts of the country tend to be at greater risk of experiencing long-term droughts, while more humid parts of the country tend to be more susceptible to short-term droughts. According to the USGS Division of Water Resources, Nassau County and its jurisdictions fall within what is described as a "humid region" and is more likely to experience a short-term drought.

Extreme Winds

Wind, as defined by the American Meteorological Society, is air that is in constant motion relative to the surface of the earth. Since vertical components of atmospheric motion are relatively small, especially near the surface of the earth, meteorologists use the term "wind" to denote almost exclusively the horizontal component. Vertical winds are usually identified as such. Extreme winds are most often associated with tornadoes, hurricanes, tropical cyclones, destructive wind, and thunderstorms.

Extreme wind events can occur suddenly without warning. They can occur at any time of the day or night, at any location within Nassau County. Extreme winds pose a significant threat to lives, property, and vital utilities due to flying debris, such as rocks, lumber, fuel drums, sheet metal and loose gear of any type that can be picked up by the wind and hurled with great force. Extreme winds also down trees and power lines, often resulting in power outages across an affected area. Extreme winds are most commonly the result of tornadoes, hurricanes, tropical cyclones, extratropical cyclones (northeasters), destructive wind, and thunderstorms, but can also occur in their absence as mere "windstorms."

(1) Tornadoes: Tornadoes are the most commonly known type of windstorm causing the most damage to property and life and all is due to severe winds. As researched by FEMA, there are, on average, 10 severe windstorms, classified as tornadoes, in the United States defined as F4 or F5 on the Fujita scale. (The Fujita scale reflects how much wind damage results from a tornado expressed in wind speeds. For example, wind speeds can vary between 50 and 250 mph in a typical F5 tornado.)

(2) Hurricanes: A hurricane is a tropical storm with winds that have reached a constant speed of 74 mph or more. Hurricane winds blow in a large spiral around a relative calm center known as the "eye." The "eye" is generally 20 to 30 miles wide.

(3) Coastal Storms: Coastal storms include both tropical cyclones and extratropical cyclones. The National Weather Service defines these terms as follows:

• Cyclone: area of low pressure around which winds blow counterclockwise in the Northern Hemisphere. Also the term used for a hurricane in the Indian Ocean and in the Western Pacific Ocean.

• Tropical Cyclone: forms over tropical or sub-tropical waters around centers of low barometric pressure. Tropical cyclones derive their energy from the ocean. Tropical cyclones can be further broken down according to maximum sustained winds, as follows:

Tropical Depression:	Winds < 39mph
Tropical Storm:	39 mph ≤ Winds < 74
mphHurricane: *	Winds ≥ 74 mph

