

## **5.2 IDENTIFICATION OF NATURAL HAZARDS OF CONCERN**

To provide a strong foundation for mitigation strategies considered in Section 6.0, Burlington County considered a full range of natural hazards that could impact the area, and then identified and ranked those hazards that presented the greatest concern. The natural hazard of concern identification process incorporated input from the County and participating jurisdictions; review of the State of New Jersey Hazard Mitigation Plan (NJ HMP) and previous hazard identification efforts; research and local, state, and federal information on the frequency, magnitude, and costs associated with the various hazards that have previously, or could feasibly, impact the region; and qualitative or anecdotal information regarding natural hazards and the perceived vulnerability of the study area’s assets to them. Table 5.2-1 documents the process of identifying the natural hazards of concern for further profiling and evaluation.

**Hazards of Concern** are defined as those hazards that are considered most likely to impact a community. These are identified using available data and local knowledge.

For the purposes of this planning effort, the Planning Committee chose to group some natural hazards together, based on the similarity of hazard events, their typical concurrence or their impacts, consideration of how hazards have been grouped in Federal Emergency Management Agency (FEMA) guidance documents (FEMA 386-1, “Understanding Your Risks, Identifying Hazards and Estimating Losses; FEMA’s “Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy”), and consideration of hazard grouping in the NJ HMP.

The “Flood” hazard includes riverine flooding, flash flooding, coastal flooding, and dam flooding. Other types of flooding such as ice jam do not typically occur within the County; therefore, it will not be further considered for inclusion within this HMP. Inclusion of the various forms of flooding under a general “Flood” hazard is consistent with that used in FEMA’s “Multi-Hazard Identification and Risk Assessment” guidance.

The “Severe Storm” hazard includes windstorms that often entail a variety of other influencing weather conditions including thunderstorms, hail, lightning and tornados. Since tropical disturbances are identified as a type of severe storm event, this hazard also includes tropical cyclone events (hurricanes, tropical storms and tropical depressions). Tropical cyclones were not grouped as a separate hazard, because the County felt that these types of events do not directly impact the area on a frequent basis and that exposure and risk of such events are minimal in comparison to communities along the New Jersey coastline. However, this was found to be an exception for certain tropical events that created a regional impact upon the State, such as Hurricane Irene (2011), Tropical Storm Lee (2011) and Hurricane Sandy (2012), as further discussed in Section 5.4.1 Severe Storm of this HMP.

The “Severe Winter Storm” hazard includes heavy snowfall, blizzards, freezing rain/sleet, ice storms, and extra-tropical cyclones (nor’easters and severe winter low-pressure systems). Extra-tropical events generally occur during winter weather months; therefore, for the purpose of this HMP, all such events are to be grouped within this hazard. Although not all extra-tropical events, such as Nor’Easters, occur during the winter, they will remain grouped within this hazard category to avoid duplication of events in hazard profiles.

Please note that technological [e.g. hazardous material incidents] and man-made hazards (e.g. terrorism) are not being addressed in this planning process. The DMA 2000 regulations do not require consideration of such hazards and due to a limited schedule and funding, these were not chosen for inclusion in this plan by the County and planning participants.

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Table 5.2-1. Identification of Natural Hazards of Concern for Burlington County

Hazard	Is this a hazard that may occur in the County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
Avalanche	No	No	<ul style="list-style-type: none"> <li>The NJ HMP does not identify avalanche as a hazard of concern for New Jersey.</li> <li>The topography and climate of Burlington County does not support the occurrence of an avalanche event.</li> <li>New Jersey in general has a very low occurrence of avalanche events based on statistics provided by National Avalanche Center – American Avalanche Association (NAC-AAA) between 1950 and 2006.</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP</li> <li>Review of NAC-AAA database between 1998 and 2012.</li> </ul>
Coastal Erosion	Yes	Yes	<ul style="list-style-type: none"> <li>The NJ HMP identifies coastal erosion as a hazard of concern for NJ. Counties bounded by coastal waters are most affected by coastal erosion.</li> <li>A portion of Burlington County is located within the CAFRA area (Township of Bass River). Coastal erosion may occur because it is tidally influenced. A majority of the County is located along the Delaware River where it is densely populated and in some areas, heavily industrialized.</li> <li>The Planning Committee identified coastal erosion as a significant concern affecting several municipalities within the County</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP</li> <li>Planning Committee Input</li> </ul>
Drought	Yes	Yes	<ul style="list-style-type: none"> <li>The NJ HMP identifies drought as a hazard of concern for New Jersey. The NJHMP indicated that Burlington County experienced drought events during the following time periods:                             <ul style="list-style-type: none"> <li>March 1995</li> <li>December 1998</li> <li>January 1999</li> <li>July-September 1999</li> <li>November-December 2001</li> <li>January-July 2002</li> <li>September - October 2002</li> <li>September 2005</li> <li>May-July 2006</li> </ul> </li> <li>Burlington County is located in the Southern Climate Divisions. Periods of severe and/or extreme drought in this division includes:                             <ul style="list-style-type: none"> <li>January-February 1931</li> <li>May 1965-August 1966</li> <li>March-June 1985</li> <li>November-December 1998</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP</li> <li>FEMA</li> <li>NRCC</li> <li>Planning Committee Input</li> </ul>

