SECTION 4. RISK ASSESSMENT

4.3 HAZARD PROFILES

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the severe weather hazard in Burlington County.

2024 HMP Changes

- New and updated figures from federal and state agencies are incorporated.
- Previous occurrences were updated with events that occurred between 2018 and 2022.

4.3.7 Severe Weather

Hazard Description

For the purpose of this HMP update and as deemed appropriated by the Burlington County Planning Committee, the severe weather hazard includes high wind, tornadoes, thunderstorms and lightning, hailstorms, and hurricane/tropical storms, which are defined below. The flood profile (Section 4.3.6) discusses storm surges associated with hurricane/tropical storm events.

High Winds

Wind begins with differences in air pressures. It is rough horizontal movement of air caused by uneven heating of the earth's surface. Wind occurs at all scales, from local breezes lasting a few minutes to global winds resulting from solar heating of the earth. High winds are often associated by other severe weather events such as thunderstorms, tornadoes, hurricanes, and tropical storms (NWS 2012). There are various types of high wind events, including those listed below.

- *Straight-line Wind* is a term used to define any thunderstorm wind that is not associated with rotation and is used mainly to differentiate from tornadic winds.
- A *microburst* is a small, concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small — less than 4 km across — and short-lived, lasting only five to 10 minutes, with maximum windspeeds sometimes exceeding 100 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.
- *Derechos* are widespread, long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts, downbursts, and downburst clusters. If the wind damage swath extends more than 240 miles (about 400 kilometers)

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and includes wind gusts of at least 58 mph (93 km/h) or greater along most of its length, then the event may be classified as a derecho (NOAA 2023).

Tornadoes

A tornado is a violently rotating column of air that extends from a thunderstorm to the ground with an average forward speed of 30 miles per hour (mph). Tornadoes typically develop from either a severe thunderstorm or hurricane as cool air rapidly overrides a layer of warm air. Tornadoes can occur at any time of the year, with peak seasons at different times for different states (NWS 2010).

Thunderstorms and Lightning

> Thunderstorms can lead to flooding, landslides, strong winds, and lightning. Roads could become impassable from flooding, downed trees or power lines, or a landslide. Downed utility poles can lead to utility losses, such as electricity, phone, and water (from loss of pumping and filtering capabilities).

A thunderstorm is a local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder (NWS 2021). A thunderstorm forms from a combination of moisture, rapidly rising warm air, and a force capable of lifting air, such as a warm and cold front, a sea breeze, or a mountain. Thunderstorms form from the equator to as far north as Alaska. Although thunderstorms generally affect a small area when they occur, they have the potential to become dangerous due to their ability in generating tornadoes, hailstorms, strong winds, flash flooding, and lightning. The NWS considers a thunderstorm *severe* only if it produces damaging wind gusts of 58 mph or higher or large hail one inch (quarter size) in diameter or larger or tornadoes (NWS 2021).

Lighting is a bright flash of electrical energy produced by a thunderstorm. The resulting clap of thunder is the result of a shock wave created by the rapid heating and cooling of the air in the lightning channel. All thunderstorms produce lightning and are very dangerous. Lightning ranks as one of the top weather killers in the United States, killing approximately 50 people and injuring hundreds each year. Lightning can occur anywhere there is a thunderstorm. Lightning can be cloud to air, cloud to cloud, and cloud to ground (NOAA 2014).

Hailstorms

Hail forms inside a thunderstorm where there are strong updrafts of warm air and downdrafts of cold water. If a water droplet is picked up by the updrafts, it can be carried well above the freezing level. Water droplets freeze when temperatures reach 32 °F or colder. As the frozen droplet begins to fall, it might thaw as it moves into warmer air toward the bottom of the thunderstorm, or the droplet might be picked up again by another updraft and carried back into the cold air to re-freeze. With each trip above and below the freezing level, the frozen droplet adds another layer of ice. The frozen droplet, with many layers of ice, falls to the ground as hail (NSSL 2021).

Hurricanes and Tropical Storms

Tropical cyclones are an organized system of clouds and thunderstorms originating in tropical or subtropical waters. Tropical cyclones (hurricanes and tropical storms) are fueled by a different heat mechanism than other cyclonic windstorms such as nor'easters and polar lows. The characteristic that separates a tropical storm from another cyclonic system is that at any height in the atmosphere, the center of a tropical storm will be warmer than its surroundings, a phenomenon called "warm core" storm systems (NWS n.d.). Tropical cyclones strengthen when water evaporated from the ocean is released as the saturated air rises, resulting in condensation of water vapor contained in the moist air. Tropical cyclones begin as disturbed areas of weather, often referred to as tropical waves. As the storm organizes, it is designated as a tropical depression (NOAA 2020). Tropical cyclones are classified based on wind speeds:

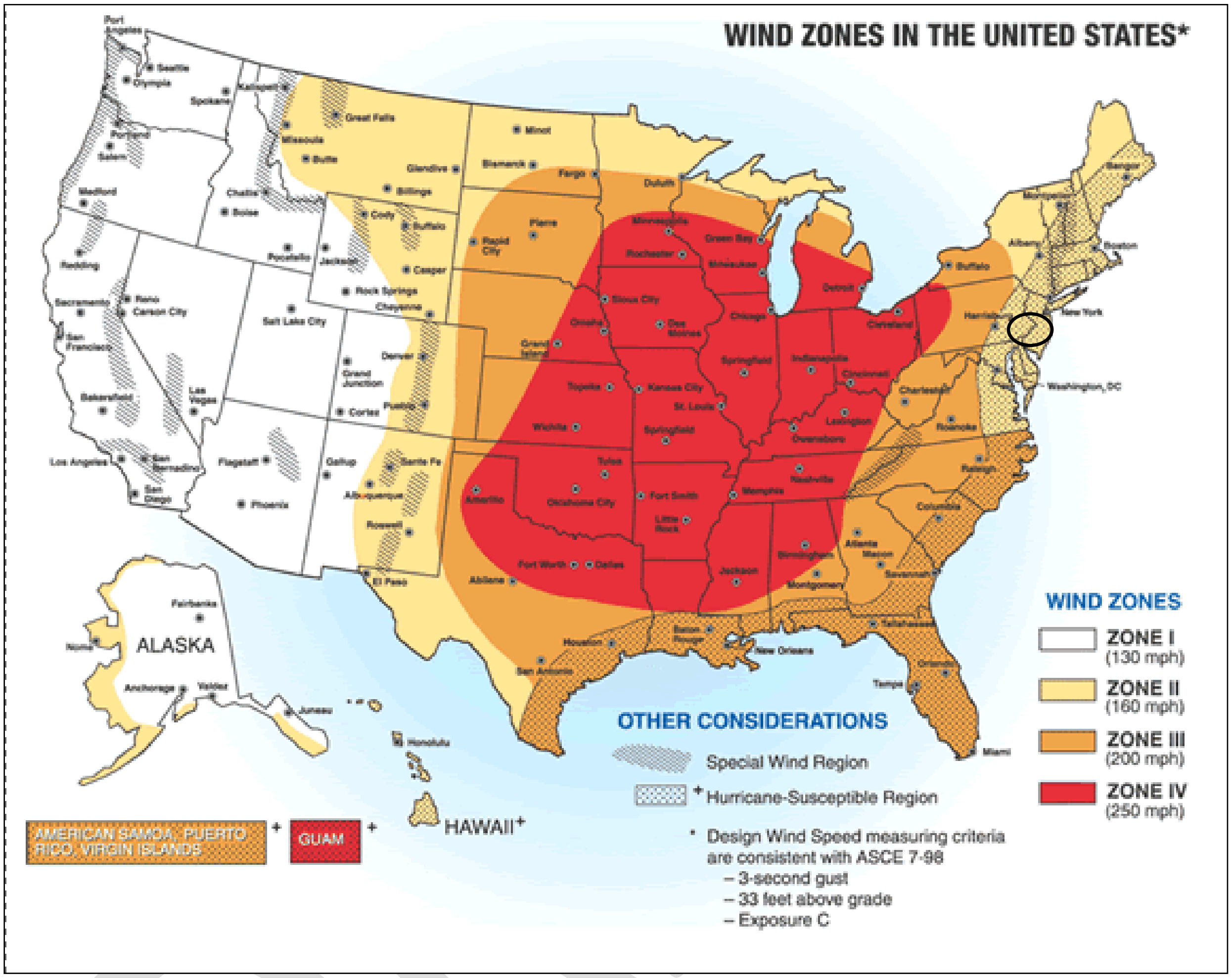
- Tropical depressions have maximum sustained winds of 38 mph or less
- Tropical storms have maximum sustained winds of 39 to 73 mph
- Hurricanes have maximum sustained winds of 74 to 110 mph
- Major hurricanes have maximum sustained winds of 111 mph or greater (NHC n.d.)

Tropical systems can develop in the Atlantic between the Lesser Antilles and the African coast or in the warm tropical waters of the Caribbean Sea and Gulf of Mexico. These storms can move up the Atlantic coast of the United States, impacting the eastern seaboard, or move into the United States through the states along the Gulf Coast, bringing wind and rain as far north as New England before moving eastward offshore) (NOAA 2020).

Location

All of Burlington County is exposed to severe weather events (high winds, tornadoes, thunderstorms, lightning, hail, hurricanes/tropical storms, and extreme temperatures) and the entire County is subject to high winds from severe weather events. According to the FEMA Winds Zones of the United States map, Burlington County is located in Wind Zones II, where wind speeds can reach up to 160 mph. The County is also located in the hurricane susceptible region. Figure 4.3.7-1 illustrates wind zones across the United States, which indicate the impacts of the strength and frequency of wind activity per region. The information on the figure is based on 40 years of tornado data and 100 years of hurricane data collected by FEMA.

Figure 4.3.7-1. Wind Zones in the United States

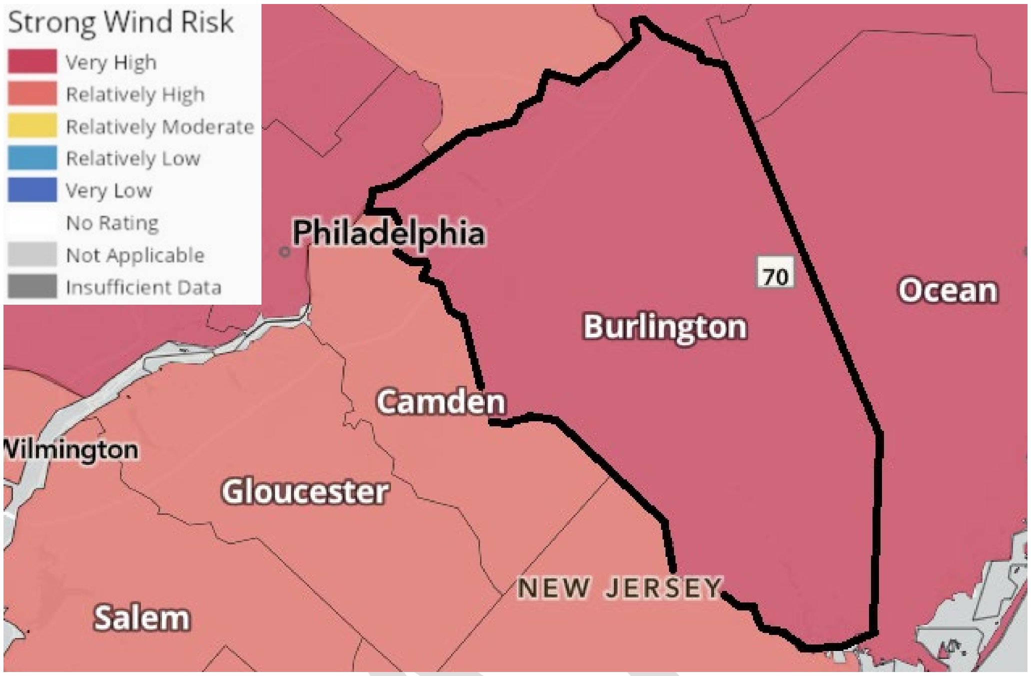


Source: NIST 2011
Note: The black oval indicates the approximate location of Burlington County.

High Winds

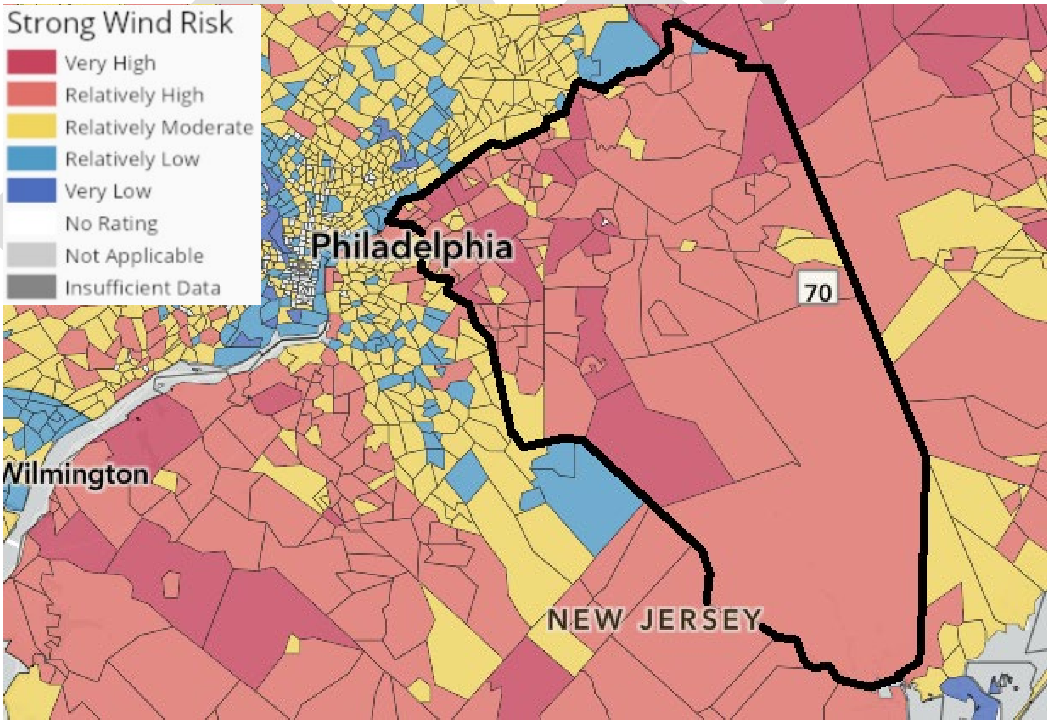
Severe summer weathers have the power to produce powerful winds; therefore, strong, and powerful winds have a higher chance of occurring in locations that are more likely to experience these storms (NOAA n.d.). In addition, high wind events may occur without a thunderstorm, tornado, or hurricane present and can be just as dangerous and destructive as those hazards. Figure 4.3.7-2 and Figure 4.3.7-3 show the Strong Wind Risk Index for Burlington County on the county and census tract scales, respectively. This index helps to understand the susceptibility of the County to strong wind. According to the National Risk Index, on the county scale, the County has a very high risk to strong winds; on the census tract scale, the County ranges from a relatively low to a very high risk.

Figure 4.3.7-2. National Risk Index, Strong Wind Risk Index Score Using the County Scale



Source: *FEMA 2019*
Note: *Burlington is outlined in a boldened black border.*

Figure 4.3.7-3. National Risk Index, Strong Wind Risk Index Score Using the Census Tract Scale



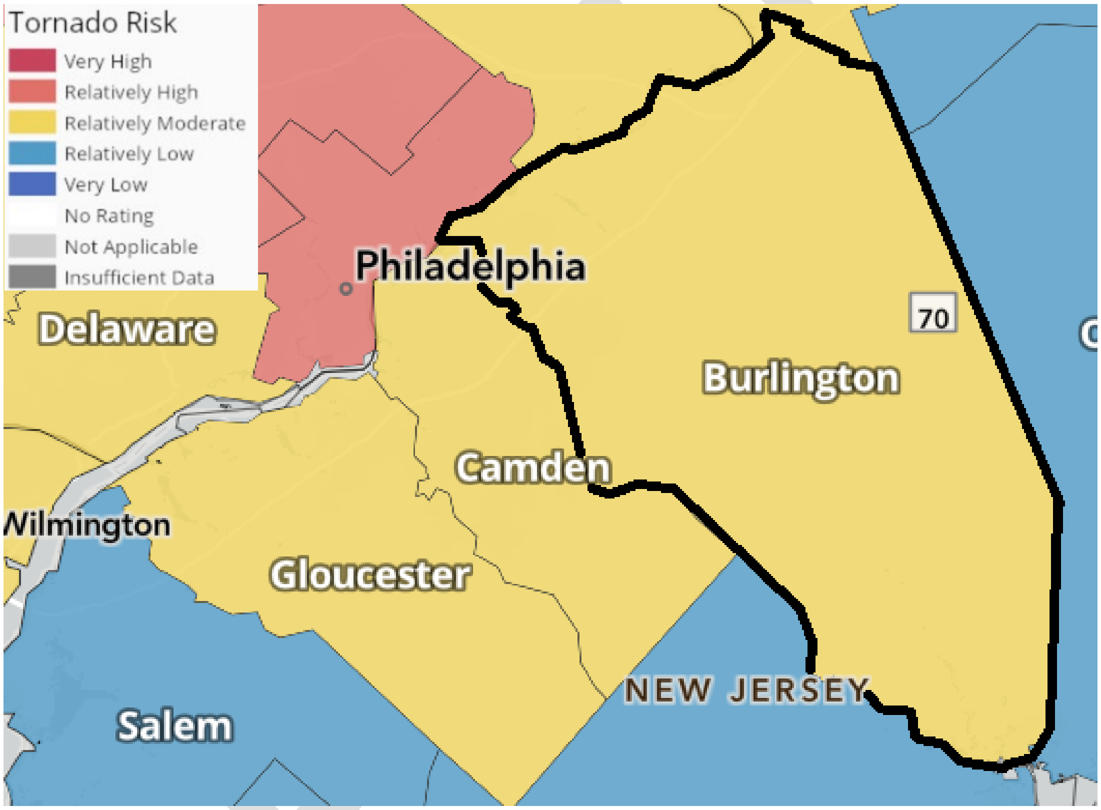
Source: *FEMA 2019*
Note: *Burlington is outlined in a boldened black border.*

Tornadoes

Similar to that of thunderstorms, tornadoes do not have any specific geographic boundary and can occur anywhere in Burlington County. According to NOAA's Storm Events Database, of the total 21 tornadoes which have occurred in Burlington County, 8 tornadoes were recorded since 2019.