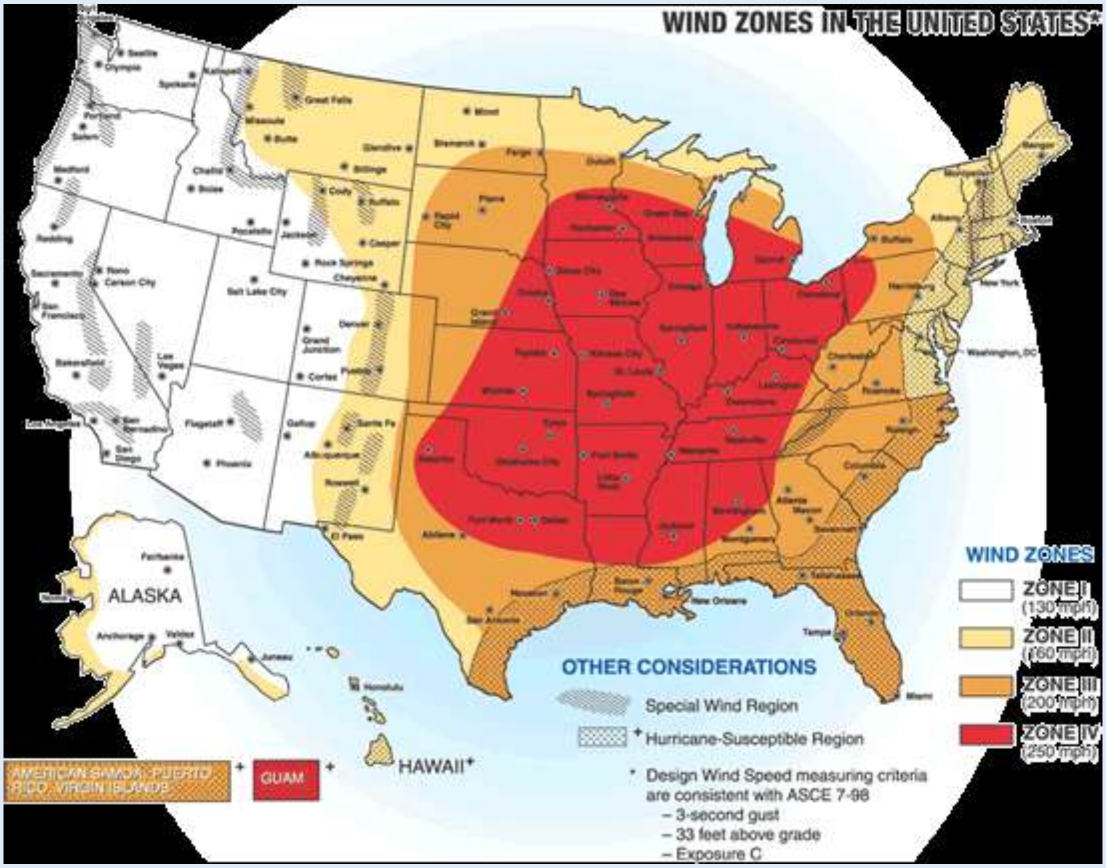
• Extratropical Cyclone: A non-tropical cyclone that forms around a center of low barometric pressure and derives its energy from the atmosphere. Extratropical cyclones are more commonly referred to as "winter storms." Extratropical storms can be experienced on both the East and West Coasts of the United States. On the East Coast, extratropical cyclones are often called "Nor'easters" due to the direction of the storm winds.

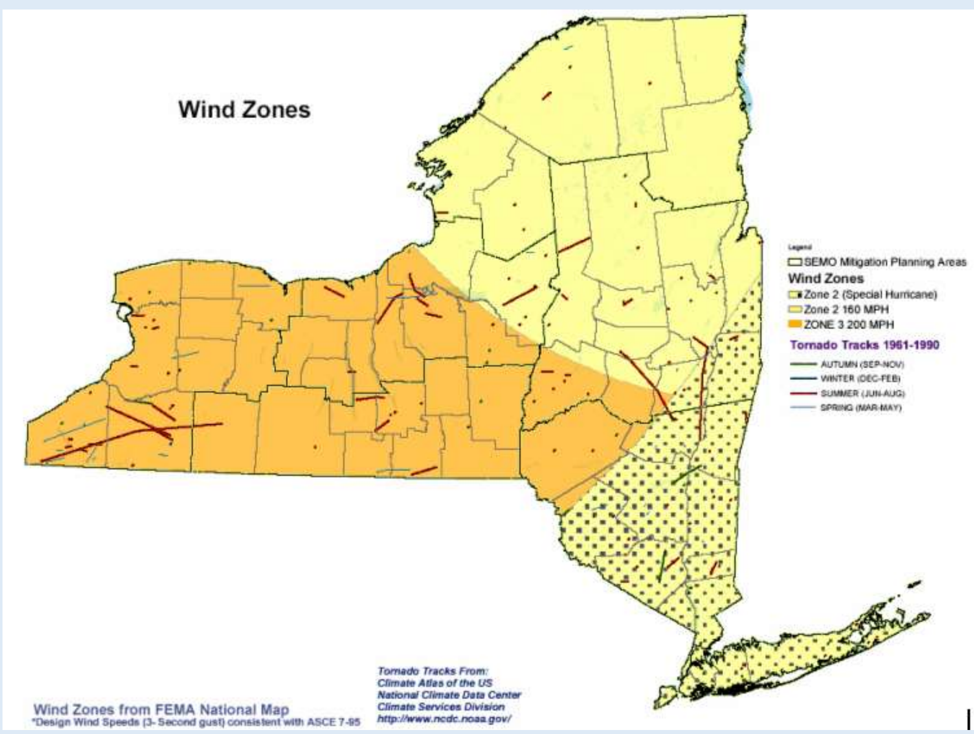
(4) Destructive Wind: Destructive wind is a windstorm that poses a significant threat to life and property and destroying everything in its path. Destructive wind can also cause damage by flying debris, such as rocks, lumber, fuel drums, sheet metal and loose gear of any type which can be picked up by the wind and hurled with great force.