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			<ul style="list-style-type: none"> <li>○ July-September 2002</li> <li>○ August-September 2010</li> <li>● Burlington County has been included in one FEMA Disaster Declaration for a drought event:               <ul style="list-style-type: none"> <li>○ FEMA-EM-3083 – Water Shortage – October 1980</li> </ul> </li> </ul>	
Earthquake	Yes	Yes	<ul style="list-style-type: none"> <li>● The NJ HMP identifies earthquake as a hazard of concern for NJ. Although they are known to occur on a regular basis, records indicate that no major earthquakes have struck the state since the establishment of historical record-keeping (1500's). Between 1783 and 2012, there have been 179 earthquakes with epicenters in New Jersey. Of those 179 earthquakes, eight had epicenters in Burlington County.</li> <li>● According to the USGS seismic hazard maps, the PGA with a 10% probability of exceedance over 50 years for Burlington County is between 2%g and 4%g. FEMA's How-To Guide recommends that earthquakes be considered for further evaluation in the planning process in areas where the PGA is over 2%g.</li> </ul>	<ul style="list-style-type: none"> <li>● NJ HMP</li> <li>● FEMA</li> <li>● NJGWS</li> <li>● USGS</li> <li>● NJDEP</li> <li>● Planning Committee Input</li> </ul>
Expansive Soils	No	No	<ul style="list-style-type: none"> <li>● The NJ HMP does not identify expansive soils as a hazard of concern for NJ.</li> <li>● USGS indicated that in Burlington County, 50% or less of the soils consist of clay that has slight to moderate potential of swelling, with some areas underlain by soils with little to no clays with swelling potential.</li> </ul>	<ul style="list-style-type: none"> <li>● NJ HMP</li> <li>● Review of USGS 1989 Swelling Clays Map of the Conterminous United States.</li> <li>● Planning Committee Input</li> </ul>
Extreme Temperature	No	No	<ul style="list-style-type: none"> <li>● The NJ HMP identifies extreme heat as a hazard of concern for NJ citing 61 extreme heat events between 1950 and 2009. The NJ HMP also identifies extreme cold as a hazard of concern for NJ.</li> <li>● NOAA-NCDC indicated that between 2008 and 2013, Burlington County did not experience any excessive heat or extreme cold events. According to SHELDUS, there were four heat events that occurred between 2009 and 2012 that resulted in one fatality and 13 injuries.</li> <li>● Extreme temperature events have occurred in Burlington County and will continue to occur. However, damages associated with extreme temperature events are primarily health impacts, an increased need for heating and cooling centers, impacts on</li> </ul>	<ul style="list-style-type: none"> <li>● NJ HMP</li> <li>● SHELDUS</li> <li>● NOAA – NCDC</li> <li>● Planning Committee Input</li> </ul>