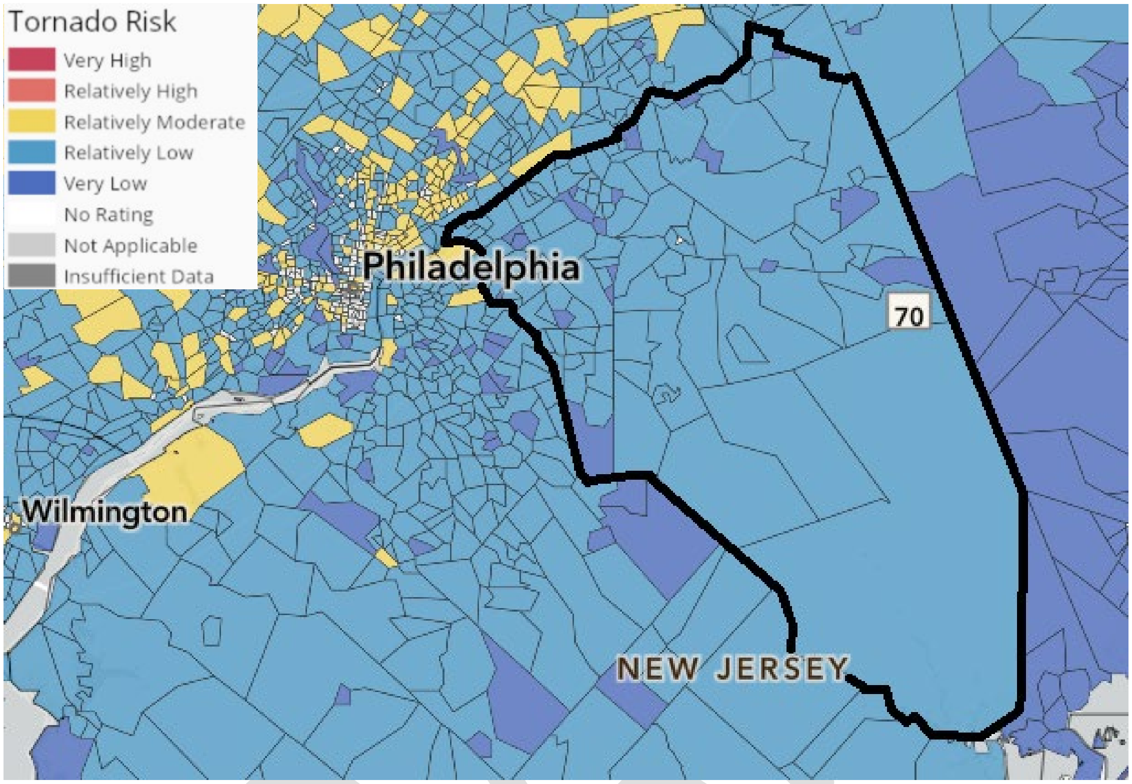
Figure 4.3.7-4 and Figure 4.3.7-5 show the Hurricane Risk Index for Burlington County on the county and census tract scales, respectively. This index helps to understand the susceptibility of the County to hurricanes. According to the National Risk Index, on the county scale, the County has a relatively moderate risk to tornadoes; on the census tract scale, the County ranges from a very low to a relatively moderate risk.

Figure 4.3.7-4. National Risk Index, Tornado Risk Index Score Using the County Scale



Source: FEMA 2019
Note: Burlington is outlined in a boldened black border.

Figure 4.3.7-5. National Risk Index, Tornado Risk Index Score Using the Census Tract Scale

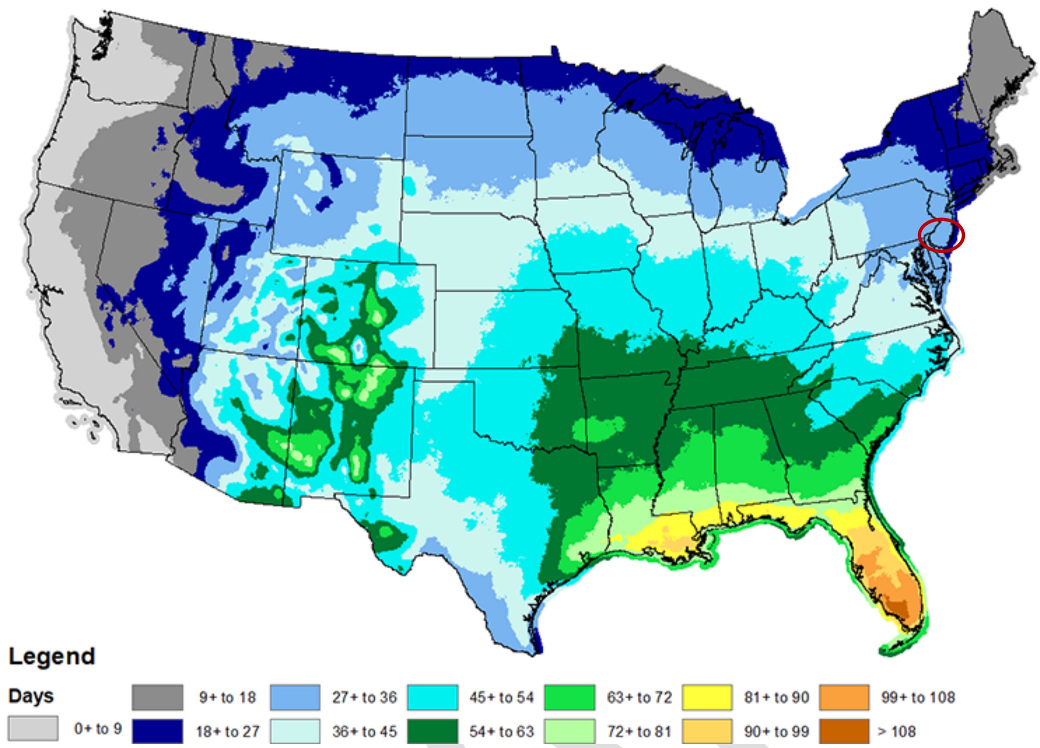


Source: FEMA 2019
Note: Burlington is outlined in a boldened black border.

Thunderstorms and Lightning

Thunderstorms tend to take place during the spring and summer months, and during the warmest times of the day, which tend to be late afternoon and early evening (NOAA n.d.). Figure 4.3.7-6 displays thunderstorm days per year across the United States. The map shows that Burlington County is likely to have between 27 and 36 thunderstorms each year (NOAA 2023).

Figure 4.3.7-6. Average Number of Thunderstorms in the United States

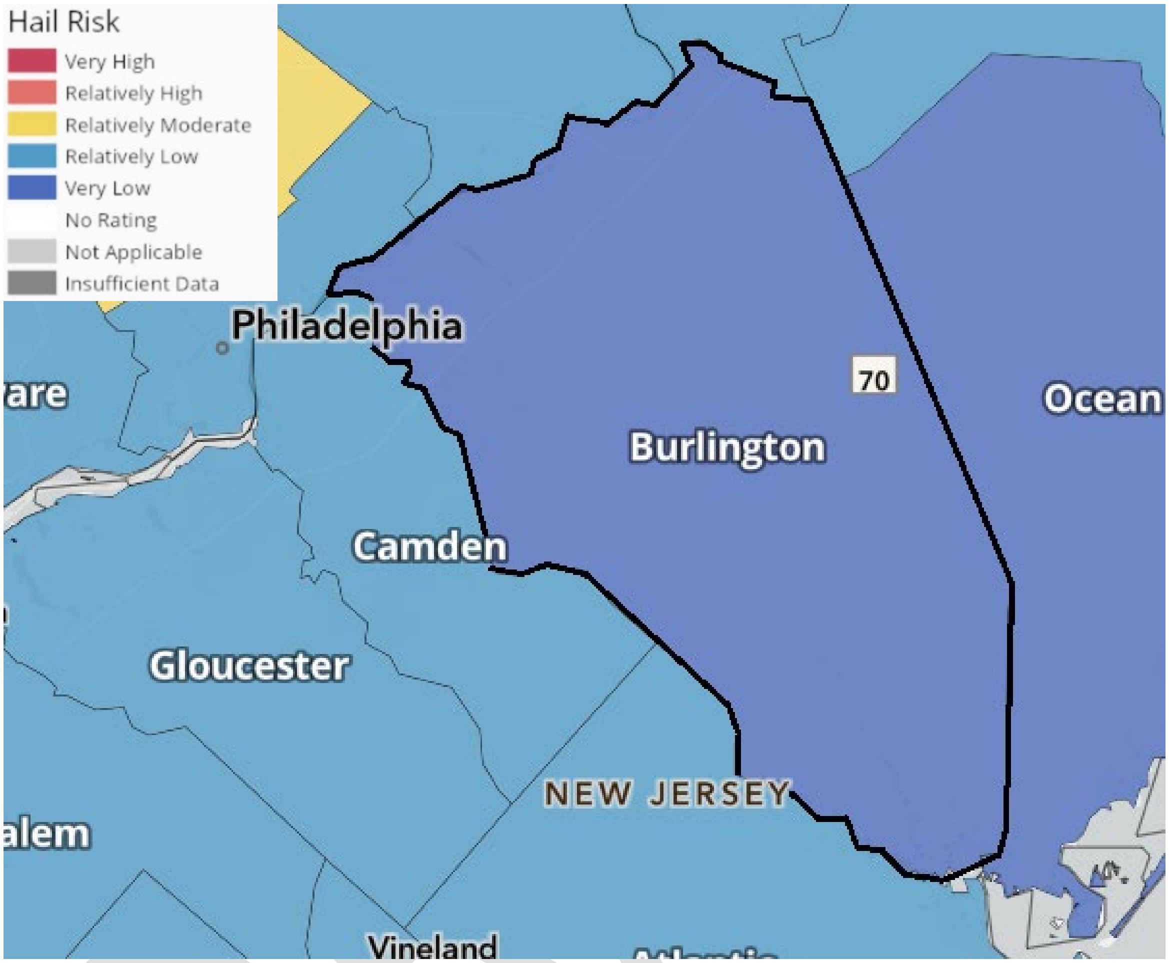


Source: NOAA 2023
Note: The red oval indicates the approximate location of Burlington County.

Hailstorms

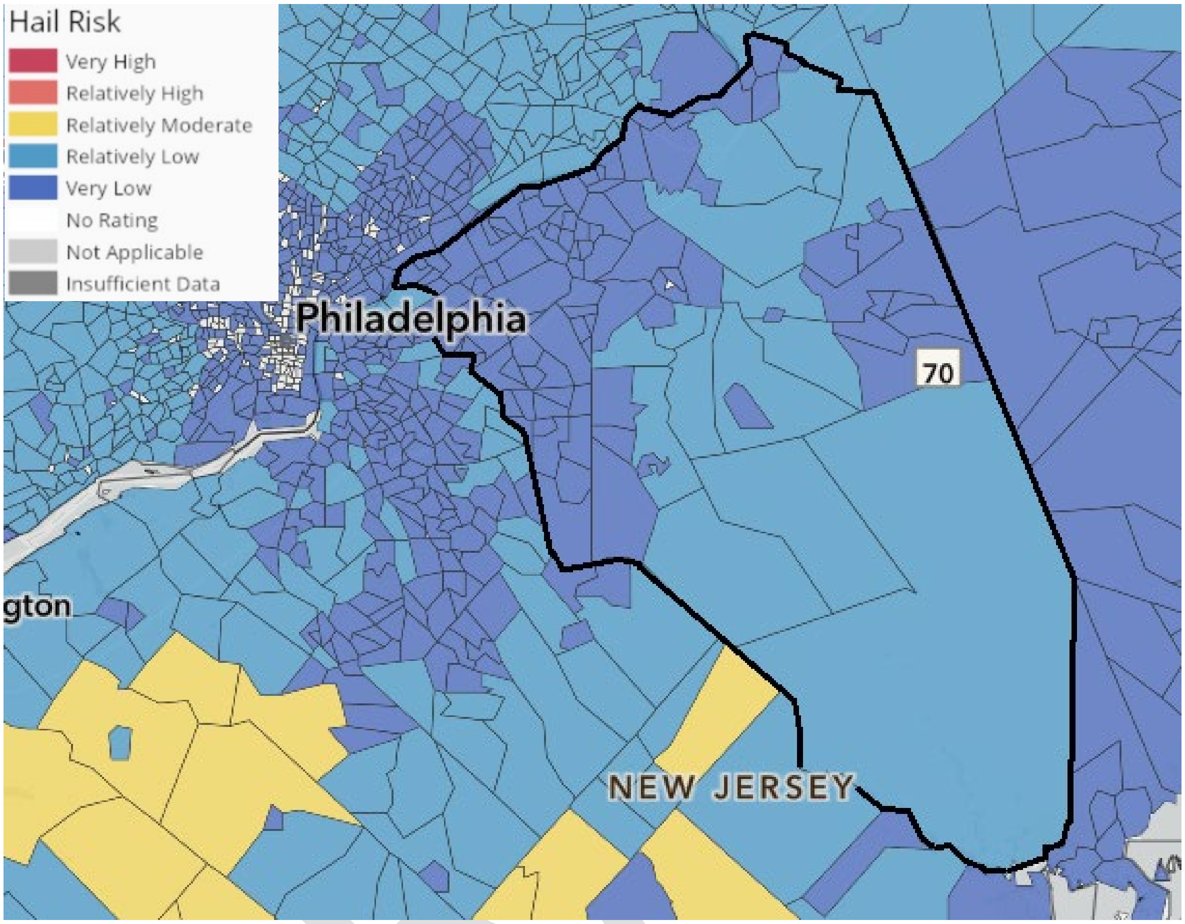
Hailstorms can form anywhere; however, they are more likely to fall in areas that have the most thunderstorms. The longer a hailstone spends in the clouds, the larger it becomes as more droplets continue to freeze. Hail falls when it becomes heavy enough to overcome the strength of the thunderstorm updraft and is pulled to the earth by gravity. Smaller hailstones may be blown away from the updraft by horizontal winds, so larger hail typically falls closer to the updraft than smaller hail (NOAA n.d.). Figure 4.3.7-7 and Figure 4.3.7-8 show the Hail Risk Index for Burlington County on the county and census tract scales, respectively. This index helps to understand the susceptibility of the County to hail. According to the National Risk Index, on the county scale, the County has a very low to hail; on the census tract scale, the County ranges from having no rating to a relatively low risk.

Figure 4.3.7-7. National Risk Index, Hurricane Risk Index Score Using the County Scale



Source: *FEMA 2019*
Note: *Burlington is outlined in a boldened black border.*

Figure 4.3.7-8. National Risk Index, Hurricane Risk Index Score Using the Census Tract Scale



Source: FEMA 2019
Note: Burlington is outlined in a boldened black border.

Hurricanes and Tropical Storms

Hurricanes and tropical storms are most likely to form during hurricane season, which is from June to November each year. Each storm's path is predicted on a case-by-case basis which allows scientists to be able to consider information from the specific storm as well as what is known about the conditions of the atmosphere and the ocean (University Corporation for Atmospheric Research 2022); refer to Figure 4.3.7-14 for historic hurricane tracks through Burlington County.

Figure 4.3.7-9 and Figure 4.3.7-10 display the wind impacts from the 100- and 500-year Mean Return Period events. As displayed in Figure 4.3.7-9, the peak wind gusts experienced for the eastern portion of Burlington County is associated with a Category 2 hurricane, while the western side of the County experiences wind gusts associated with a Category 1 hurricane for the 100-year MRP. Conversely, as shown in Figure 4.3.7-10, the peak wind gusts experienced for the eastern portion of Burlington County is associated with a Category 1 hurricane, while the western side of the County experiences wind gusts associated with a Category 2 hurricane for the 500-year MRP.