(5) Thunderstorms: A thunderstorm is a combination of moisture, rapidly rising warm air and forceful winds capable of lifting air that's either warm or cold. They also contain lightning and thunder.

Location – Extreme Winds

A useful tool for determining the location of the extreme wind hazard area in a jurisdiction is depicted in the following figures.





Source: FEMA Website

Extent – Extreme Winds

The severity of a severe wind event depends upon the maximum sustained winds experienced in any given area. For Nassau County, the 100-year wind speed ranges from 101 mph on the south shore to 99 mph on the north shore. Wind speeds in excess of this amount are highly unlikely, though not impossible, in Nassau County. Damages associated with winds up to 101 mph range from minimal to moderate. The damages associated with an extreme wind event in Nassau County would be high, however, because the County is highly developed and has a high population, so more people, buildings, and infrastructure could potentially be exposed than in, for example, a similar area of lesser development.

Table 23
Severity and Typical Effects of Various Speed Winds

Maximum Wind Speeds	Equivalent Saffir-Simpson Scale* (Hurricanes)	Equivalent Fujita Scale (Tornadoes)	Severity	Typical Effects
40-72 mph *(35-62 kt)*	Tropical Storm = 39-73 mph	F0	Minimal	Some damage to chimneys; breaks twigs and branches off tress; pushes over shallow-rooted trees; damages signboards; some windows broken; hurricane wind speed begins at 73 mph.
73-112 mph *(63-97 kt)*	Cat 1 = 74-95mph Cat 2 = 96-110 mph Cat 3 = 111-130 mph	F1	Moderate	Peels surfaces off roofs; mobile homes pushed off foundations or overturned; outbuildings demolished; moving autos pushed off the roads; trees snapped or broken.
113-157 mph *(98-136 kt)*	Cat 3 = 111-130 mph Cat 4 = 131-155 mph Cat 5 > 155 mph	F2	Considerable	Roofs torn off frame houses; mobile homes demolished; frame houses with weak foundations lifted and moved; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
158-206 mph *(137-179 kt)*	Cat 5 > 155 mph	F3	Severe	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forests uprooted; heavy cars lifted off the ground and thrown; weak pavement blown off roads.
207-260 mph *(180-226 kt)*	? Cat 5 > 155 mph	F4	Devastating	Well constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and disintegrated; large missiles generated; trees in forest uprooted and carried some distance away. The maximum wind speeds of hurricanes are not likely to reach this level.
261-318 mph *(227-276 kt)*	N/A	F5	Incredible	Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 300 ft (100 m); trees debarked; incredible phenomena will occur. The maximum wind speeds of hurricanes are not expected to reach this level.
Greater than 319 mph *(277 kt)*	N/A	F6	N/A	The maximum wind speeds of tornadoes are not expected to reach this level. The maximum wind speeds of hurricanes are not expected to reach this level.

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In addition to high wind events associated with pressure systems and storms, tornadoes are a particular type of high wind event which are recorded by NOAA's NCDC. No tornadoes were reported between October, 1 2006 and October 31, 2012. In total, the six tornadoes in Nassau County have reportedly caused $1.26 million in damages and six injuries.

Probability of Occurrence – Extreme Winds

Extreme winds are a probabilistic natural phenomenon: it is impossible to predict in what years windstorms will occur or how severe the winds will be. Wind hazards are often expressed in terms of wind frequencies or recurrence intervals, such as a 10-year wind or a 100-year wind. A "100-year wind" means that there is a 1 percent chance in any given year of a wind at the 100- year or higher wind speed. A 10-year wind means that there is a 10 percent chance in any given year of a wind at the 10-year or higher wind speed. Wind recurrence intervals don't mean that windstorms occur exactly at these intervals; rather, they express probabilities of winds. Thus, a given location may experience two 100-year windstorms in a short time period or go several decades without experiencing a 10-year windstorm.