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			<p>livestock and agriculture, and increased demand for electricity.</p> <ul style="list-style-type: none"> <li>• Extreme temperatures are generally a regional hazard event, affecting a large swath of counties and/or states simultaneously.</li> <li>• Many sources have indicated that all counties of NJ have experienced extreme temperature events (heat waves or cold temperatures). Most recent events:               <ul style="list-style-type: none"> <li>○ February 1996 – Extreme Cold throughout NJ. Blackwell Mills experienced temperatures near -8°F</li> <li>○ July 1997 – Excessive Heat effecting 16 counties (25 injuries)</li> <li>○ July 1999 – All NJ counties affected by a Heat Wave, with 17 fatalities and 160 injuries. The heat in SC resulted in 10 Injuries and 1 death. Somerville experienced temperatures near 103°F.</li> <li>○ January 2000 – Extremely cold temperatures and wind chills</li> <li>○ August 2001 – Heat wave</li> <li>○ July 2002 – Heat wave</li> <li>○ January 2003 – Extreme Cold, resulting in 1 fatality and 7 injuries in the state.</li> <li>○ January 2004 – Extremely cold temperatures and wind chills</li> <li>○ July-August 2006 – Heat wave; entire tri-state area under excessive heat warning. NJ experienced 41 injuries.</li> <li>○ January 2009 – Extreme cold, reported temperature of -2 degrees F in Basking Ridge</li> <li>○ June 2011 – Extreme heat, resulting in 1 injury in SC.</li> <li>○ July 2011 – Extreme heat resulting in 3 injuries in SC. 104 degree temperatures were recorded in Somerville.</li> </ul> </li> <li>• The NOAA-NCDC storm event database indicated that SC has been a part of 78 temperature extremes. All these events included other counties or the entire state.</li> </ul>	
<p>Flood (Riverine, Flash, Coastal and Dam Flooding)</p>	<p>Yes</p>	<p>Yes</p>	<ul style="list-style-type: none"> <li>• NJ HMP stated that flooding is NJ's most common major natural hazard. The NJ HMP cited that between 1996 and 2010, 1,169 flood events were reported in New Jersey, with over \$1.82 billion in damages.</li> <li>• Burlington County has been issued five FEMA Disaster Declarations for flooding associated with various storm events (severe storms, snowstorm, severe winter storm). These events include the following:               <ul style="list-style-type: none"> <li>○ FEMA-DR-1530 – Severe Storms and Flooding – July 2004</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP</li> <li>• FEMA</li> <li>• NOAA – NCDC</li> <li>• Burlington County GIS</li> <li>• Planning Committee Input</li> </ul>



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			<ul style="list-style-type: none"> <li>o FEMA-DR-1694 – Severe Storms and Flooding – April 2007</li> <li>o FEMA-DR-1873 – Snowstorm – February 2010</li> <li>o FEMA-DR-1889 - Severe Winter Storm and Snowstorm – March 2010</li> <li>o FEMA-DR-1897 – Severe Storms and Flooding – April 2010</li> <li>• Approximately 19% of Burlington County’s total area is located in an A-Zone (97,640 acres); 1.4% in a V-Zone (7,356 acres); 21% in a 500-year flood area (108,514 acres); and 16% in a D-Zone (84,091 acres).</li> <li>• According to NOAA NCDC storm database, between 1996 and 2013, Burlington County experienced 54 flood events.</li> </ul>	
Hailstorm	Yes	Yes	Please see Severe Storm	
Hurricane (and other Tropical Cyclones)	Yes	Yes	Please see Severe Storm and Flood	
Ice Jams	Yes	No	Please see Flood	
Ice Storm	Yes	Yes	Please see Severe Winter Storm	
Infestation	No	No	<ul style="list-style-type: none"> <li>• The NJ HMP does not identify infestation as a hazard of concern for the State of New Jersey.</li> <li>• Although some infestations of ticks, mosquitoes, and/or other types of pest may be present, no sources indicate that this is a major hazard of concern for the County.</li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP</li> <li>• Planning Committee Input</li> </ul>
Land Subsidence	Yes	No	<ul style="list-style-type: none"> <li>• NJ HMP indicates NJ is vulnerable to land subsidence; the soil collapse sinkhole is the most concerned type of sinkhole for NJ.</li> <li>• NJ HMP does not identify Burlington County as an area that has experienced significant land subsidence in the past. In general, areas with narrow bands of carbonate rock are prone to sinkholes and subsidence.</li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP</li> <li>• Planning Committee Input</li> </ul>
Landslide	Yes	Yes	<ul style="list-style-type: none"> <li>• The NJ HMP identifies landslide as a hazard of concern for NJ.</li> <li>• USGS indicates within the National Atlas Map Maker program that the County has a moderate susceptibility/low incidence to landslides along the northwestern most edge, and low incidence (or less than 1.5% of the area is susceptible) throughout the remainder of the County.</li> <li>• NJGWS provides four recorded landslides within Burlington County: <ul style="list-style-type: none"> <li>o May 4, 1893 – Debris flow due to heavy rain in Bordentown</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP</li> <li>• NJGWS</li> <li>• NationalAtlas.gov (USGS)</li> <li>• Planning Committee Input</li> </ul>