Figure 4.3.7-9. 100-Year Mean Return Period (MRP) Hurricane Event

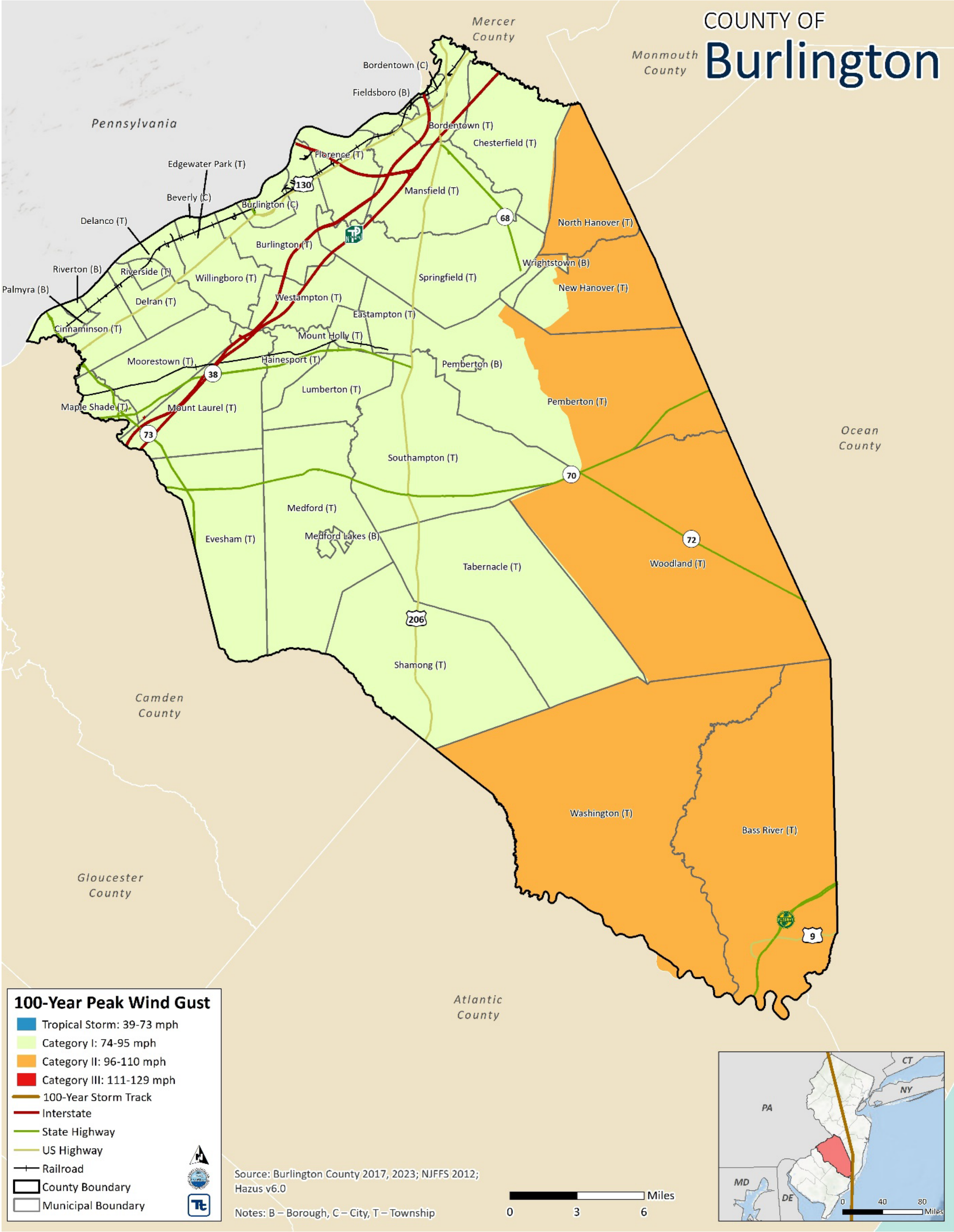
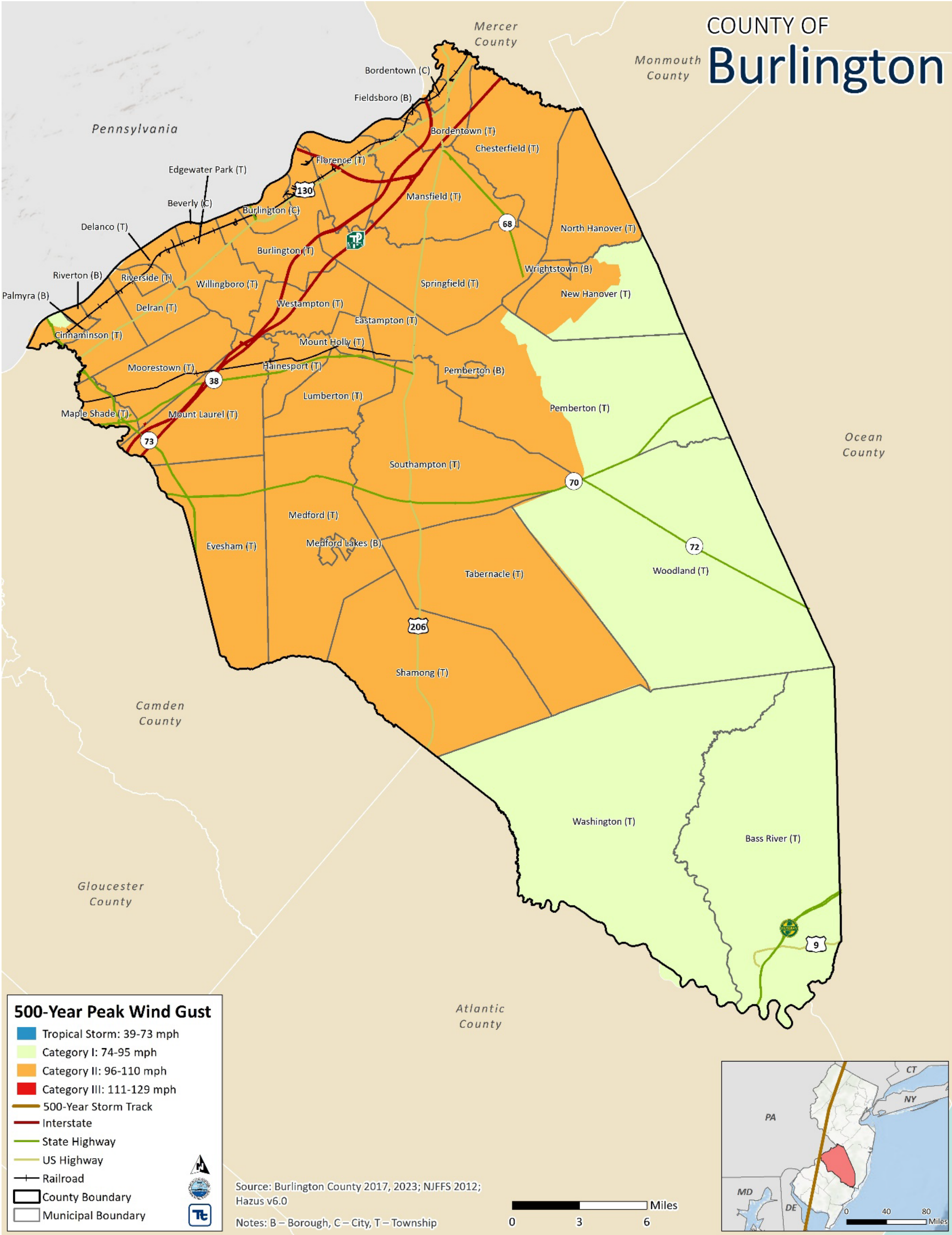


Figure 4.3.7-10. 500-Year Mean Return Period (MRP) Hurricane Event



Storm Surge

Portions of Burlington County experience coastal flooding from the Delaware River or Mullica River caused by extremely high tides and/or storm surge events (refer to Section 4.3.6 Flood for information on coastal flooding). The reach of storm surge is dependent on the elevation of the land and the height of the storm tide. Inland communities are also vulnerable to storm surge events as rising water levels can also affect river systems, causing storm surges to travel upstream resulting in the flooding of inland areas (NOAA 2023).

Figure 4.3.7-11 displays the storm surge hazard areas for category 1, 2, and 3 hurricanes in Burlington County based on the SLOSH model. These hazard areas are located along the tidal waterways in the County including the Delaware River, Assincunk Creek, Rancocas Creek, Pennsauken Creek, and the Mullica River. The largest expanse of these hazard areas are in the coastal wetlands along the Mullica River.

Figure 4.3.7-11. SLOSH Hazard Areas in Burlington County

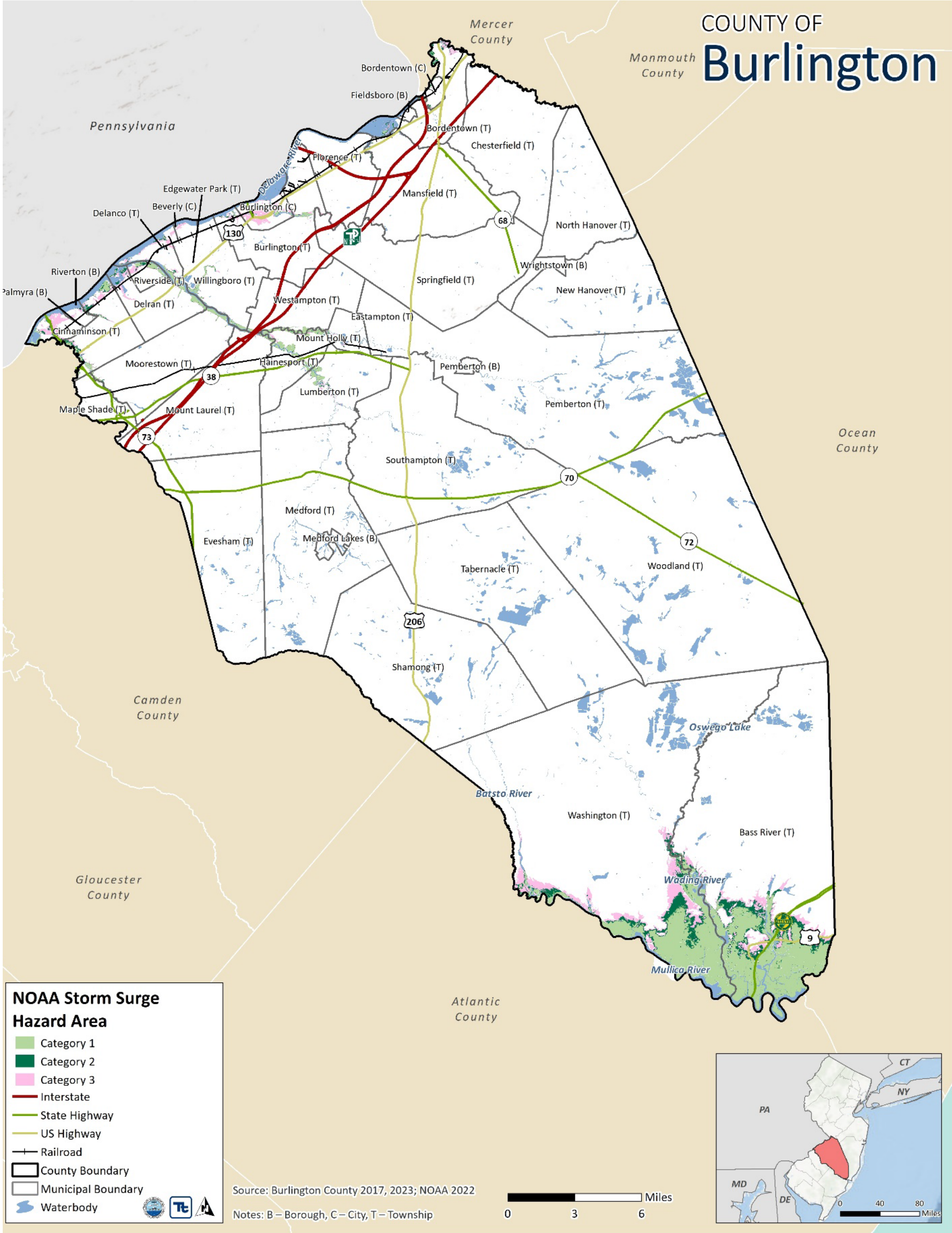
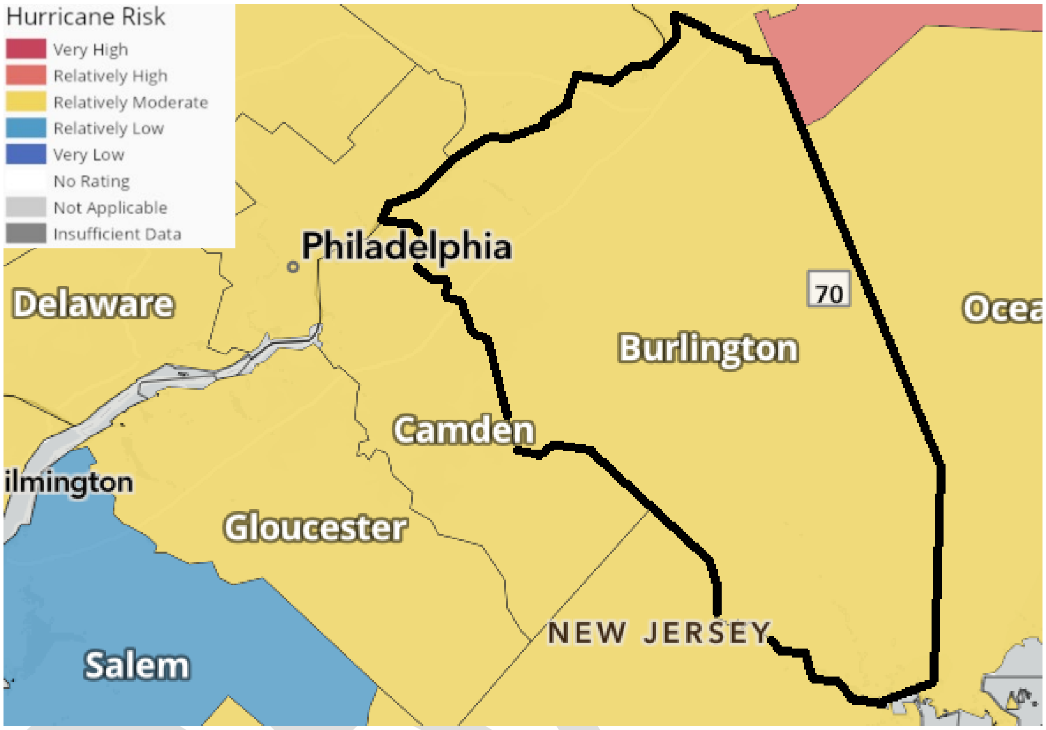


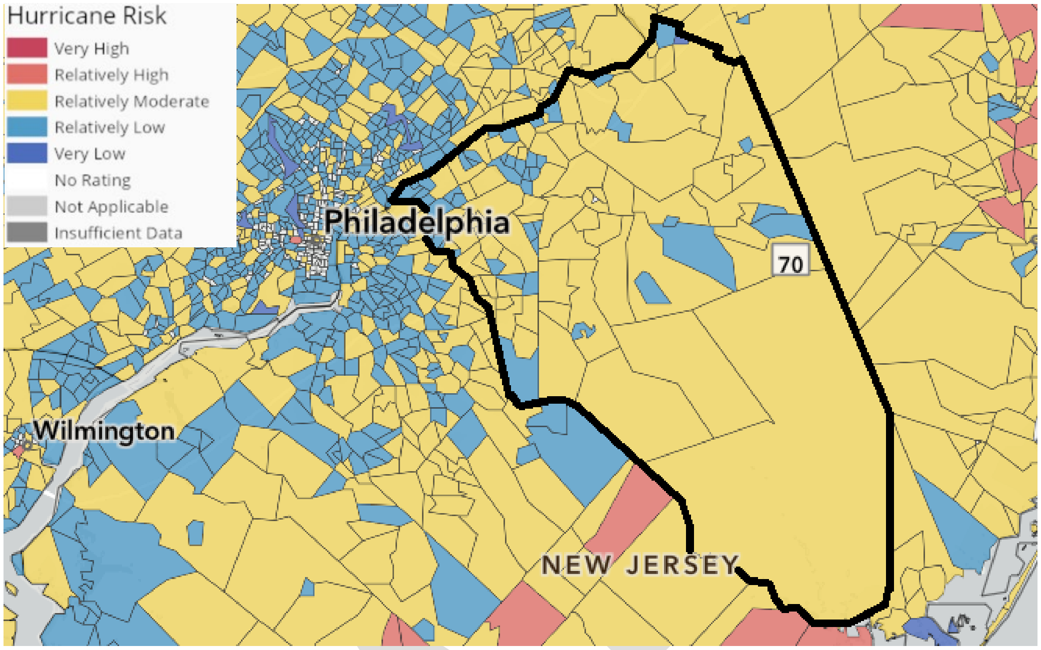
Figure 4.3.7-12 and Figure 4.3.7-13 show the Hurricane Risk Index for Burlington County on the county and census tract scales, respectively. This index helps to understand the susceptibility of the County to hurricanes. According to the National Risk Index, on the county scale, the County has a relatively moderate risk to hurricanes; on the census tract scale, the County ranges from a relatively low to a relatively moderate risk.

Figure 4.3.7-12. National Risk Index, Hurricane Risk Index Score Using the County Scale



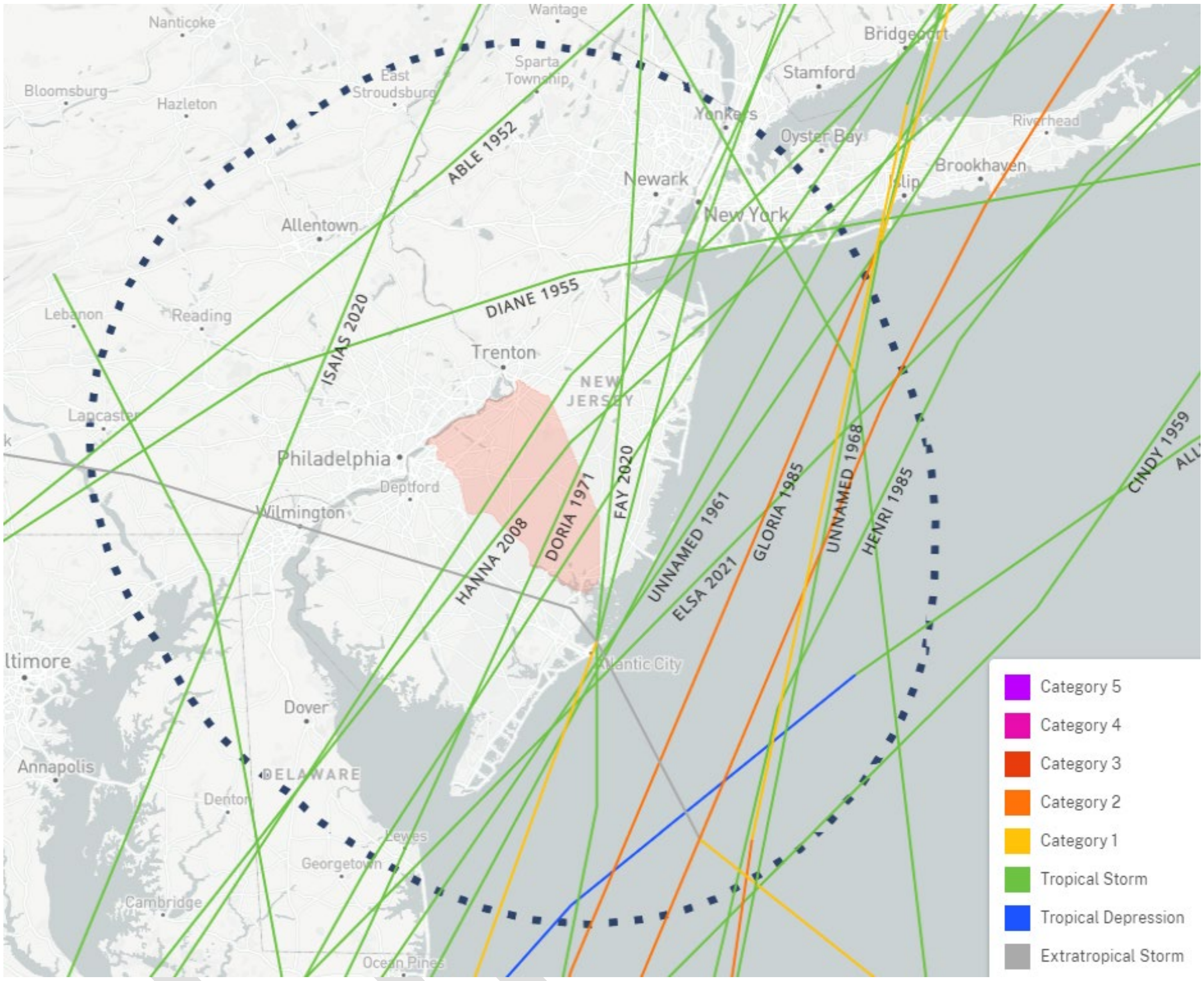
Source: FEMA 2019
Note: Burlington is outlined in a boldened black border.