Extreme winds can occur during tornadoes, hurricanes, tropical cyclones, extratropical cyclones (northeasters), destructive wind, and thunderstorms, but can also occur in their absence as mere "windstorms." Extreme winds have a history of occurrence throughout Nassau County, and are highly likely to occur in the future.

The degree of wind hazard risk at a particular site is characterized by the wind speeds expected at the site with recurrence intervals of 10-, 25-, 50-, 100-, and 2000- years. The FEMA Benefit-Cost Module for Wind Hazard Risk provides winds speed data for various return periods at a series of mileposts located along US Gulf and Atlantic coastlines. The data is provided for locations at the coast and for locations 200 km (approximately 125 miles) inland. For the purposes of estimating wind data applicable for Nassau County, milepost 2550 was assumed to most closely resemble conditions in Nassau County. This milepost is located midway between milepost 2500 (located on the New Jersey shore) and milepost 2600 (located on the eastern end of Long Island). Table 21 illustrates Wind Speed Data for Nassau County. FEMA's Hurricane Benefit Cost Analysis module was used to obtain wind speeds at distances between the coast and 20 miles inland (where 20 miles is roughly the distance between Nassau County's north and south shorelines).

Hurricane and Tropical Storm Events

Hurricanes and tropical storms are particular types of events. The hazards associated with a hurricane or tropical storm event are: high winds, flooding (including storm surge), coastal erosion, and wave action. Each of the unique hazards associated with hurricane and tropical storm events are summarized briefly below.

- Winds. After making landfall, hurricane winds can remain at or above hurricane force well inland (sometimes more than 100 miles). In addition, hurricanes can also spawn tornadoes. Typically, the more intense a hurricane is, the greater the tornado threats. High winds are addressed separately in this document, beginning on Page 90.
- Flooding. Upon making landfall, a hurricane rainfall can be as high as 20 inches or more in a 24-hour period, with amounts in the 10 to 15 inch range being most common. If the storm is large and moving slowly, the rainfall amounts can be much higher. Heaviest rainfall tends to be along the coastline, but sometimes there is a secondary maximum further inland. Following a hurricane, inland streams and rivers can flood and trigger landslides. Flooding can also be caused when drainage system capacities are exceeded. Flooding is addressed separately in this document, beginning on Page 57.
- Storm Surge. Even more dangerous than the high winds of a hurricane is the storm surge, a dome of ocean water that is basically pushed ashore by the hurricane winds. Hurricane storm surge can be as much as 20 feet at its peak and 50 to 100 miles wide, depending on hurricane strength and depth of offshore waters. Generally, the stronger the hurricane and the shallower the offshore water depths, the higher the storm surge. Most hurricane fatalities and coastal damages are attributable to storm surge, as opposed to hurricane winds. Storm surge can cause the most damage when it occurs during high tides. Storm surge can come ashore as much as five hours in advance of the time that a hurricane makes landfall. Storm surge is addressed in the Flooding section of this document, beginning on Page 57.
- Coastal Erosion. The currents created by the tide and storm surge, combined with wave action, can severely erode coastlines. Many buildings withstand hurricane force winds until their foundations, undermined by erosion, are weakened and fail. Coastal erosion is addressed separately in this document, beginning on Page 30.
- Wave Action. Hurricanes and tropical storms are also associated with significant wave action, which can damage not only buildings but infrastructure and protective features. Wave action is addressed separately in this document, beginning on Page 41.

Description – Hurricane and Tropical Storm Events

A **hurricane** is a severe tropical cyclone with winds that have reached a constant speed of 74 miles per hour or more. Hurricane winds blow in a large spiral around a relative calm center known as the “eye” which is generally 20 to 30 miles wide, and the system can extend outward from the eye by up to 400 miles. In the Northern Hemisphere, circulation is in a counterclockwise motion around the eye. These storms are usually short in duration but are extremely powerful and cause the greater amount of damage due to significant storm surges and high winds. If these systems have wind speeds of between 39 and 73 miles per hour, they are classified as **tropical storms**.