Figure 4.3.7-13. National Risk Index, Hurricane Risk Index Score Using the Census Tract Scale



Source: FEMA 2019
Note: Burlington is outlined in a boldened black border.

Figure 4.3.7-14. Historical Tracks of Tropical Storms and Hurricanes Within 60 Nautical Miles of Burlington County, 1950-2023



Source: NOAA NHC 2023

Figure 4.3.7-9 displays hurricanes and tropical storms that tracked within 60 nautical miles of Burlington County. 60 nautical miles is used as an approximate distance from the center of rotation of these storms where significant impacts are still felt. Since 1950, the County has been impacted by 18 tropical storms and 5 hurricanes. While all of the County is exposed to hurricane wind and rainfall risk, storm surge risk is limited to areas close to tidal waterways.

Extent

High Winds

Table 4.3.7-1 provides the descriptions of winds and their associated sustained wind speed used by the NWS during wind-producing events. The Beaufort wind scale, developed in 1805, is also used today to classify wind conditions, and is provided in Appendix H (Supplementary Data).

Table 4.3.7-1. NWS Wind Descriptions

Descriptive Term	Sustained Wind Speed (mph)
Strong, dangerous, or damaging	≥40
Very Windy	30-40
Windy	20-30
Breezy, brisk, or blustery	15-25
None	5-15 or 10-20
Light or light and variable wind	0-5

Source: NWS 2010
mph miles per hour

The NWS issues advisories and warnings for winds that are typically site-specific. The NWS issues high wind advisories, watches, and warnings when wind speeds can pose a hazard or are life threatening. The criterion for each of these varies from state to state. According to the NWS, wind warnings and advisories from the Mount Holly National Weather Service Office are defined as follows:

- *Wind Advisories* are issues when sustained winds of 30 to 39 mph are forecast for one hour or longer, or wind gusts of 46 to 57 mph for any duration.
- *High Wind Watches* are issued when there is the possibility that High Wind Warning Criteria may be met at longer ranges (24 to 48 hours out).
- *High Wind Warnings* are issued when sustained wind speeds of 40 mph or greater lasting for one hour or longer or for winds of 58 mph or greater for any duration or widespread damage are possible (NWS 2012).

Tornadoes

The magnitude or severity of a tornado is categorized using the Enhanced Fujita Tornado Intensity Scale (EF Scale). This is the scale now used exclusively for determining tornado ratings by comparing wind speed and actual damage. Figure 4.3.7-15 illustrates the relationship between EF ratings, wind speed, and expected tornado damage.

Tornado watches and warning are issued by the local NWS office. A tornado watch is released when tornadoes are possible in an area. A tornado warning means a tornado has been sighted or indicated by weather radar. The current average lead time for tornado warnings is 13 minutes. Occasionally, tornadoes develop so rapidly, that little, if any, advance warning is possible (NOAA 2011).

Figure 4.3.7-15 Explanation of EF-Scale Ratings

EF Rating	Wind Speeds	Expected Damage		
EF-0	65-85 mph	'Minor' damage: shingles blown off or parts of a roof peeled off, damage to gutters/siding, branches broken off trees, shallow rooted trees toppled.		
EF-1	86-110 mph	'Moderate' damage: more significant roof damage, windows broken, exterior doors damaged or lost, mobile homes overturned or badly damaged.		
EF-2	111-135 mph	'Considerable' damage: roofs torn off well constructed homes, homes shifted off their foundation, mobile homes completely destroyed, large trees snapped or uprooted, cars can be tossed.		
EF-3	136-165 mph	'Severe' damage: entire stories of well constructed homes destroyed, significant damage done to large buildings, homes with weak foundations can be blown away, trees begin to lose their bark.		
EF-4	166-200 mph	'Extreme' damage: Well constructed homes are leveled, cars are thrown significant distances, top story exterior walls of masonry buildings would likely collapse.		
EF-5	> 200 mph	'Massive/incredible' damage: Well constructed homes are swept away, steel-reinforced concrete structures are critically damaged, high-rise buildings sustain severe structural damage, trees are usually completely debarked, stripped of branches and snapped.		

Source: NWS 2015

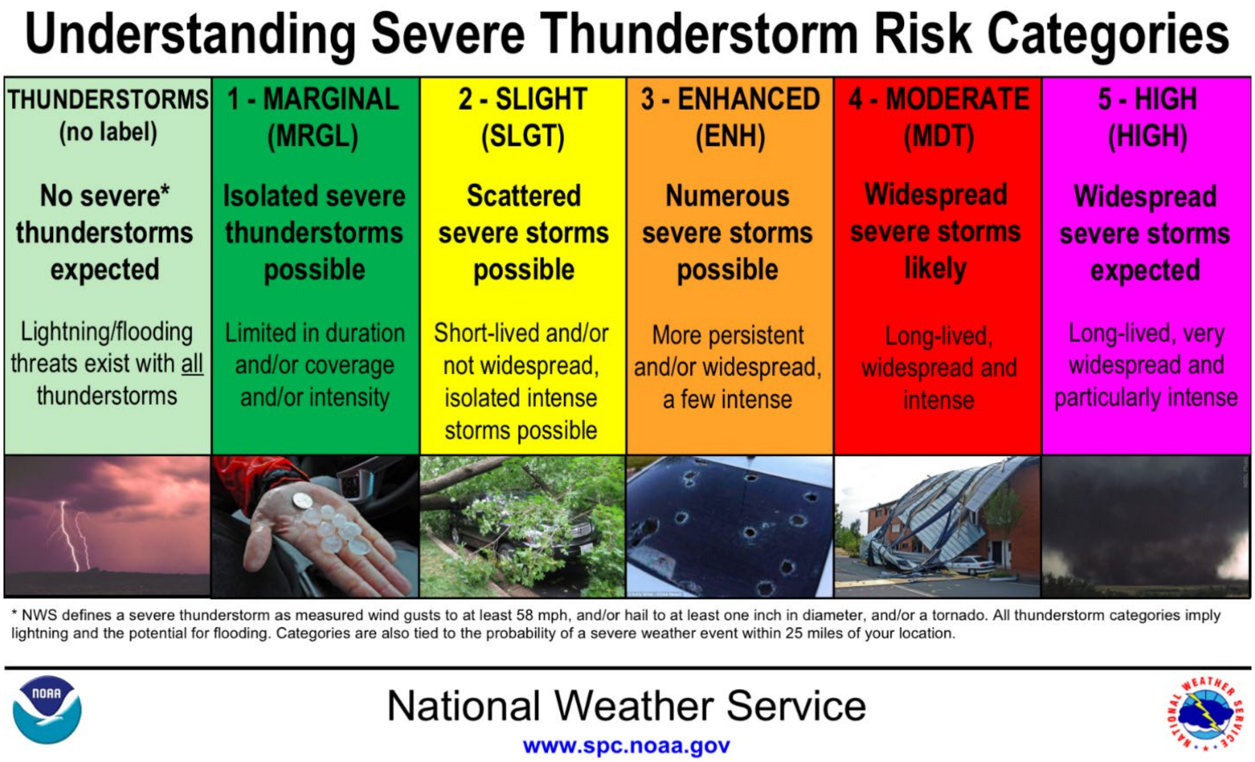
Thunderstorms and Lightning

Severe thunderstorm statements, watches, and warnings are issued by the local NWS office and the Storm Prediction Center (SPC). The NWS and SPC will update the watches and warnings and notify the public when they are no longer in effect. NWS issues statements, watches, and warnings for thunderstorms:

- *Special Weather Statement:* Issued for strong storms that are below severe levels but may have impacts. Usually reserved for the threat of wind gust of 40–57 mph or hail of 0.5-inches to 0.99-inches in diameter (NWS 2023).
- *Severe Thunderstorm Watches:* A severe thunderstorm watch is issued when severe thunderstorms are possible in and near watch areas (NWS 2023).
- *Severe Thunderstorm Warning:* A severe thunderstorm is imminent or occurring; it is either detected by weather radar or reported by storm spotters. A severe thunderstorm is one that produces winds 58 mph or stronger and/or hail 1 inch in diameter or larger. A warning means to take shelter (NWS 2023).

The NWS has five risk categories for severe thunderstorm risk: marginal, slight, enhanced, moderate, and high. The probabilistic forecast directly expresses the best estimate of a severe weather event occurring within 25 miles of a point (NWS 2022). Figure 4.3.7-16 details the thunderstorm risk categories.

Figure 4.3.7-16. Thunderstorm Risk



Source: NOAA n.d.

Currently, cloud-to-ground (CG) and intra-cloud (IC) lightning flashes are detected and mapped in real-time by two different networks in the United States: the National Lightning Detection Network (NLDN) and the Earth Networks Total Lightning Network. These systems work by detecting radio waves (sferics) emitted by fast electric currents (strokes) in lightning channels. A "stroke" can be a fast current within the cloud, or a "return stroke" in a channel to ground (NOAA n.d.).

Hailstorms

The severity of hail is measured by duration, hail size, and geographic extent. Hail can exhibit a variety of sizes, though only the very largest hail stones pose serious risk to people, if exposed. It is often estimated by comparing it to a known object (Figure 4.3.7-17). Most hailstorms are made up of a mix of different sizes, and only the very largest hail stones pose serious risk to people caught in the open (NSSL 2021).

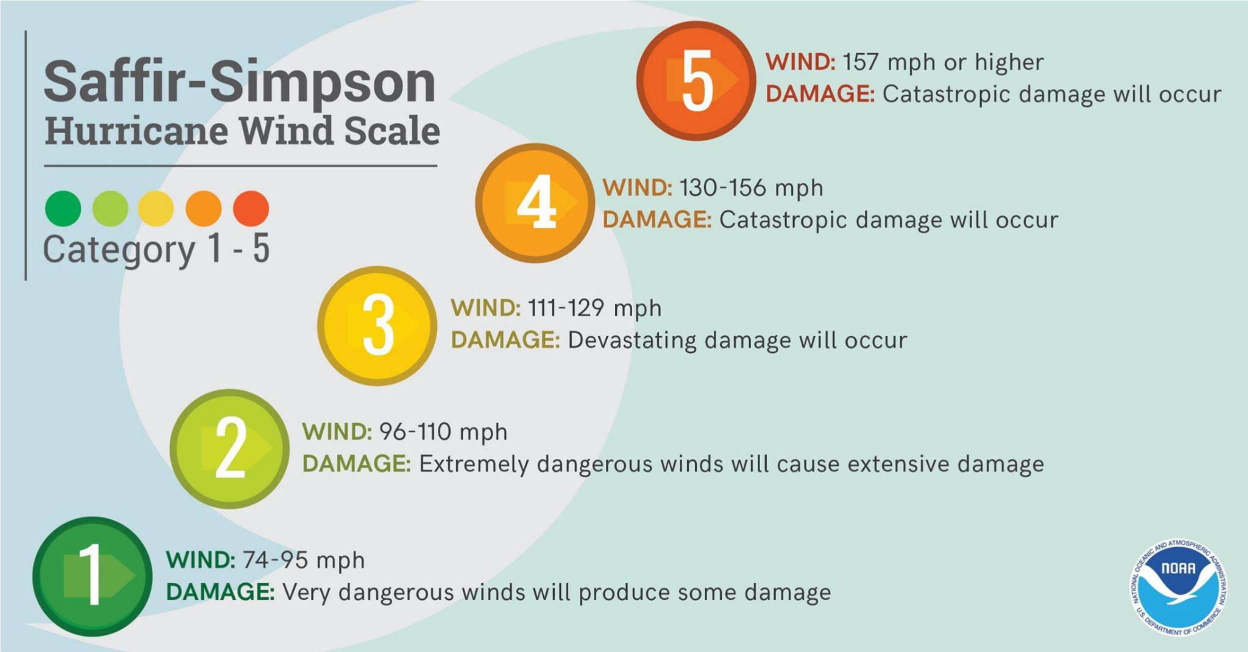
Figure 4.3.7-17. Hail Size Chart

Source: NWS 2023

Hurricanes and Tropical Storms

The extent of a hurricane or tropical storm is commonly categorized in accordance with the Saffir-Simpson Hurricane Wind Scale, which assigns a designation of tropical storm for storms with sustained wind speeds below 74 mph and a hurricane category rating of 1–5 based on a hurricane's increasing sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered *major hurricanes* because of their potential for significant loss of life and damage. Tropical Storms and Category 1 and 2 storms are still dangerous and require preventative measures (NOAA 2020). Figure 4.3.7-18 presents this scale.

Figure 4.3.7-18 The Saffir-Simpson Scale



Source: NOAA 2020

The NWS issues hurricane and tropical storm watches and warnings. These watches and warnings are issued or will remain in effect after a tropical cyclone becomes post-tropical, when such a storm poses a significant threat to life and property. The NWS allows the National Hurricane Center (NHC) to issue advisories during the post-tropical stage (NOAA NHC 2010). See below for descriptions of each watch and warning (NOAA NHC 2010):

- *Tropical Storm Watch*: An announcement that tropical storm conditions (sustained winds of 39 to 73 mph) are possible within the specified coastal area within 48 hours.
- *Tropical Storm Warning*: An announcement that tropical storm conditions (sustained winds of 39 to 73 mph) are expected somewhere within the specified coastal area within 36 hours.
- *Hurricane Watch*: An announcement that hurricane conditions (sustained winds of 74 mph or higher) are possible within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds.
- *Hurricane Warning*: An announcement that hurricane conditions (sustained winds of 74 mph or higher) are expected somewhere within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds (NOAA NHC 2010).

Storm Surge

The SLOSH model is a storm surge forecast model that forecasts surge events using information astronomical tides, storm track, intensity, and size of the storm. In addition to coastal flood watches and warnings, storm surge watches and warnings can also be issued for coastal areas in conjunction with tropical cyclone activity.

A storm surge watch is issued when there is the possibility of life-threatening inundation from rising water moving inland from the shoreline somewhere within the specified area, generally within 48 hours. The watch may be issued earlier when other conditions, such as the onset of tropical storm-force winds, are expected to limit the time available to take protective actions for surge (e.g., evacuations). The watch may also be issued for locations not expected to receive life-threatening inundation, but which could potentially be isolated by inundation in adjacent areas (NHC n.d.).

A storm surge warning is issued when there is danger of life-threating inundation from rising water moving inland from the shoreline anywhere within the specified area, generally within 36 hours. The warning may be issued earlier when other conditions, such as the onset of tropical storm-force winds, are expected to limit the time available to take protective actions for surge (e.g., evacuations). The warning may also be issued for locations not expected to receive life-threatening inundation, but which could potentially be isolated by inundation in adjacent areas (NHC n.d.).

Previous Occurrences and Losses

FEMA Major Disasters and Emergency Declarations

Between May 1953 and June 2023, the State of New Jersey was included in 32 FEMA declared severe weather-related disasters (DR) or emergencies (EM) classified as one or a combination of the following hazards: coastal storm, high tides, heavy rain, hurricane, tropical storm, nor'easter, straight-line winds, and mudslide. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Of those declarations, Burlington County has been included in 15 declarations. Since the 2020 HMP, Burlington County has been included in two additional the FEMA disaster declarations. Table 4.3.7-2 lists FEMA declarations from May 1953 to May 2023 for this HMP update. Detailed information about the declared disasters since 1953 is provided in Section 3 (County Profile).