Location – Hurricane and Tropical Storm Events

No one jurisdiction within Nassau County is any more likely to have such a system make landfall within its borders than any other location. Because of the size of hurricane and tropical storm systems, areas within Nassau County can still be affected even when the eye makes landfall outside of Nassau County. The hazards associated with hurricane and tropical storm events (high winds, flooding, and coastal erosion) have distinct hazard area locations, discussed in other sections of this report.

Extent – Hurricane and Tropical Storm Events

The magnitude or severity of hurricanes is categorized by the Saffir-Simpson scale. The Saffir-Simpson Scale is a five-category wind speed / storm surge classification scale used to classify Atlantic hurricane intensities. The scale is used to give an estimate of the potential property damage and flooding that can be expected. The Saffir-Simpson values range from Category 1 to Category 5. Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf in the landfall region.

The magnitude or severity of hurricane and tropical storm events will increase under the following conditions:

- As the storm category increases;
- As the diameter of the storm system increases;
- As the systems forward speed decreases;
- As rainfall amounts increase;
- As storm surge increases;
- As coastal erosion increases;
- As wave action increases; and
- As the quantity of people, structures and infrastructure in the affected areas increases.

In all likelihood, the magnitude and severity of damages would be the greatest within the geographical boundary of the Town of Hempstead, as this is where the county's population, structure, and infrastructure are greatest in number. In addition, this area includes the highly developed Long Beach Island barrier island communities.

The following bullets describe historic hurricanes that have impacted Nassau County.

- **Hurricane of September 1904**. At the time that this hurricane crossed over Long Island, the County's population was a mere fraction of what it is today. On September 14-15, 1904 the Sag Harbor Express reported on a storm that passed over the western end of Long Island. The high winds downed trees blocking roads. At Bridgehampton, the forty- foot high steeple of the Presbyterian Church was blown down smashing a large hole in the roof. Fishing boats anchored in the bay were blown up on the shore.
- **The New England Hurricane (also known as the Long Island Express) hit Long Island on September 21, 1938** as a Category 3 (winds 111-130 mph) and devastated the coast of Long Island with storm surges of 10 to 12 feet and was responsible for, in total, 700 deaths, $308 million in damage, and 63,000 people homeless between Long Island and New England. The LI Express was so powerful that it created the Shinnecock Inlet and widened the Moriches Inlet in Suffolk County. Nassau County was not impacted as heavily. The team noted that rain fell steadily for 5 days during this event. Downed trees were a significant problem, blocking access routes in some cases. Flooding of coastal structures and basement flooding of other structures was widespread, as well as boat damage.

- **The Great Atlantic Hurricane of 1944** was a Category 3 (winds 111-130 mph) storm. The storm swept over eastern Long Island and Nassau County was spared the brunt of the damages. Most damages were in the form of downed trees and power lines, boat wreckage, flooding and other property damage. Upwards of 4 inches of rain fell and total damage for all of Long Island were estimated at $1,000,000. The storm could have caused significant more damage if it had instead struck at high tide.
- **Hurricanes Carol and Edna of 1954** were both Category 3 hurricanes when they hit Long Island and Connecticut. Nassau County did not receive the brunt of the damages. During Hurricane Carol high winds downed trees and power lines cutting off electric and phone services in many areas. High tides inundated local roadways, docks, beaches and cellars.The Plandome Bridge was completely covered, as was Shore Road and Manorhanven Boulevard. **For Hurricane Carol** (August 31, 1954) damages in Nassau and Suffolk County were estimated at $3,000,000. Personal injuries were minimal, one death, from a heart attack was attributed to the storm. Rainfall recorded during the storm on August 31 was 3.3 inches. The forward speed of the storm was 40 mph as the storm center crossed Long Island 25 miles east of Westhampton. The hurricane which brought 14 foot waves and wind up to 96 mph and sustained winds of 55 mph hit at the time of the predicted high tide. For Hurricane Edna (September 11, 1954), power and telephone outages lasted for several days following the storm. Rainfall between September 11 and September 12 was recorded at over 6 inches.
- **Hurricane Donna of 1960** started as a Category 4 and hit Nassau County as a Category 3 (winds 111-130 mph). According to the FEMA Flood Insurance Study, as this storm passed over Long Island, its eye became elongated and extended over the entire length of Long Island. Then it broke up into three eyes, causing variable wind patterns. Maximum tides in Nassau County were below 8.6 feet. At LaGuardia Airport, 70 mph winds from the northeast were recorded with gusts up to 97 miles per hour. Winds downed trees and power lines disrupting telephone and electric services. High tides and roadway flooding were widespread. Roof damage was widespread, ranging from shingle loss to loss of entire roofs. Hundreds of boats capsized and were destroyed. Manorhaven and Sands Point were hit especially hard with power outages.
- **Hurricane Belle.** On August 10, 1976, Hurricane Belle threatened Long Island. While Belle had been much stronger when it was off the coast of Florida and North Carolina. However, its intensity was reduced in the colder waters of the northern Atlantic. In addition, it hit several hours after high tide. Damages were relatively minor.
- **Hurricane Gloria of 1985** began as a Category 3 hurricane when it hit Cape Hatteras, North Carolina, but was considered a Category 1 (winds 74-95 mph) when it reached Nassau County. Gloria devastated the U.S., including serious damage to Nassau County. High tides caused roadway flooding. Downed trees and power lines were widespread. Basement flooding, roof damage, and window damage was also widespread, as well as damage to boats.
- **Hurricane Irene** of 2011 Shortly before making four landfalls in the Bahamas, Irene peaked as a 120 mph (195 km/h) Category 3 hurricane. Thereafter, the storm slowly leveled-off in intensity as it struck the Bahamas and then curved northward after passing east of Grand Bahama. Continuing to weaken, Irene was downgraded to a Category 1 hurricane before making landfall on the Outer Banks of North Carolina on August 27, becoming the first hurricane to make landfall in the United States since Hurricane Ike in 2008. Early on the following day, the storm re-emerged into the Atlantic from southeastern Virginia. Although Irene remained a hurricane over land, it weakened to a tropical storm while making yet another landfall in the Little Egg Inlet in southeastern New Jersey on August 28.

• **Hurricane Sandy** of 2012 developed from a tropical wave in the western Caribbean Sea on October 22, quickly strengthened, and was upgraded to Tropical Storm Sandy six hours later. Sandy moved slowly northward toward the Greater Antilles and gradually intensified. On October 24, Sandy became a hurricane, made landfall near Kingston, Jamaica, a few hours later, re-emerged into the Caribbean Sea and strengthened into a Category 2 hurricane. On October 25, Sandy hit Cuba as a Category 3 hurricane, then weakened to a Category 1 hurricane. Early on October 26, Sandy moved through the Bahamas. On October 27, Sandy briefly weakened to a tropical storm and then re-strengthened to a Category 1 hurricane. Early on October 29, Sandy curved north-northwest and then moved ashore near Brigantine, New Jersey, just to the northeast of Atlantic City, as a post-tropical cyclone with hurricane-force winds. It resulted in mandatory evacuations of communities on the south shore of Nassau and resulted in millions of dollars of damages, much of which is still being totaled.

Probability of Occurrence – Hurricane and Tropical Storm Events

Internet resources on NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) web site were researched and it was determined that Nassau County and its jurisdictions have roughly an 18 to 24 percent chance of being impacted by a named coastal storm in any given year. For Nassau County and its participating jurisdictions, the estimate percent chance of occurrence of various category storms impacting the area in a given year is presented in the table below.