Table 4.3.7-2. FEMA Declarations for Severe Weather Events in Burlington County

Date(s) of Event	Date of Declaration	Event Type	FEMA Declaration Number	Burlington County included in Declaration?	Description
September 16-18, 1999	September 17, 1999	Hurricane	EM-3148-NJ	Yes	Hurricane Floyd Emergency Declarations
July 12-23, 2004	July 16, 2004	Severe Storm	DR-1530-NJ	Yes	Severe Storms and Flooding
August 29 – October 1, 2005	September 19, 2005	Hurricane	EM-3257-NJ	Yes	Hurricane Katrina Evacuations
April 14-20, 2007	April 26, 2007	Severe Storm	DR-1694-NJ	Yes	Heavy Rains, Severe Storms, Hail, and Tornadoes
March 12 – April 15, 2010	April 2, 2010	Severe Storm	DR-1897-NJ	Yes	Heavy Rains and Flooding

Date(s) of Event	Date of Declaration	Event Type	FEMA Declaration Number	Burlington County included in Declaration?	Description
August 26 – September 5, 2011	August 27, 2011	Hurricane	EM-3332-NJ	Yes	Hurricane Irene
August 26 – September 5, 2011	August 31, 2011	Hurricane	DR-4021-NJ	Yes	Hurricane Irene
October 26 – November 8, 2012	October 28, 2012	Hurricane	EM-3354-NJ	Yes	Hurricane Sandy
October 26 – November 8, 2012	October 30, 2012	Hurricane	DR-4086-NJ	Yes	Hurricane Sandy
June 23, 2015	July 22, 2015	Severe Storm	DR-4231-NJ	Yes	Severe Storm
January 22-24, 2016	March 14, 2016	Severe Storm	DR-4264-NJ	Yes	Severe Winter Storm and Snowstorm
March 6-7, 2018	June 8, 2018	Severe Storm	DR-4368-NJ	Yes	Severe Winter Storm and Snowstorm
August 4, 2020	December 11, 2020	Tropical Storm	DR-4574-NJ	Yes	New Jersey Tropical Storm Isaias
September 1-3, 2021	September 3, 2021	Hurricane	EM-3573-NJ	Yes	New Jersey Remnants of Hurricane Ida
September 1-3, 2021	September 5, 2021	Hurricane	DR-4614-NJ	Yes	New Jersey Remnants of Hurricane Ida

Source: FEMA 2023

U.S. Department of Agriculture Disaster Declarations

The Secretary of Agriculture from the U.S. Department of Agriculture (USDA) is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in counties that are contiguous to a designated county. Between August 2018 and May 2023, Burlington County was included in one severe weather-related agricultural disaster declarations.

Table 4.3.7-3. USDA Declarations for Severe Weather Events in Burlington County

Date(s) of Event	Event Type	USDA Declaration Number	Description
April 1 – June 21, 2019	Heavy Rain	S4519	Excessive Rain, Flash Flooding, and Flooding

Source: USDA 2023

Previous Events

For the 2024 HMP update, known severe weather events that impacted Burlington County between August 2018 and May 2023 are discussed below. For events prior to 2018, refer to the 2018 Burlington County HMP.

Table 4.3.7-4. Severe Weather Events in Burlington County, 2018 to 2023

Date(s) of Event	Event Type	Declaration Number (if applicable)	Burlington County included in Declaration?	Description
February 25, 2019	High Wind	N/A	N/A	High winds gusting 50-60 miles per hour resulted in scattered power outages and trees down. Some minor structural damage also occurred. Trees and power lines reported down on NJ-47.
April 15, 2019	Thunderstorm Wind	N/A	N/A	A severe weather outbreak caused widespread straight line wind damage. Several thunderstorm related damage reports were received. The National Weather Service estimated wind gusts to be around 60 miles per hour.
April 26, 2019	Thunderstorm Wind	N/A	N/A	Severe storms caused widespread wind damage. Tree and powerline damage was observed in Maple Shade, Willingboro, and Mansfield. A downed tree blocked multiple lanes of State Highway 38.
June 2, 2019	Hail, Thunderstorm Wind	N/A	N/A	Severe thunderstorms impacted the region. Hail was reported to be between 0.75 and 1 inch in diameter. Trees were reported down in Pemberton Township.
June 29, 2019	Hail, Thunderstorm Wind	N/A	N/A	Widespread severe thunderstorms developed, resulting in numerous reports of damaging wind, as well as some hail. Hail was reported to be 0.75 inch in diameter. Trees, large limbs, and powerlines were downed in Mount Holly and Pemberton Township; one tree fell onto a residence. In Mount Holly. A downed tree fell on NJ-68 and closed all lanes in Springfield Township
July 6, 2019	Tornado, Thunderstorm Wind	N/A	N/A	Scattered strong to severe thunderstorms developed in the area. An EF-0 tornado occurred in Mount Laurel Township. The tornado caused minor damage to a warehouse and overturned one car before quickly dissipating. No injuries or fatalities occurred during this event. Trees were reported down in Mount Laurel, unassociated with the EF-0 tornado.
July 11, 2019	Tornado, Thunderstorm Wind	N/A	N/A	A brief tornado occurred in Mount Laurel Township. The EF-1 tornado caused major tree damage, including uprooting; a few houses and apartments in the Township incurred minor damages. A tree was downed in the right lane of NJ-68; another tree was blown down onto a road near Ramblewood Country Club.
July 17, 2019	Thunderstorm Wind	N/A	N/A	The remnants of Hurricane Barry moved into Burlington County, producing severe weather. Trees and tree limbs were reported down in Willingboro and Springfield.
July 21, 2019	Thunderstorm Wind	N/A	N/A	A severe storm produced areas of wind damage. Wires were downed on Odd Fellows Road.

Date(s) of Event	Event Type	Declaration Number (if applicable)	Burlington County included in Declaration?	Description
July 22, 2019	Thunderstorm Wind	N/A	N/A	Severe weather developed producing widespread damaging winds with considerable damage over a large area. Wind gusts were recorded at 60 miles per hour. Several trees, large tree branches and powerlines were downed, including a tree drowned on NJ-38, closing all lanes. Another tree was downed on I-295, closing the ramp to Exit 57. Building damage was reported in Beverly. A tree fell on a house in Moorestown with an occupant inside.
July 31, 2019	Thunderstorm Wind	N/A	N/A	Scattered thunderstorms developed; some storms became strong to severe with the threat of damaging winds. Wires were reported down in Cinnaminson and Beverly.
August 7, 2019	Hail, Thunderstorm Wind	N/A	N/A	Numerous severe storms impacted Burlington County, producing damaging winds and hail. Hail was reported to be 0.75 inch in diameter. Several tree limbs and powerlines were reported down.
August 19, 2019	Thunderstorm Wind	N/A	N/A	Scattered thunderstorms developed; some storms became strong to severe with the threat of damaging winds. Trees and powerlines were downed in Moorestown, Westampton, and Mansfield; a tree collapsed onto a house in Moorestown.
July 11, 2020	Tropical Storm	N/A	N/A	Tropical Storm Fay made landfall just north of Atlantic City before tracking north, bring heavy rain and wind.
February 7, 2020	High Wind, Thunderstorm Wind	N/A	N/A	Winds remained strong following a severe weather outbreak; winds were strongest in coastal areas. Winds began to diminish late in the day as the weather system moved further away. Tree and power line damage was reported; a fallen tree closed all lanes on NJ-68 and another closed Exit 52 off I-295 Southbound. Wind gusts of 60 miles per hour were measured.
March 3, 2020	Thunderstorm Wind	N/A	N/A	Widespread showers and some embedded thunder developed, producing damaging wind gusts. Trees and wires were downed in Burlington Township. There were no property or crop damages reported from this event in Burlington County.
April 9, 2020	Thunderstorm Wind	N/A	N/A	Scattered thunderstorms developed; some storms became strong to severe with the threat of damaging winds. Several trees and powerlines were downed. A downed tree blocked the right lane of the westbound New Jersey Turnpike. A tree was downed on I-295 north of Exit 43, causing lane restrictions. There were no property or crop damages reported from this event in Burlington County.

Date(s) of Event	Event Type	Declaration Number (if applicable)	Burlington County included in Declaration?	Description
April 13, 2020	High Wind	N/A	N/A	Severe thunderstorms produced several damaging wind reports. Wind damage was reported near Tabernacle. Observations suggest it is highly likely additional tree damage occurred in the heavily wooded and sparsely populated portions of the County. The McGuire Air Force Base measured a 60 mile per hour wind gust. Multiple reports of tree and utility damage were received.
April 21, 2020	Thunderstorm Wind	N/A	N/A	Scattered thunderstorms developed; some storms became strong to severe with the threat of damaging winds. Multiple reports of tree and utility damage were received.
April 30, 2020	High Wind	N/A	N/A	Strong wind gusts produced tree and utility damage. A large tree down was reported in Maple Shade. Fencing was blown down in Delran. Some power outages also occurred in the area, likely due to utility damage from high winds.
June 3-4, 2020	Thunderstorm Wind	N/A	N/A	A derecho developed then moved rapidly. The storm produced damaging winds more than 60 miles per hour; as the thunderstorm continued eastward, wind damage reports became more numerous and widespread. Wind gust reports between 60 and 70 MPH were common. In addition to these destructive wind gusts, frequent to continuous cloud to ground lightning and heavy downpours were also reported throughout the area. Because this derecho moved off the coast rapidly, another round of severe thunderstorms occurred over some of the same areas. Reported wind gusts associated with these thunderstorms generally ranged between 45 and 65 miles per hour. Multiple large trees down and at least one power pole snapped in Cinnaminson. A downed tree was reported on the New Jersey Turnpike north of State Highway 73 near Moorestown; another tree was downed on I-295 in Mount Laurel; US-130 had downed powerlines and poles on the roadway. A wind gust of 64 miles per hour was recorded in Delanco and Willingboro; a 73 mile per hour wind gust was recorded in Delran; and a 72 mile per hour gust was recorded in Moorestown. Numerous trees were downed in Willingboro, Beverly, Delran, Riverside, Westampton, Burlington City, and Moorestown. A tree fell on a car, also landing on a section of a home, near Moorestown; the house had no significant damage.
July 6, 2020	Thunderstorm Wind	N/A	N/A	Severe thunderstorms developed, producing strong winds. Multiple reports of tree and utility damage were received. Downed wires closed NJ-73 in both directions between Brick Rd and Maple Ave. Multiple trees and wires were downed on NJ-73 in Marlton. A tree fell on wires on Creek Rd at NJ-38 in Hainesport.

Date(s) of Event	Event Type	Declaration Number (if applicable)	Burlington County included in Declaration?	Description
July 30, 2020	Thunderstorm Wind	N/A	N/A	Scattered thunderstorms, some of which became strong to severe, produced several reports of damaging winds. Wires were downed in Riverside, Burlington City, Mansfield, and Bordentown.
August 3, 2020	Thunderstorm Wind	N/A	N/A	Multiple clusters of thunderstorms produced scattered and significant wind damage. Trees and wires downed were reported. Siding was blown off a building in Mount Laurel.
August 4, 2020	Tropical Storm	DR-4574-NJ	Yes	Tropical Storm Isaias brought high winds, heavy rain, and coastal flooding to Burlington County. Multiple observations of 40 to 50 miles per hour sustained winds were recorded. Numerous trees and power lines were downed. There was a reported 53 mile per hour wind gust in Tabernacle. Downed trees and power lines were reported and sustained tropical storm force winds almost certainly occurred.
August 12, 2020	Thunderstorm Wind	N/A	N/A	Severe thunderstorms developed, producing strong winds. Multiple reports of tree and utility damage were received.
August 28, 2020	Thunderstorm Wind	N/A	N/A	Significant storms produced widespread wind damage. Multiple reports of tree and utility damage were received. Downed trees caused a power outage at US-206 and Mansfield Road.
November 15, 2020	Thunderstorm Wind	N/A	N/A	There were no property or crop damages reported from this event in Burlington County.
December 24, 2020	High Wind	N/A	N/A	A high wind event occurred in Burlington County. The McGuire Air Force Base measured a 58 mile per hour wind gust. Observations from the more densely observed northwestern part of the County, and coastal observations from surrounding Counties, suggest wind gusts of around 60 miles per hour likely occurred.
March 28, 2021	Thunderstorm Wind	N/A	N/A	A strong weather system produced wind damage. Several severe wind gusts were measured, with numerous reports of tree, utility, and some structural damage. Trees and wires were reported down in Springfield Township. The National Weather service estimated wind gusts reached 60 miles per hour.
April 21, 2021	Hail	N/A	N/A	Severe storms led to scattered instances of hail and wind damage in Burlington County. Hail was reported to be 0.88 inch in diameter.
April 29, 2021	Thunderstorm Wind	N/A	N/A	Thunderstorms developed and resulted in reports of damaging wind. Multiple trees and powerlines were downed in Evesham, Moorestown, and Mount Holly.

Date(s) of Event	Event Type	Declaration Number (if applicable)	Burlington County included in Declaration?	Description
May 26, 2021	Thunderstorm Wind	N/A	N/A	A widespread severe weather event resulted in damaging winds. Numerous instances of downed trees and power lines and some property damage were reported. Thunderstorms during the evening hours were also prolific lightning producers. Multiple trees and powerlines were downed in Mount Holly, Hainesport, Medford, Willingboro, Palmyra, and Riverton.
June 4, 2021	Hail, Thunderstorm Wind	N/A	N/A	Several severe storms posed a threat for damaging winds and hail. Trees and wires downed were reported in Palmyra, Florence, North Hanover, Wrightstown, Springville, Pemberton, Medford, and Medford Lakes. Hail was reported to be 0.75 inch in diameter.
June 9, 2021	Lightning, Thunderstorm Wind	N/A	N/A	Severe thunderstorms developed bringing a threat for damaging winds, hail, and torrential rain. A couple of downed trees and limbs were reported in the Edgewater Park. A man in his 70s was struck and killed by lightning at Burlington Country Club. This was the first documented case of a fatal lightning strike in the United States in 2021.
June 14, 2021	Thunderstorm Wind	N/A	N/A	Strong and severe storms posed a risk of damaging winds along with some hail. Multiple trees and powerlines were downed in Bass River, Moorestown, Florence, and Bordentown.
July 1, 2021	Thunderstorm Wind	N/A	N/A	Severe storms capable of producing straight line wind damage caused reports of downed trees and power outages due to winds. Wires were reported down in Pemberton and Bordentown.
July 6, 2021	Thunderstorm Wind	N/A	N/A	Storms produced damaging winds and some hail. Wires were downed in Moorestown.
July 8-9, 2021	Tropical Storm	N/A	N/A	Tropical Storm Elsa paralleled the New Jersey coastline, bringing heavy thunderstorms to Burlington County.
July 12, 2021	Thunderstorm Wind	N/A	N/A	Scattered to widespread thunderstorms developed; some of the storms became severe, with several instances of damaging wind across the region. Trees and wires downed were reported in Moorestown, Maple Shade, Springfield, Willingboro, Florence, Beverly, Fieldsboro, Mansfield, Palmyra, and Riverton.

Date(s) of Event	Event Type	Declaration Number (if applicable)	Burlington County included in Declaration?	Description
July 17, 2021	Tornado, Thunderstorm Wind	N/A	N/A	Severe storms with damaging wind impacted Burlington County. A weak EF-1 tornado was confirmed in the County. Areas of heavy rain and flash flooding also occurred due to the widespread and slow-moving storm. A narrow, discontinuous, path of tree damage began just east of the Route 206 and Columbus-Jobstown Road intersection; tornado dissipated before the Ocean County line.
July 21, 2021	Thunderstorm Wind	N/A	N/A	Widespread thunderstorms developed; storms mainly took the form of clusters. Several storms became severe, posing a threat for both damaging winds and large hail. Large tree limbs were downed and blocked Bridgeboro Rd near the Westfield Rd intersection in Moorestown. Wires were downed in Delanco near the border with Riverside Twp and the Rancocas Creek.
July 29, 2021	Tornado, Hail, Thunderstorm Wind	N/A	N/A	A tornado touched down on in a heavily forested area in the eastern portion of Woodland Twp. After touching down, the tornado moved in an east-northeasterly direction and quickly crossed the Ocean County border. Trees and wires were reported down, and shingles were blown off roofs. Hail was reported to be between 1 to 1.5 inches in diameter.
August 26, 2021	Thunderstorm Wind	N/A	N/A	Storms produced locally damaging winds. Tree limbs and wires were downed on Moravvian Ave and Pancoast Blvd in Delran Twp, and near Beverly Rancocas Rd in Willingboro Twp.
September 1, 2021	Tornado, Thunderstorm Wind	EM-3573-NJ, DR-4614-NJ	Yes	The remnants of Hurricane Ida resulted in widespread thunderstorms. An EF-1 tornado formed in Burlington Township, near the Township line with Edgewater Park. Extensive tree damage was reported, including large branches snapped and trees uprooted. Damages to houses and vehicles were also reported, including a tree which had fallen onto an unoccupied vehicle. Power outages occurred due to damages to powerlines. The tornado continued into Bucks County, Pennsylvania.
November 13, 2021	Hail	N/A	N/A	Severe thunderstorms produced hail in Burlington County; hail was reported to be 0.88 inch in diameter.
February 18, 2022	Thunderstorm Wind	N/A	N/A	Locally damaging wind gusts occurred ahead of a weather system; isolated thunderstorms later developed. This system strengthened and produced several instances of damaging wind near the I-95 corridor. There was a power outage in Willingboro due to fallen tree limbs; tree limbs were also reported down in Mount Laurel and Bordentown.

Date(s) of Event	Event Type	Declaration Number (if applicable)	Burlington County included in Declaration?	Description
March 7, 2022	Thunderstorm Wind	N/A	N/A	Widespread wind gusts of 50 to 65 miles per hour moved through Burlington County. This resulted in scattered to numerous reports of downed trees and power outages. A tree was downed on US-130 northbound south of Jacksonville Road. Several poles and wires were downed on Route 541 near Irick Road and Western Drive. Power outages occurred at nearby hotels in Westampton.
April 14, 2022	Thunderstorm Wind	N/A	N/A	Scattered showers and thunderstorms developed, causing the storms to mainly stay below severe limits, some locally strong to damaging wind gusts were reported. Wires and a tree were reported down in Pemberton.
April 16, 2022	Hail	N/A	N/A	Scattered thunderstorms developed and produced hail. Hail was reported to be between 0.75 and 1 inch in diameter.
May 20, 2022	Hail	N/A	N/A	Severe storms produced damaging winds, hail, and one brief tornado in New Jersey. In Burlington County, hail was reported to be between 0.75 and 2.5 inches in diameter.
May 27, 2022	Thunderstorm Wind	N/A	N/A	Scattered to widespread storm development produced instances of damaging wind. A large tree was split on Harper Drive in Moorestown.
June 2, 2022	Thunderstorm Wind	N/A	N/A	Widespread thunderstorms developed; some of the storms became severe as they moved through the region, producing damaging winds and small hail. Trees were downed and uprooted, powerlines were downed, and tree limbs fell in Beverly, Delanco, Edgewater Park, Mount Laurel, Pemberton, Medford, and Woodland.
June 9, 2022	Thunderstorm Wind	N/A	N/A	Multiple clusters of showers and thunderstorms produced localized wind damage. A downed tree blocked a ramp on Route 38 in Mount Laurel.
July 21, 2022	Thunderstorm Wind	N/A	N/A	An isolated thunderstorm produced some minor wind damage near Marlton. Evesham Twp Police Department reported wires down on North Elmwood Road near Route 70.