Table 24
Estimated Annual Percent Chance of Occurrence, Hurricanes (by Category)

Category*	Wind Speed (miles per hour) *	Storm Surge (feet above normal sea level)*	Expected Damage*	Return Period**	Estimated Percent Chance of Occurrence in Any Given Year**
1	74-96 mph	4-5 ft	Minimal: Damage is done primarily to shrubbery and trees, unanchored mobile homes are damaged, some signs are damaged, no real damage is done to structures	17 years	5.9%
2	96-110 mph	6-8 ft	Moderate: Some trees are toppled, some roof coverings are damaged, and major damage is done to mobile homes.	39 years	2.6%
3	111-130 mph	9-12 ft	Extensive: Large trees are toppled, some structural damage is done to roofs, mobile homes are destroyed, structural damage is done to small homes and utility buildings.	68 years	1.5%

4	131-155 mph	13-18 ft	Extreme: Extensive damage is done to roofs, windows, and doors; roof systems on small buildings completely fail; some curtain walls fail.	150 years	0.7%
5	Greater than 155 mph	Greater than 18 ft	Catastrophic: Roof damage is considerable and widespread, window and door damage is severe, there are extensive glass failures, and entire buildings could fail.	370 years	0.3%

Source: NOAA Website

Tornado Events

Tornadoes are particular types of events. The hazard associated with a tornado event is high winds. The high wind hazard is summarized briefly below, and addressed specifically elsewhere in the plan. Tornado events are discussed in the remainder of this section.

- Winds. After making landfall, hurricane winds can remain at or above hurricane force well inland (sometimes more than 100 miles). In addition, hurricanes can also spawn tornadoes. Typically, the more intense a hurricane is, the greater the tornado threats.

Description – Tornado Events

The American Meteorological Society, "Glossary of Meteorology" defines a tornado as violently rotating column of air that has contact with the ground and extends downward from a cumulonimbus cloud. Tornado wind speeds can range from as low as 40 mph to as high as 318 mph. Tornadoes often accompany thunderstorms and hurricanes. Tornadoes can occur at any time of the year but are more prevalent during the spring and summer months.

Location – Tornado Events

Tornadoes can occur anywhere in the US. They have struck in all 50 states, with the highest concentration on the central plains and in the southeastern states, such as Oklahoma, Texas, and Florida. No one jurisdiction within Nassau County is any more likely to have a tornado touch down within its borders than any other location. The hazard associated with tornado events (high winds) have distinct hazard area locations, discussed in other sections of this report.

Extent – Tornado Events

The magnitude or severity of a tornado is dependent upon wind speed and is categorized by the Fujita Scale. Tornadoes are typically considered to be "significant" for F2 or F3 on the Fujita Scale, and "violent" for F4 and F5.

Tornado Probability of Occurrence

For tornado events, this plan indicates the probability of future occurrences in terms of frequency based on historical events. According to the NOAA National Climatic Data Center, Nassau County has experienced an average of 0.11 tornadoes per year. The following table illustrates a summary of tornado events in both New York State and Nassau County, and provides an associated average annual number of storms and probability of occurrence.

Table 25
Probability of Occurrence of Tornadoes

Category	Total Number of Events	Probability of Occurrence (%)	Average Annual Number of Events
New York State			
F0	113	33.2 %	2.05
F1	136	40.0 %	2.47
F2	45	13.2 %	0.82
F3	24	7.1 %	0.44
F4	6	1.8 %	0.11
F5	0	0 %	0.00
Unable to Determine	16	4.7 %	0.29
Total	*340*		*6.18*
Nassau County			
F0	1	16.7 %	0.02
F1	1	16.7 %	0.02
F2	3	50 %	0.05
F3	0	0 %	0.00
F4	0	0 %	0.00
F5	0	0 %	0.00
Unable to Determine	1	16.7 %	0.02
Total	*6*		*0.11*

Source: NOAA National Climatic Data Center

Winter Storms / Ice Storms

Severe winter storms are particular types of events. They are characterized by the hazards of high winds, extreme cold, heavy precipitation (in the form of snow and/or ice), and sometimes wave action, coastal erosion and flooding. Winter storm and ice storm events are discussed in general terms in this section of the document; their specific hazards are discussed elsewhere in the plan.

Description – Winter Storms / Ice Storms

Winter storms consist of cold temperatures and heavy snow or ice. Because winter storms are regular, annual occurrences in Nassau County, they are considered hazards only when they result in damage to specific structures and/or overwhelm local capabilities to handle disruptions to traffic, communications, and electric power.

Winter storms and ice storms can occur in New York State from late October until mid-April. Peak months for these events for Nassau County would be December through March.

Northeasters are one type of winter storm that is common in Nassau County. The New York State Hazard Mitigation Plan notes that these storms usually form off the US East Coast near the Carolinas then follow a track northward along the coast until they blow out to sea, hence the term "northeaster". Occasionally these storms are large enough to cover a majority of the state; however, they most often affect southern New York State and Long Island. Northeasters are most notable for snow accumulations in excess of nine inches accompanied by high winds (sometimes gale force) and storm surges.

New York State also experiences "Lake Effect" storms, from systems picking up moisture across the Great Lakes; however, Nassau County is too far south to be impacted by these types of events except under rare circumstances where the system is unusually large.

Statewide, average annual snowfall is about 65 inches. Many areas in extreme northern and western New York State see more than twice this amount on an annual basis. Extreme southern New York State and Long Island have some of the lowest annual snowfall averages in the state, with Nassau County at 22.3 inches.

Location – Winter Storms / Ice Storms

Severe winter storms and ice storms can occur anywhere in the County; no one jurisdiction within Nassau County is any more likely to be impacted by a severe winter storm or ice storm within its borders than any other location. The hazards associated with this event have distinct hazard area locations, discussed in other sections of this report.

Extent – Winter Storms / Ice Storms

A severe winter storm can adversely affect roadways, utilities, business activities and can cause loss of life, frostbite, or freezing. The most common effect of winter storms and ice storms is traffic accidents, interruptions in power supply and communications; and the failure of inadequately designed and/or maintained roofing systems. Power outages and temperatures below freezing for extended periods of time can cause pipes to freeze and burst. Heavily populated areas tend to be significantly impacted by losses of power and communications systems due to downed lines. Distribution lines can be downed by the weight of snow or ice, or heavy winds. When limbs and lines fall on roadways, transportation routes can be adversely affected and buildings, automobiles can be damaged. Heavy snow loads can cause roof collapse for residential, commercial, and industrial structures in cases of inadequate design and/or maintenance. Severe winter storms can also cause extensive coastal flooding, coastal erosion, and wave damage. If significant snowfall amounts melt quickly, inland flooding can occur as bankfull conditions are exceeded or in areas of poor roadway drainage.

The severity of the effects of winter storms and ice storms increases as the amount and rate of precipitation increase. In addition, storms with a low forward velocity are in an area for a longer duration and become more severe in their affects. Storms that are in full force during the morning or evening rush hours tend to have their affects magnified because more people are out on the roadways and directly exposed. Storms that arrive at high tide can also have exacerbated affects in coastal areas.

The magnitude of a severe winter storm or ice storm can be qualified into five main categories by event type, as shown below:

- Heavy Snowstorm: Accumulations of four inches or more of snow in a six-hour period, or six inches or more of snow in a twelve-hour period.
- Sleet Storm: Significant accumulations of solid pellets which form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces posing hazards to pedestrians and motorists.
- Ice Storm: Significant accumulations of rain or drizzle freezing on objects (tress, power lines, roadways, etc.) as it strikes them, causing slippery surfaces and damage from the sheer weight of ice accumulation.
- Blizzard: Wind velocity of 35 miles per hour or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile prevailing over an extended period of time.
- Severe Blizzard: Wind velocity of 45 miles per hour, temperatures of 10 degrees Fahrenheit or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period of time.

Probability of Occurrence – Winter Storms / Ice Storms

Using the same methodology as the New York State Hazard Mitigation Plan for winter storm and ice storm events, this plan indicates the probability of future occurrences in terms of frequency based on historical events. Using the historical data presented in Table 26, Nassau County and its participating jurisdictions have experienced 35 winter storms / ice storms between February 8, 1994 and December 31, 2012 – an average of 2.64 storms per year.

Table 26
Probability of Occurrence of Winter Storms/Ice Storms, Nassau County

Type	Total Number of Events	Probability of Occurrence (%)	Average Annual Number of Events
Heavy Snow Events	23	65.7%	1.27
Snow/Ice Events	12	34.3%	0.67
All Winter Storm / Ice Storm Events	35	100%	1.94

Source - New York State Hazard Mitigation Plan