Source: NOAA NCEI 2023; FEMA 2023; USDA 2023

Probability of Future Occurrence

For the 2024 HMP update, the most up-to-date data was collected to calculate the probability of future occurrence of severe weather events for the County. Information from NOAA-NCEI storm events database, FEMA, and the NOAA NHC was used to identify the number of severe weather events that occurred between 1950 and May 2023. Table 4.3.7-5 presents the probability of future events for severe weather in Burlington County.

Table 4.3.7-5. Probability of Future Occurrences of Severe Weather Events

Hazard Type	Number of Occurrences Between 1950 and 2023	% Chance of Occurring in Any Given Year
Funnel Cloud	12	16.43%
Hail	76	100%
Heavy Rain	67	91.78%
High Wind	41	56.16%
Hurricane	5	0.68%
Lightning	40	54.79%
Strong Wind	128	100%
Thunderstorm Wind	254	100%
Tornado	21	28.77%
Tropical Storm	18	24.66%
Total	**662**	**100%**

Source: NOAA 2023; NOAA NHC 2023
Note: Disaster occurrences include federally declared disasters since the 1950 Federal Disaster Relief Act, and selected events since 1968. Due to limitations in data, not all severe weather events occurring between 1954 and 1996 are accounted for in the tally of occurrences. As a result, the number of hazard occurrences is underestimated.

In Section 4.4, the identified hazards of concern for the County were ranked (Table 4.4-2). The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Team, the probability of occurrence for severe weather in the County is considered 'frequent'.

Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

Climate change includes major changes in temperature, precipitation, or wind patterns, which occur over several decades or longer. Due to the increase in greenhouse gas concentrations since the end of the 1890s, New Jersey has experienced a 3.5° F (1.9° C) increase in the State's average temperature, which is faster than the rest of the Northeast region (2° F [1.1° C]) and the world (1.5° F [0.8° C]) (IPCC 2014). This warming trend is expected to continue. By 2050, temperatures in New Jersey are expected to increase by 4.1 to 5.7° F (2.3° C to 3.2° C). Thus, New Jersey can expect to experience an average annual temperature that is warmer than any to date (low emissions scenario) and future temperatures could be as much as

10° F (5.6° C) warmer (high emissions scenario). New Jersey can also expect that by the middle of the 21st century, 70 percent of summers will be hotter than the warmest summer experienced to date. The increase in temperatures is expected to be felt more during the winter months (December, January, and February), resulting in less intense cold waves, fewer sub-freezing days, and less snow accumulation (NJDEP 2020).

As temperatures increase, Earth's atmosphere can hold more water vapor which leads to a greater potential for precipitation. Currently, New Jersey receives an average of 46 inches of precipitation each year. Since the end of the twentieth century, New Jersey has experienced slight increases in the amount of precipitation it receives each year, and over the last 10 years there has been a 7.9 percent increase. By 2050, annual precipitation in New Jersey could increase by 4 percent to 11 percent. By the end of this century, heavy precipitation events are projected to occur two to five times more often and with more intensity than in the last century. New Jersey will experience more intense rain events, less snow, and more rainfalls. Also, small decreases in the amount of precipitation may occur in the summer months, resulting in greater potential for more frequent and prolonged droughts. New Jersey could also experience an increase in the number of flood events (NJDEP 2020).

A warmer atmosphere means storms have the potential to be more intense and occur more often. In New Jersey, extreme storms typically include coastal nor'easters, snowstorms, spring and summer thunderstorms, tropical storms, and on rare occasions hurricanes. Most of these events occur in the warmer months between April and October, with nor'easters occurring between September and April. Over the last 50 years, in New Jersey, storms that resulted in extreme rain increased by 71 percent which is a faster rate than anywhere else in the United States (NJDEP 2020). In the past decade, warmer ocean temperatures have resulted in many tropical systems taking place outside of the typical hurricane season. It remains to be seen if other factors such as steering currents, atmospheric sheer, and the presence of Saharan dust will be impacted in ways which increase or decrease the risk of hurricanes in Burlington County.

Vulnerability Assessment

To assess Burlington County's risk to the severe weather hazard, a spatial analysis was conducted using SLOSH Categories 1, 2, and 3 hazard areas were assessed to estimate exposure to the Storm Surge hazard area. The SLOSH boundaries (sourced from NOAA) were overlaid on the centroids of updated assets (population, building stock, and critical facilities); as well as on the centroids of anticipated new development. Centroids that intersected the SLOSH boundaries were totaled to estimate the building RCV and vulnerable populations to the SLOSH Category 1, 2 and 3 hazard areas. These results are summarized below.

A Hazus probabilistic analysis was performed to analyze the wind hazard losses for Burlington County for the 100- and 500-year MRP events. The probabilistic Hazus hurricane model activates a database of thousands of potential storms that have tracks and intensities reflecting the full spectrum of Atlantic hurricanes observed since 1886 and identifies those with tracks associated with Burlington County. Hazus contains data on historic hurricane events and wind speeds. It also includes surface roughness and vegetation (tree coverage) maps for the area. Surface roughness and vegetation data support the modeling of wind force across various types of land surfaces. Default demographic and updated building and critical facility inventories in Hazus were used for the analysis. Although damages are estimated at the census tract level, results were presented at the municipal level. Because there are multiple census tracts that contain more than one jurisdiction, a density analysis was used to extract the percentage of building structures that fall within each tract and jurisdiction. The percentage was multiplied against the results calculated for each tract and summed for each jurisdiction.

Impact on Life, Health, and Safety

The impact of a severe weather on life, health, and safety is dependent upon several factors including the severity of the event and whether adequate warning time was provided to residents. The entire population of Burlington County (461,860) is exposed to this hazard.

Lightning can be responsible for deaths, injuries, and property damage. Lightning-based deaths and injuries typically involve heart damage, inflated lungs, or brain damage, as well as loss of consciousness, amnesia, paralysis, and burns, depending on the severity of the strike. Additionally, most people struck by lightning survive, although they may have severe burns and internal damage. People located outdoors (i.e., recreational activities and farming) are considered most vulnerable to hailstorms, thunderstorms, and tornadoes because there is little to no warning, and shelter might not be available. Downed trees, damaged buildings, and debris carried by high winds from hurricanes, tropical storms, or tornadoes can lead to injury or loss of life.

Table 4.3.7-6 identifies the estimated population located in each Sea, Lake, and Overland Surges (SLOSH) Category Hazard Area. The Township of Bass River has the highest number of people (66) in the SLOSH Category 1 Hazard Area, while the Township of Washington has the highest percentage (5.1-percent) of their population in the SLOSH Category 1 Hazard Area. The Township of Cinnaminson has the highest number of people (434) in the SLOSH Category 2 Hazard Area, while the Township of Bass River has the highest percentage (23.1-percent) of their population in the SLOSH Category 2 Hazard Area. The City of Burlington has the highest number of people (2,343) in the SLOSH Category 3 Hazard Area, while the Township of Bass River has the highest percentage (51.6-percent) of their population in the SLOSH Category 3 Hazard Area.

Table 4.3.7-6. Estimated Population Located in SLOSH Category Hazard Areas

Jurisdiction	Total Population (Decennial Population 2020)	Estimated Population Located in SLOSH Category 1 Hazard Area		Estimated Population Located in SLOSH Category 2 Hazard Area		Estimated Population Located in SLOSH Category 3 Hazard Area	
		Number of People	Percent of Total	Number of People	Percent of Total	Number of People	Percent of Total
Bass River (T)	1,355	66	4.8%	314	23.1%	700	51.6%
Beverly (C)	2,499	0	0.0%	0	0.0%	6	0.2%

Jurisdiction	Total Population (Decennial Population 2020)	Estimated Population Located in SLOSH Category 1 Hazard Area		Estimated Population Located in SLOSH Category 2 Hazard Area		Estimated Population Located in SLOSH Category 3 Hazard Area	
		Number of People	Percent of Total	Number of People	Percent of Total	Number of People	Percent of Total
Bordentown (C)	3,993	0	0.0%	4	0.1%	4	0.1%
Bordentown (T)	11,791	0	0.0%	0	0.0%	4	<0.1%
Burlington (C)	9,743	0	0.0%	0	0.0%	2,343	24.1%
Burlington (T)	23,983	0	0.0%	0	0.0%	12	<0.1%
Chesterfield (T)	9,422	0	0.0%	0	0.0%	0	0.0%
Cinnaminson (T)	17,064	53	0.3%	434	2.5%	1,025	6.0%
Delanco (T)	4,824	0	0.0%	12	0.2%	194	4.0%
Delran (T)	17,882	4	<0.1%	159	0.9%	541	3.0%
Eastampton (T)	6,191	0	0.0%	0	0.0%	0	0.0%
Edgewater Park (T)	8,930	0	0.0%	0	0.0%	4	<0.1%
Evesham (T)	46,826	0	0.0%	0	0.0%	0	0.0%
Fieldsboro (B)	526	0	0.0%	0	0.0%	0	0.0%
Florence (T)	12,812	0	0.0%	0	0.0%	0	0.0%
Hainesport (T)	6,035	5	0.1%	8	0.1%	11	0.2%
Lumberton (T)	12,803	8	0.1%	28	0.2%	44	0.3%
Mansfield (T)	8,897	0	0.0%	0	0.0%	0	0.0%
Maple Shade (T)	19,980	0	0.0%	4	<0.1%	13	0.1%
Medford (T)	24,497	0	0.0%	0	0.0%	0	0.0%
Medford Lakes (B)	4,264	0	0.0%	0	0.0%	0	0.0%
Moorestown (T)	21,355	10	<0.1%	26	0.1%	30	0.1%
Mount Holly (T)	9,981	0	0.0%	0	0.0%	7	0.1%
Mount Laurel (T)	44,633	0	0.0%	0	0.0%	4	<0.1%
New Hanover (T)	6,367	0	0.0%	0	0.0%	0	0.0%
North Hanover (T)	7,963	0	0.0%	0	0.0%	0	0.0%
Palmyra (B)	7,438	16	0.2%	16	0.2%	1,898	25.5%
Pemberton (B)	1,371	0	0.0%	0	0.0%	0	0.0%
Pemberton (T)	26,903	0	0.0%	0	0.0%	0	0.0%
Riverside (T)	8,003	0	0.0%	3	<0.1%	450	5.6%
Riverton (B)	2,764	3	0.1%	6	0.2%	209	7.6%
Shamong (T)	6,460	0	0.0%	0	0.0%	0	0.0%
Southampton (T)	10,317	0	0.0%	0	0.0%	0	0.0%
Springfield (T)	3,245	0	0.0%	0	0.0%	0	0.0%
Tabernacle (T)	6,776	0	0.0%	0	0.0%	0	0.0%
Washington (T)	693	36	5.1%	103	14.9%	240	34.6%
Westampton (T)	9,121	0	0.0%	0	0.0%	22	0.2%
Willingboro (T)	31,889	3	<0.1%	6	<0.1%	42	0.1%
Woodland (T)	1,544	0	0.0%	0	0.0%	0	0.0%

Jurisdiction	Total Population (Decennial Population 2020)	Estimated Population Located in SLOSH Category 1 Hazard Area		Estimated Population Located in SLOSH Category 2 Hazard Area		Estimated Population Located in SLOSH Category 3 Hazard Area	
		Number of People	Percent of Total	Number of People	Percent of Total	Number of People	Percent of Total
Wrightstown (B)	720	0	0.0%	0	0.0%	0	0.0%
Burlington County Total	**461,860**	**203**	**<0.1%**	**1,123**	**0.2%**	**7,802**	**1.7%**

Source: Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; U.S. Census Bureau 2020; NOAA 2022

Socially Vulnerable Populations

Research has shown that some populations, while they may not have more hazard exposure, may experience exacerbated impacts and prolonged recovery if/when impacted. This is due to many factors, including their physical and financial ability to react or respond during a hazard. Of the population exposed, the most vulnerable include the economically disadvantaged and the population over age 65. Economically disadvantaged populations may be more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on net economic impacts on their families. The population over age 65 is also more vulnerable because they are more likely to seek or need medical attention that may not be available due to isolation during a flood event, and they may have more difficulty evacuating. According to the 2021 5-year ACS estimates, there are 27,947 total persons living below the poverty level, 78,093 persons over the age of 65 years, 23,350 persons under the age of 5 years, 9,103 non-English speakers, and 51,899 persons with a disability in Burlington County.

Outdoor workers are vulnerable to severe weather events. Employers should prepare for the hazards associated with adverse weather conditions that may require special facilities and safety equipment being provided to employees, or in some instances, work stoppage to ensure the safety and health of workers. Wet weather and high wind conditions can pose a greater threat to employees working in the construction, and shipbuilding industries. For instance, workers in the construction industry are bound to work in open spaces, at heights, with electrical equipment and metals, in excavation areas and trenches, and may handle hazardous materials as a work task, thereby causing exposure to a myriad of safety hazards (Hazwoper OSHA 2020).

As a result of a significant hurricane event, residents may be displaced or require temporary to long-term sheltering. The number of people requiring shelter is generally less than the number displaced as some displaced persons use hotels or stay with family or friends following a disaster event. Hazus estimates that there will be 16 displaced households and 10 persons seeking short-term sheltering caused by the 500-year MRP event. Further, Hazus estimates that there will be 537 households displaced and 292 persons seeking short-term sheltering caused by the 500-year MRP event (Table 4.3.7-7).

Table 4.3.7-7. Estimated Displaced Households and Persons Seeking Shelter Caused by the 100-Year and 500-Year Mean Return Period (MRP) Hurricane Events

	100-Year Mean Return Period Hurricane		500-Year Mean Return Period Hurricane	
Jurisdiction	Displaced Households	Persons Seeking Short-Term Sheltering	Displaced Households	Persons Seeking Short-Term Sheltering
Bass River (T)	0	0	0	0
Beverly (C)	0	0	2	1
Bordentown (C)	1	0	8	3
Bordentown (T)	4	2	17	9
Burlington (C)	0	0	13	8
Burlington (T)	0	0	30	20
Chesterfield (T)	1	0	4	2
Cinnaminson (T)	0	0	12	6
Delanco (T)	0	0	6	3
Delran (T)	0	0	12	8
Eastampton (T)	0	0	10	6
Edgewater Park (T)	0	0	9	6
Evesham (T)	0	0	69	30
Fieldsboro (B)	0	0	1	0
Florence (T)	1	0	29	14
Hainesport (T)	0	0	11	5
Lumberton (T)	0	0	27	18
Mansfield (T)	0	0	8	4
Maple Shade (T)	0	0	16	8
Medford (T)	0	0	46	19
Medford Lakes (B)	0	0	7	2
Moorestown (T)	0	0	17	9
Mount Holly (T)	0	0	25	21
Mount Laurel (T)	0	0	63	28
New Hanover (T)	0	0	0	0
North Hanover (T)	1	0	1	0
Palmyra (B)	0	0	4	2
Pemberton (B)	0	0	0	0
Pemberton (T)	8	8	9	9
Riverside (T)	0	0	10	10
Riverton (B)	0	0	2	0
Shamong (T)	0	0	6	2

Jurisdiction	100-Year Mean Return Period Hurricane		500-Year Mean Return Period Hurricane	
	Displaced Households	Persons Seeking Short-Term Sheltering	Displaced Households	Persons Seeking Short-Term Sheltering
Southampton (T)	0	0	10	4
Springfield (T)	0	0	2	1
Tabernacle (T)	0	0	4	2
Washington (T)	0	0	0	0
Westampton (T)	0	0	13	7
Willingboro (T)	0	0	34	25
Woodland (T)	0	0	0	0
Wrightstown (B)	0	0	0	0
Burlington County (Total)	**16**	**10**	**537**	**292**

Source: *Hazus v6.0*
Notes: *Values are rounded down*

Impact on General Building Stock

All buildings are exposed to severe weather hazards such as hailstorms and lightning strikes. Refer to Section 3 (County Profile), which summarizes the building inventory in Burlington County. While hailstorms are not frequently known to cause major injuries or damage in New Jersey, an extreme event can carry hail stones traveling at speeds greater than 100 miles per hour (NWS 2019). This could cause structural damage for the general building stock in the County. Severe summer weather that causes lightning could be a threat to the County's general building stock if the lightning starts a fire. Over 22,000 fires caused by lightning occurred annually throughout the U.S. between 2007 and 2011, which was valued at approximately $450 million of damages per year (NFPA 2013).

Buildings located within the SLOSH hazard areas are exposed and considered vulnerable to the severe storm hazard, in particular hurricanes and storm surge. Buildings constructed of wood or vinyl siding are generally more likely to be impacted by the severe storm hazard than buildings constructed of brick or concrete. Table 4.3.7-8 summarizes the estimated building stock inventory located in the hazard area by municipality. Approximately 0.1-percent ($179 million) of the County's building replacement cost value is located in the SLOSH category 1 hazard area; 0.5-percent ($782 million) in the SLOSH category 2 hazard area; and 2.7-percent (4.5 billion) in the SLOSH category 3 hazard area. The Township of Bass River has the greatest number and proportion of buildings located in the category 1 hazard area (35 structures – 4.9-percent of its total). The Township of Cinnaminson has the greatest number of buildings located in the category 2 hazard area (162 structures – 2.8-percent of its total), and the Township of Bass River has the greatest proportion of its buildings located in the category 2 hazard area (i.e., 21.8-percent). The City of Burlington has the greatest number of buildings located in the category 3 hazard area (820 structures

– 25.9-percent of its total), and the Township of Bass River has the greatest proportion of its buildings located in the category 3 hazard area (i.e., 51.3-percent).

Table 4.3.7-8. Estimated Number and Total Replacement Cost Value of Structures Located in the SLOSH Hazard Area Categories

			Estimated Number and Total Replacement Cost Value of Structures Located in the SLOSH Category 1 Hazard Area				Estimated Number and Total Replacement Cost Value of Structures Located in the SLOSH Category 2 Hazard Area				Estimated Number and Total Replacement Cost Value of Structures Located in the SLOSH Category 3 Hazard Area			
Jurisdiction	Total Number of Buildings	Total Replacement Cost Value (RCV)	Number of Buildings	Percent of Total	Total Replacement Cost Value of Buildings	Percent of Total	Number of Buildings	Percent of Total	Total Replacement Cost Value of Buildings	Percent of Total	Number of Buildings	Percent of Total	Total Replacement Cost Value of Buildings	Percent of Total
Bass River (T)	719	$881,423,037	35	4.9%	$34,751,992	3.9%	157	21.8%	$106,218,453	12.1%	369	51.3%	$483,792,685	54.9%
Beverly (C)	939	$1,218,790,334	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	4	0.4%	$4,387,580	0.4%
Bordentown (C)	1,041	$2,794,074,193	0	0.0%	$0	0.0%	1	0.1%	$404,984	<0.1%	1	0.1%	$404,984	<0.1%
Bordentown (T)	3,389	$5,866,485,431	0	0.0%	$0	0.0%	2	0.1%	$72,368,590	1.2%	4	0.1%	$109,479,364	1.9%
Burlington (C)	3,165	$5,813,312,404	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	820	25.9%	$1,852,928,498	31.9%
Burlington (T)	6,525	$8,819,483,894	0	0.0%	$0	0.0%	1	<0.1%	$2,563,080	<0.1%	6	0.1%	$46,758,225	0.5%
Chesterfield (T)	2,673	$2,243,175,804	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Cinnaminson (T)	5,833	$6,206,033,564	20	0.3%	$76,376,024	1.2%	162	2.8%	$315,703,457	5.1%	363	6.2%	$533,783,503	8.6%
Delanco (T)	1,717	$1,777,428,934	0	0.0%	$0	0.0%	7	0.4%	$37,135,580	2.1%	72	4.2%	$84,646,362	4.8%
Delran (T)	5,008	$5,342,639,406	1	<0.1%	$380,754	<0.1%	48	1.0%	$43,266,418	0.8%	170	3.4%	$114,966,762	2.2%
Eastampton (T)	1,947	$1,223,958,808	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Edgewater Park (T)	2,210	$2,391,677,740	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	1	<0.1%	$380,754	<0.1%
Evesham (T)	13,368	$11,128,366,531	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Fieldsboro (B)	224	$241,524,257	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Florence (T)	4,084	$6,582,323,116	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Hainesport (T)	2,546	$3,283,651,920	2	0.1%	$761,508	<0.1%	3	0.1%	$1,142,262	<0.1%	5	0.2%	$3,941,582	0.1%
Lumberton (T)	3,724	$4,304,673,748	2	0.1%	$775,408	<0.1%	7	0.2%	$2,851,508	0.1%	11	0.3%	$4,429,737	0.1%
Mansfield (T)	3,805	$3,398,330,024	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Maple Shade (T)	5,120	$5,835,178,181	0	0.0%	$0	0.0%	2	<0.1%	$12,403,623	0.2%	6	0.1%	$16,157,630	0.3%
Medford (T)	8,792	$10,042,226,056	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Medford Lakes (B)	1,804	$967,238,228	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Moorestown (T)	7,173	$12,232,463,125	3	<0.1%	$1,170,061	<0.1%	9	0.1%	$37,505,811	0.3%	11	0.2%	$38,047,567	0.3%
Mount Holly (T)	2,987	$3,763,298,318	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	2	0.1%	$917,380	<0.1%

Jurisdiction	Total Number of Buildings	Total Replacement Cost Value (RCV)	Estimated Number and Total Replacement Cost Value of Structures Located in the SLOSH Category 1 Hazard Area				Estimated Number and Total Replacement Cost Value of Structures Located in the SLOSH Category 2 Hazard Area				Estimated Number and Total Replacement Cost Value of Structures Located in the SLOSH Category 3 Hazard Area			
			Number of Buildings	Percent of Total	Total Replacement Cost Value of Buildings	Percent of Total	Number of Buildings	Percent of Total	Total Replacement Cost Value of Buildings	Percent of Total	Number of Buildings	Percent of Total	Total Replacement Cost Value of Buildings	Percent of Total
Mount Laurel (T)	13,150	$15,418,468,979	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	1	<0.1%	$207,451	0.0%
New Hanover (T)	1,068	$2,868,939,587	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
North Hanover (T)	2,176	$2,404,670,347	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Palmyra (B)	2,482	$2,133,107,140	5	0.2%	$793,061	<0.1%	7	0.3%	$37,119,298	1.7%	657	26.5%	$763,188,595	35.8%
Pemberton (B)	519	$736,141,491	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Pemberton (T)	9,729	$6,973,242,840	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Riverside (T)	2,532	$2,459,954,166	0	0.0%	$0	0.0%	5	0.2%	$2,539,063	0.1%	165	6.5%	$164,770,361	6.7%
Riverton (B)	989	$1,096,729,598	1	0.1%	$394,654	<0.1%	3	0.3%	$14,865,378	1.4%	77	7.8%	$75,954,436	6.9%
Shamong (T)	2,494	$2,504,926,736	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Southampton (T)	5,368	$4,593,018,255	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Springfield (T)	1,826	$2,140,517,320	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Tabernacle (T)	2,938	$2,200,440,237	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Washington (T)	538	$604,084,949	24	4.5%	$63,908,648	10.6%	66	12.3%	$95,446,942	15.8%	175	32.5%	$224,268,135	37.1%
Westampton (T)	2,795	$4,620,292,645	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	6	0.2%	$1,641,952	<0.1%
Willingboro (T)	10,830	$8,789,434,159	1	<0.1%	$380,754	<0.1%	2	<0.1%	$761,508	<0.1%	15	0.1%	$39,622,325	0.5%
Woodland (T)	782	$1,333,495,830	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Wrightstown (B)	296	$748,872,423	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Burlington County Total	**149,305**	**$167,984,093,756**	**94**	**0.1%**	**$179,692,863**	**0.1%**	**482**	**0.3%**	**$782,295,954**	**0.5%**	**2,941**	**2.0%**	**$4,564,675,867**	**2.7%**

Source: Burlington County 2023; NJOGIS 2023; Microsoft BING 2022; RS Means 2022; NOAA 2022

Potential building damage was evaluated by Hazus across the following damage categories: none, slight, moderate, extensive, and complete. Table 4.3.7-9 provides definitions of these five categories of damage for a light wood-framed building. Definitions for other building types are included in the Hazus technical manual documentation. The results of potential damage states for buildings in Burlington County categorized by general occupancy classes (i.e., residential, commercial, industrial, etc.) from Hazus are summarized in Table 4.3.7-10 for the 100-year MRP event. Hazus estimates that there will be $249,636,513 in damages to structures caused by the 100-year MRP event, with the estimated residential damage being the most expensive at $215,195,962, or 86.2-percent of the total damages. Table 4.3.7-11 summarizes the damages to structures for the 500 MRP event, which estimates that there will be $1,003,552,104 in damages to structures caused by the 500-year MRP event, with the estimated residential damage being the most expensive at $770,181,556, or 76.7-percent of the total damages.

Table 4.3.7-9. Example of Structural Damage State Definitions for a Light Wood-Framed Building

Damage Category	Description
Slight	Small plaster or gypsum-board cracks at corners of door and window openings and wall-ceiling intersections; small cracks in masonry chimneys and masonry veneer.
Moderate	Large plaster or gypsum-board cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys.
Extensive	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations; partial collapse of room-over-garage or other soft-story configurations.
Complete	Structure may have large permanent lateral displacement, may collapse, or be in imminent danger of collapse due to cripple-wall failure or the failure of the lateral load resisting system; some structures may slip and fall off the foundations; large foundation cracks.

Source: FEMA 2022

Table 4.3.7-10. Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane by Occupancy

Jurisdiction	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane for Residential Structures Only	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane for Commercial Structures Only	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane for All Other Occupancies Structures Only
Bass River (T)	$2,512,908	$1,947,647	$332,821	$232,440
Beverly (C)	$1,052,625	$917,918	$95,012	$39,695
Bordentown (C)	$4,231,132	$2,977,133	$969,119	$284,880
Bordentown (T)	$10,020,244	$7,574,448	$2,121,469	$324,326
Burlington (C)	$5,292,468	$3,968,726	$855,912	$467,830
Burlington (T)	$9,060,960	$7,577,057	$709,087	$774,816
Chesterfield (T)	$7,088,842	$5,842,625	$349,163	$897,053
Cinnaminson (T)	$4,964,194	$4,533,768	$269,174	$161,252
Delanco (T)	$1,794,695	$1,639,896	$69,370	$85,429
Delran (T)	$4,837,399	$4,507,737	$198,378	$131,284
Eastampton (T)	$3,022,176	$2,874,837	$71,733	$75,606
Edgewater Park (T)	$3,524,001	$3,335,419	$132,008	$56,574
Evesham (T)	$13,080,991	$12,180,074	$558,563	$342,354
Fieldsboro (B)	$645,359	$437,310	$165,568	$42,481
Florence (T)	$10,377,767	$8,221,462	$1,012,998	$1,143,306
Hainesport (T)	$3,207,868	$2,689,369	$367,533	$150,966
Lumberton (T)	$6,620,786	$5,601,363	$558,232	$461,191
Mansfield (T)	$8,738,187	$7,741,953	$523,136	$473,098
Maple Shade (T)	$3,117,758	$2,710,810	$333,680	$73,267

Jurisdiction	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane for Residential Structures Only	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane for Commercial Structures Only	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane for All Other Occupancies Structures Only
Medford (T)	$16,933,731	$15,738,033	$800,458	$395,240
Medford Lakes (B)	$3,067,865	$3,017,536	$20,107	$30,222
Moorestown (T)	$10,008,170	$9,082,245	$532,483	$393,441
Mount Holly (T)	$4,656,852	$3,510,910	$775,181	$370,761
Mount Laurel (T)	$13,265,758	$11,651,412	$1,195,061	$419,285
New Hanover (T)	$3,421,241	$676,483	$436,647	$2,308,112
North Hanover (T)	$6,418,301	$4,385,591	$870,990	$1,161,720
Palmyra (B)	$1,550,128	$1,426,470	$81,742	$41,917
Pemberton (B)	$1,364,839	$947,042	$316,659	$101,139
Pemberton (T)	$28,011,259	$25,570,709	$1,230,274	$1,210,275
Riverside (T)	$1,687,926	$1,414,777	$209,786	$63,362
Riverton (B)	$1,163,020	$1,094,249	$37,380	$31,391
Shamong (T)	$6,240,221	$5,952,551	$95,007	$192,663
Southampton (T)	$12,065,759	$11,109,797	$517,511	$438,451
Springfield (T)	$3,948,982	$2,868,346	$387,080	$693,555
Tabernacle (T)	$6,039,104	$5,707,492	$133,771	$197,840
Washington (T)	$1,877,412	$1,455,804	$248,197	$173,410
Westampton (T)	$4,413,524	$3,585,533	$344,287	$483,704
Willingboro (T)	$16,692,726	$16,027,036	$253,083	$412,607

Jurisdiction	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane for Residential Structures Only	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane for Commercial Structures Only	Estimated Building Losses Caused by the 100-Year Mean Return Period Hurricane for All Other Occupancies Structures Only
Woodland (T)	$2,728,742	$2,115,986	$360,723	$252,034
Wrightstown (B)	$890,594	$578,406	$117,111	$195,076
Burlington County (Total)	**$249,636,513**	**$215,195,962**	**$18,656,497**	**$15,784,055**

Source: Hazus v6.0; Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; RS Means 2022

Table 4.3.7-11. Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane by Occupancy

Jurisdiction	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane for Residential Structures Only	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane for Commercial Structures Only	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane for All Other Occupancies Structures Only
Bass River (T)	$1,275,407	$1,068,508	$128,162	$78,737
Beverly (C)	$4,449,603	$3,312,818	$843,526	$293,260
Bordentown (C)	$12,519,987	$7,494,901	$3,953,118	$1,071,968
Bordentown (T)	$28,427,396	$18,572,767	$8,589,552	$1,265,077
Burlington (C)	$28,559,341	$15,827,371	$8,828,313	$3,903,656
Burlington (T)	$46,672,868	$31,867,482	$6,815,475	$7,989,911
Chesterfield (T)	$13,506,023	$10,542,493	$1,001,371	$1,962,159
Cinnaminson (T)	$25,114,973	$20,578,546	$2,819,737	$1,716,689
Delanco (T)	$7,942,846	$6,582,626	$625,999	$734,222
Delran (T)	$22,605,280	$19,213,489	$2,037,146	$1,354,645

Jurisdiction	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane for Residential Structures Only	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane for Commercial Structures Only	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane for All Other Occupancies Structures Only
Eastampton (T)	$13,391,389	$12,115,052	$630,872	$645,465
Edgewater Park (T)	$13,148,764	$11,389,798	$1,263,649	$495,318
Evesham (T)	$86,971,584	$73,067,106	$9,153,755	$4,750,723
Fieldsboro (B)	$2,283,037	$1,272,884	$789,857	$220,296
Florence (T)	$49,580,215	$33,181,426	$7,171,524	$9,227,265
Hainesport (T)	$23,584,402	$15,429,422	$6,098,166	$2,056,814
Lumberton (T)	$43,180,028	$30,868,612	$7,223,231	$5,088,185
Mansfield (T)	$27,907,097	$23,083,707	$2,883,741	$1,939,649
Maple Shade (T)	$19,862,813	$14,814,928	$4,196,152	$851,732
Medford (T)	$100,711,754	$80,541,312	$14,514,486	$5,655,957
Medford Lakes (B)	$13,397,772	$12,910,102	$225,585	$262,085
Moorestown (T)	$50,412,221	$39,597,876	$6,499,282	$4,315,064
Mount Holly (T)	$28,532,341	$17,552,968	$8,237,648	$2,741,725
Mount Laurel (T)	$78,915,783	$58,378,121	$15,676,391	$4,861,270
New Hanover (T)	$3,737,525	$529,563	$369,224	$2,838,738
North Hanover (T)	$6,782,863	$4,594,771	$967,823	$1,220,269
Palmyra (B)	$7,612,126	$6,413,109	$798,510	$400,507

Jurisdiction	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane for Residential Structures Only	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane for Commercial Structures Only	Estimated Building Losses Caused by the 500-Year Mean Return Period Hurricane for All Other Occupancies Structures Only
Pemberton (B)	$3,474,438	$2,187,375	$986,479	$300,584
Pemberton (T)	$30,619,169	$26,776,757	$1,869,507	$1,972,905
Riverside (T)	$8,195,045	$5,916,519	$1,793,999	$484,527
Riverton (B)	$5,452,984	$4,739,436	$388,691	$324,856
Shamong (T)	$22,571,743	$20,192,504	$881,973	$1,497,267
Southampton (T)	$38,481,444	$31,021,949	$4,772,174	$2,687,321
Springfield (T)	$14,814,938	$9,208,827	$2,613,571	$2,992,541
Tabernacle (T)	$15,627,146	$13,993,091	$719,518	$914,536
Washington (T)	$961,232	$805,975	$95,967	$59,290
Westampton (T)	$29,458,013	$18,263,962	$5,265,008	$5,929,043
Willingboro (T)	$70,358,604	$64,472,876	$2,664,160	$3,221,568
Woodland (T)	$1,397,501	$1,171,810	$139,494	$86,198
Wrightstown (B)	$1,054,411	$628,719	$140,135	$285,558
Burlington County (Total)	**$1,003,552,104**	**$770,181,556**	**$144,672,970**	**$88,697,578**

Source: *Hazus v6.0; Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; RS Means 2022*

Building damage as a result of the 100-year and 500-year MRP hurricanes were estimated for each municipality using Hazus. Table 4.3.7-12 summarizes estimated total building and content losses caused by the 100-year MRP event by building occupancy class. Up to 7 buildings will be completely destroyed by the 100-year MRP event and up to 4 will be severely damaged. The majority of the losses are estimated to the residential occupancy class. Table 4.3.7-13 summarizes estimated total building and content losses caused by the 500-year MRP event by occupancy classes. Up to 215 buildings will be completely destroyed by the 500-year MRP event and up to 247 will be severely damaged. The majority of the losses are estimated to the residential occupancy class.

Table 4.3.7-12. Estimated Building Damages (Structure and Contents) from the 100-year Mean Return Period (MRP) Hurricane Event

Occupancy Class	Total Number of Buildings Assessed in Occupancy	Severity of Expected Damage	100-Year Mean Return Period Hurricane: Building Count	100-Year Mean Return Period Hurricane: Percent of Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	135,116	NONE	129,431	95.8%
		MINOR	5,395	4.0%
		MODERATE	280	0.2%
		SEVERE	3	<0.1%
		DESTRUCTION	7	<0.1%
Commercial Buildings	6,297	NONE	6,093	96.8%
		MINOR	191	3.0%
		MODERATE	13	0.2%
		SEVERE	0	0.0%
		DESTRUCTION	0	0.0%
Industrial Buildings	1,170	NONE	1,137	97.2%
		MINOR	31	2.7%
		MODERATE	2	0.1%
		SEVERE	0	0.0%
		DESTRUCTION	0	0.0%
Government, Religion, Agricultural, and Education Buildings	6,722	NONE	6,313	93.9%
		MINOR	379	5.6%
		MODERATE	29	0.4%
		SEVERE	1	<0.1%
		DESTRUCTION	0	0.0%

Source: Hazus v6.0

Table 4.3.7-13. Estimated Building Damages (Structure and Contents) from the 500-year Mean Return Period (MRP) Hurricane Event

Occupancy Class	Total Number of Buildings Assessed in Occupancy	Severity of Expected Damage	500-Year Mean Return Period Hurricane	
			Building Count	Percent of Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	135,116	NONE	106,585	78.9%
		MINOR	24,659	18.3%
		MODERATE	3,440	2.5%
		SEVERE	218	0.2%
		DESTRUCTION	215	0.2%
Commercial Buildings	6,297	NONE	5,212	82.8%
		MINOR	816	13.0%
		MODERATE	249	4.0%
		SEVERE	20	0.3%
		DESTRUCTION	0	0.0%
Industrial Buildings	1,170	NONE	969	82.8%
		MINOR	150	12.8%
		MODERATE	47	4.0%
		SEVERE	3	0.3%
		DESTRUCTION	0	0.0%
Government, Religion, Agricultural, and Education Buildings	6,722	NONE	5,507	81.9%
		MINOR	1,083	16.1%
		MODERATE	125	1.9%
		SEVERE	6	0.1%
		DESTRUCTION	0	0.0%

Source: Hazus v6.0

Impact on Critical Facilities

Critical facilities are at risk of being impacted by high winds associated with structural damage, or falling tree limbs/flying debris, which can result in the loss of power. Power loss can greatly impact households, business operations, public utilities, and emergency personnel. Emergency personnel such as police, fire, and EMS will not be able to effectively respond in a power loss event to maintain the safety of its citizens unless backup power and fuel sources are available. Loss of power can impact other public utilities, including potable water, wastewater treatment, and communications. In addition to public water services, property owners with private wells might not have access to potable water until power is restored.

All critical facilities in the County are exposed to the severe weather hazard with similar risks as discussed for the general building stock. It is essential that critical facilities remain operational during natural hazard events. Backup power is recommended for critical facilities and infrastructure. Where backup power is needed for critical facilities that provide essential services, municipalities identified mitigation actions in Section 9 (Jurisdictional Annexes).

In Burlington County, there are 90 critical facilities and lifelines, combined, located in the SLOSH hazard area, categories 1 through 3. There are 6 critical facilities and lifelines located in SLOSH category 1, 11 critical facilities and lifelines in category 2, and 73 critical facilities and lifelines located in category 3. For all SLOSH hazard areas, the safety and security lifeline has the most facilities. Refer to Table 4.3.7-14 which summarizes the number of critical lifelines in the SLOSH hazard area, sorted by categories.

Table 4.3.7-14. Estimated Number of Lifelines Categorized by FEMA Lifeline Categories Located in the SLOSH Category Hazard Areas

FEMA Lifeline Category	Number of Lifelines	Number of Lifelines Located in the SLOSH Category 1 Hazard Area	Number of Lifelines Located in the SLOSH Category 2 Hazard Area	Number of Lifelines Located in the SLOSH Category 3 Hazard Area
Communications	2	0	0	0
Energy	31	0	1	2
Food, Hydration, Shelter	189	0	0	1
Hazardous Materials	207	1	3	19
Health and Medical	113	0	0	0
Safety and Security	1,101	4	6	34
Transportation	53	1	1	8
Water Systems	119	0	0	9
Burlington County (Total)	**1,813**	**6**	**11**	**73**

Source: Burlington County 2023; NOAA 2022

The Hazus hurricane model was used to assign the range or average probability of each damage state category to the critical facilities and lifelines in Burlington County for the 100-year and 500-year MRP events. For percent probability of sustaining damage, the minimum and maximum damage estimated value for that facility type is presented.

As a result of a 100-year MRP event, Hazus estimates that police stations and emergency operation centers (EOCs) have the greatest chance of sustaining minor damage, at a range of 1.2 to 8.7-percent. Schools will have the greatest chance of moderate damages, ranging from 0.1 to 4.4-percent. Severe damages to all critical facilities is negligible, ranging from 0.0 to 0.1-percent. As a result of a 500-year MRP event, Hazus estimates that EOCs have the greatest chance of sustaining minor damage, at a range of 2.6 to 19.1-percent. Schools will have the greatest chance of moderate damages, ranging from 0.2 to 22.4-percent. Severe damages to all critical facilities is negligible, with the greatest chance of damages occurring to police stations, which range from 0.0 to 1.1-percent. Table 4.3.7-15 and Table 4.3.7-16 summarize the damage state probabilities for critical facilities during the 100-year and 500-year MRP events, respectively.

Table 4.3.7-15. Estimated Damage for Critical Facilities in Burlington County for the 100-Year Mean Return Period (MRP) Hurricane Event

		100-Year Mean Return Period Hurricane			
		Percent-Probability of Sustaining Damage			
Facility Type	Loss of Days	Minor	Moderate	Severe	Complete
Medical Facilities	0	0.6% - 6.4%	<0.1% - 1.9%	0.0%	0.0%
Police Stations	0	1.2% - 8.7%	<0.1% - 1.5%	0% - <0.1%	0.0%
Fire Stations	0	0.5% - 4.5%	<0.1% - 0.8%	0% - <0.1%	0.0%
Schools	0	0.9% - 7.8%	<0.1% - 4.4%	0% - <0.1%	0.0%
EOC	0	1.3% - 8.7%	<0.1% - 1.5%	0% - <0.1%	0.0%

Source: Hazus v6.0

Table 4.3.7-16. Estimated Damage for Critical Facilities in Burlington County for the 500-Year Mean Return Period (MRP) Hurricane Event

		500-Year Mean Return Period Hurricane			
		Percent-Probability of Sustaining Damage			
Facility Type	Loss of Days	Minor	Moderate	Severe	Complete
Medical Facilities	0	1.3% - 13.7%	<0.1% - 11.6%	0.0% - 0.2%	0.0%
Police Stations	0	2.6% - 18.4%	<0.1% - 8.9%	0.0% - 1.1%	0.0%
Fire Stations	0	1.1% - 9.8%	<0.1% - 4.9%	0.0% - 0.4%	0.0% - <0.1%
Schools	0 - 3	2.1% - 12.2%	0.2% - 22.4%	0.0% - 0.7%	0.0%
EOC	0	2.6% - 19.1%	<0.1% - 9.3%	0.0% - 1.0%	0.0%

Source: Hazus v6.0

Impact on Economy

Severe weather events can have short- and long-lasting impacts on the economy. When a business is closed during storm recovery, there is lost economic activity in the form of day-to-day business and wages to employees. Overall, economic impacts include the loss of business function (e.g., tourism, recreation), damage to inventory, relocation costs, wage loss and rental loss due to the repair/replacement of buildings. Impacts to transportation lifelines affect both short-term (e.g., evacuation activities) and long-term (e.g., day-to-day commuting and goods transport) transportation needs. Utility infrastructure (power lines, gas lines, electrical systems) could suffer damage and impacts can result in the loss of power, which can impact business operations and can impact heating or cooling provision to the population.

According to the State of New Jersey 2019 HMP, hail alone causes $2 billion worth of crop and property damage on an annual basis in the United States (State of New Jersey 2019). Even though New Jersey is only estimated to experience an average of two hailstorm events per year, the outcome of these events could be detrimental depending on the cost it would take for the community to recover from the damages. Likewise, these costs can add up for other severe weather events such as tornados destroying key infrastructure and level local businesses, or extreme rain events flooding out shopping centers or transportation hubs.

Hazus estimates building-related economic losses, including income losses (wage, rental, relocation, and capital-related losses) and capital stock losses (structural, non-structural, content, and inventory losses). Economic losses caused by the 100-year and 500-year hurricane MRP events were estimated by Hazus and are summarized in Table 4.3.7-17. Hazus estimates a difference in losses between the 100-year and 500-year MRP events. Income losses for the 100-year MRP event are $1,886,640, 21.36-percent of the 500-year MRP event's $8,832,580 inventory losses. Similarly, wage losses for the 100-year MRP event are $6,071,880, 19.9-percent of the 500-year MRP event's $30,429,330 wage losses.

Table 4.3.7-17. Economic Losses for the 100-Year and 500 Mean Return Period (MRP) Hurricane Event

	Total Business Interruption Loss (in Thousands of Dollars)				
Mean Return Period (MRP)	Income Loss	Relocation Loss	Building Losses	Wages Losses	Rental Losses
100-Year	$1,886,640	$11,305,760	$249,636,510	$6,071,880	$3,698,870
500-Year	$8,832,580	$95,050,830	$1,003,552,100	$30,429,330	$32,020,160

Source: Hazus v6.0

Hazus also estimates the volume of debris that may be generated as a result of a hurricane event to enable the study region to prepare and rapidly and efficiently manage debris removal and disposal. Debris estimates are divided into two categories: (1) reinforced concrete and steel that require special equipment to break it up before it can be transported, and (2) brick, wood, and other debris that can be loaded directly onto trucks with bulldozers (FEMA 2022).

For the 100-year MRP event, Hazus estimates that 790,406 tons of debris will be generated. For the 500-year MRP event, Hazus estimates a total of 1,516,769 tons of debris will be generated county-wide. Table 4.3.7-18 and Table 4.3.7-19 summarize the estimated debris generated as a result of these events by municipality, respectively.

Table 4.3.7-18. Estimated Debris Generated by the 100-Year Mean Return Period (MRP) Hurricane Event

	Estimated Debris Created During the 100-Year Mean Return Period Hurricane Wind Event			
Jurisdiction	Brick and Wood (Tons)	Concrete and Steel (Tons)	Tree (Tons)	Eligible Tree Volume (Cubic Yards)
Bass River (T)	229	0	53,306	31,984
Beverly (C)	108	0	99	919
Bordentown (C)	512	0	250	1,993
Bordentown (T)	1,089	0	1,976	10,477
Burlington (C)	547	0	753	4,765
Burlington (T)	867	0	2,713	13,606

Jurisdiction	Estimated Debris Created During the 100-Year Mean Return Period Hurricane Wind Event			
	Brick and Wood (Tons)	Concrete and Steel (Tons)	Tree (Tons)	Eligible Tree Volume (Cubic Yards)
Chesterfield (T)	883	0	6,977	9,688
Cinnaminson (T)	382	0	581	4,749
Delanco (T)	168	0	319	1,566
Delran (T)	379	0	652	3,947
Eastampton (T)	297	0	1,121	3,899
Edgewater Park (T)	262	0	565	4,350
Evesham (T)	956	0	5,234	21,822
Fieldsboro (B)	73	0	283	1,131
Florence (T)	1,204	0	2,471	9,802
Hainesport (T)	321	0	868	4,168
Lumberton (T)	682	0	2,584	9,786
Mansfield (T)	989	0	5,533	11,033
Maple Shade (T)	275	0	300	2,750
Medford (T)	965	0	12,477	38,693
Medford Lakes (B)	148	0	414	3,704
Moorestown (T)	735	0	1,550	9,670
Mount Holly (T)	593	0	555	4,841
Mount Laurel (T)	1,097	0	2,101	13,974
New Hanover (T)	377	0	10,657	14,166
North Hanover (T)	787	0	5,002	10,759
Palmyra (B)	125	0	233	1,754
Pemberton (B)	155	0	213	1,202
Pemberton (T)	2,279	0	30,113	61,334
Riverside (T)	185	0	279	2,220
Riverton (B)	78	0	123	1,161
Shamong (T)	388	0	17,321	22,531
Southampton (T)	908	0	16,635	26,447
Springfield (T)	552	0	7,376	8,872
Tabernacle (T)	379	0	20,731	24,874
Washington (T)	171	0	39,753	23,860
Westampton (T)	444	0	1,770	5,595
Willingboro (T)	1,169	0	1,379	12,219
Woodland (T)	248	0	57,776	34,678
Wrightstown (B)	110	0	814	1,562
Burlington County (Total)	**22,115**	**0**	**313,857**	**476,549**

Source: Hazus v6.0

Table 4.3.7-19. Estimated Debris Generated by the 500-Year Mean Return Period (MRP) Hurricane Event

Jurisdiction	Estimated Debris Created During the 500-Year Mean Return Period Hurricane Wind Event			
	Brick and Wood (Tons)	Concrete and Steel (Tons)	Tree (Tons)	Eligible Tree Volume (Cubic Yards)
Bass River (T)	99	0	40,764	24,458
Beverly (C)	567	0	392	3,646
Bordentown (C)	1,488	0	498	3,985
Bordentown (T)	3,188	10	3,888	20,397
Burlington (C)	3,330	7	2,298	14,907
Burlington (T)	5,494	8	8,503	42,752
Chesterfield (T)	1,731	1	9,843	13,870
Cinnaminson (T)	2,779	0	3,676	27,286
Delanco (T)	997	0	1,597	7,829
Delran (T)	2,650	0	3,514	21,594
Eastampton (T)	1,635	8	2,802	9,743
Edgewater Park (T)	1,464	0	1,873	14,097
Evesham (T)	9,925	30	22,557	100,583
Fieldsboro (B)	257	1	606	2,423
Florence (T)	5,975	20	6,912	27,900
Hainesport (T)	2,789	10	3,690	17,711
Lumberton (T)	5,113	18	9,954	36,968
Mansfield (T)	3,524	18	12,214	25,355
Maple Shade (T)	2,420	0	2,107	19,169
Medford (T)	9,702	8	38,281	120,794
Medford Lakes (B)	1,196	0	1,158	10,372
Moorestown (T)	5,451	0	6,847	41,536
Mount Holly (T)	3,603	7	1,990	17,182
Mount Laurel (T)	9,554	8	10,579	70,844
New Hanover (T)	388	0	9,972	13,669
North Hanover (T)	834	0	5,009	10,767
Palmyra (B)	866	0	1,152	8,275
Pemberton (B)	425	0	333	1,888

Jurisdiction	Estimated Debris Created During the 500-Year Mean Return Period Hurricane Wind Event Brick and Wood (Tons)	Concrete and Steel (Tons)	Tree (Tons)	Eligible Tree Volume (Cubic Yards)
Pemberton (T)	2,591	0	32,874	63,390
Riverside (T)	1,060	0	875	6,937
Riverton (B)	555	0	499	4,665
Shamong (T)	2,073	0	34,619	45,053
Southampton (T)	3,862	6	30,006	48,291
Springfield (T)	1,988	6	16,563	19,898
Tabernacle (T)	1,391	0	33,529	40,297
Washington (T)	74	0	30,411	18,261
Westampton (T)	3,404	12	6,553	20,793
Willingboro (T)	7,798	17	4,779	42,022
Woodland (T)	108	0	44,200	26,540
Wrightstown (B)	126	0	869	1,644
Burlington County (Total)	**112,472**	**195**	**448,782**	**1,067,792**

Source: Hazus v6.0

Impact on Environment

The impact of severe weather events on the environment varies, but researchers are finding that the long-term impacts of more severe weather can be destructive to the natural and local environment. National organizations such as USGS and NOAA have been studying and monitoring the impacts of extreme weather phenomena as it impacts long term climate change, streamflow, river levels, reservoir elevations, rainfall, floods, landslides, erosion, etc. For example, severe weather that creates longer periods of rainfall can erode natural banks along waterways and degrade soil stability for terrestrial species. Tornadoes can tear apart habitats causing fragmentation across ecosystems. (US EPA 2023) Researchers also believe that a greater number of diseases will spread across ecosystems because of impacts that severe weather and climate change will have on water supplies (U.S. Climate Resilience Toolkit 2016). Overall, as the physical environment becomes more altered, species will begin to contract or migrate in response, which may cause additional stressors to the entire ecosystem within Burlington County. Refer to Section 4.3.2 (Disease Outbreak) for more information about these stressors.

Cascading Impacts on Other Hazards

Severe weather events and severe wind events can escalate the impacts of flooding and utility failure. Severe winds can be destructive to the functionality of utilities by breaching power lines and disconnecting the utility systems. Severe weather may carry extreme rainfall that could exacerbate flooding. Tropical storms and hurricanes can result in storm surge events that result in significant coastal flooding. More information about flooding can be found in Section 4.3.6 of this HMP.

Further Changes that May Impact Vulnerability

Understanding future changes that may impact vulnerability in the County can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. The County considered the following factors that may affect hazard vulnerability:

- Potential or projected development.
- Projected changes in population.
- Other identified conditions as relevant and appropriate, including the impacts of climate change.

Projected Development

The ability of new development to withstand extreme summer weather hazard impacts lies in sound land use practices, building design considerations (e.g., Leadership in Energy and Environmental Design [LEED]), and consistent enforcement of codes and regulations for new construction. New development will change the landscape where buildings, roads, and other infrastructure potentially replace open land and vegetation. Surfaces that were once permeable and moist are now impermeable and dry, potentially making them more susceptible to fires caused by lightning.

The Pinelands Commission has identified Pinelands Management Area Boundaries, including regional growth areas and rural development areas that may also provide insight to where development and growth may occur in the County. In addition, each community was requested to provide recent and anticipated new development and infrastructure projects; summarized in Section 9 (Jurisdictional Annexes).

Specific areas of recent and new development are indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 (Jurisdictional Annexes) of this plan.

Projected Changes in Population

Burlington County has experienced an increase in its population since 2010. According to the U.S. Census Bureau, the County's population increased by approximately 3-percent between 2010 and 2020 (U.S. Census Bureau 2020). The New Jersey Department of Labor and Workforce Development produced populations projections by County from 2014 to 2019, 2024, 2029, and 2034. According to these projections, Burlington County is projected to have a population of 460,400 by 2024, 464,900 by 2029, and 472,700 by 2034 (State of New Jersey 2017). Changes in the density of population can impact the number of persons exposed to flooding and erosion. As areas continue to be cleared for new development and run-off persists, the population in the County will remain exposed to this hazard. Refer to Section 3 (County Profile), which includes a discussion on population trends for the County.

Climate Change

As discussed above, most studies project that the County will see an increase in average annual temperatures and precipitation. As the climate warms, the intensity of summer weather may change, with the potential to create more frequent events with lightning and/or hail. It is anticipated that the County will continue to experience direct and indirect impacts of severe weather events annually that may induce secondary hazards such as infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents, and inconveniences.

Change of Vulnerability Since 2019 HMP

Overall, the County's vulnerability has not changed, and the entire County will continue to be exposed and vulnerable to severe weather events. As existing development and infrastructure continue to age, they can be at increased risk to failed utility and transportation systems if they are not properly maintained and do not adapt to the changing environment.