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			<ul style="list-style-type: none"> <li>○ Township</li> <li>○ Unknown Date – Debris flow due to heavy rain in Bordentown Township</li> <li>○ Unknown Date – Debris flow due to quarrying in Burlington Township</li> <li>○ Unknown Date – Debris flow due to heavy rain in Southampton Township</li> </ul>	
Nor'Easters	Yes	Yes	Please see Severe Winter Storm and Flood	
Severe Storm (Windstorms, Thunderstorms, Hail, Lightning, Tornadoes and Hurricanes,)	Yes	Yes	<ul style="list-style-type: none"> <li>• NJ HMP identifies thunderstorms, lightning, tornadoes, hurricanes and extreme winds as hazards of concern for NJ.</li> <li>• Burlington County has been issued eight FEMA Disaster Declarations for severe storm-related events (flooding and hurricane). These events include the following:               <ul style="list-style-type: none"> <li>○ FEMA-EM-3148 – Hurricane Floyd – September 1999</li> <li>○ FEMA-DR-1530 – Severe Storms and Flooding – July 2004</li> <li>○ FEMA-DR-1694 – Severe Storms and Inland/Coastal Flooding – April 2007</li> <li>○ FEMA-DR-1897 – Severe Storms and Flooding – March-April 2010</li> <li>○ FEMA-DR-4021 – Hurricane Irene – August-September 2011</li> <li>○ FEMA-DR-4086 – Hurricane Sandy – October 2012</li> </ul> </li> <li>• Between 1950 and 2012, Burlington County experienced 18 tornadoes.</li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP</li> <li>• FEMA</li> <li>• SPC</li> <li>• ONJSC</li> <li>• Planning Committee Input</li> </ul>
Severe Winter Storm (Heavy Snow, Blizzards, Freezing Rain/Sleet, Nor'Easters, Ice Storms)	Yes	Yes	<ul style="list-style-type: none"> <li>• NJ HMP indicates winter storms are significant hazards that impact NJ.</li> <li>• ONJSC indicated that normal seasonal snowfall for Burlington County ranges from 14.4 inches to 21.8 inches.</li> <li>• Burlington County has been issued five FEMA Disaster Declarations for winter storm-related events (severe blizzard, snow, snowstorm, and severe winter storm). These events include the following:               <ul style="list-style-type: none"> <li>○ FEMA-EM-3106 – Severe Blizzard – March 1993</li> <li>○ FEMA-EM-3181 – Snow – February 2003</li> <li>○ FEMA-DR-1873 – Snowstorm – December 2009</li> <li>○ FEMA-DR-1889 – Severe Winter Storm and Snowstorm – February 2010</li> <li>○ FEMA-DR-1954 – Severe Winter Storm and Snowstorm –</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP</li> <li>• ONJSC</li> <li>• NWS</li> <li>• FEMA</li> <li>• NOAA – NCDC</li> <li>• Planning Committee Input</li> </ul>

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			<p>December 2010</p> <ul style="list-style-type: none"> <li>The NOAA-NCDC Storm Events Database indicated that between 1996 and 2013, Burlington County experienced 27 winter storm events (heavy snow, winter weather, and winter storm).</li> </ul>	
Tornado	Yes	Yes	Please see Severe Storm	
Tsunami	Yes	No	<ul style="list-style-type: none"> <li>The NJ HMP does not identify tsunami as a hazard of concern for NJ; however, tsunamis are discussed and it is indicated that there is no record of the generation of a catastrophic Atlantic Basin tsunami that has impacted the mid-Atlantic coastline.</li> <li>Over the past 200 years, the Atlantic and Gulf Coasts have experienced very few tsunamis. The probability of a large tsunami impacting the coastal areas of New Jersey is believed to be small, however earthquake activity along the Mid-Atlantic Ridge is recognized as having the potential to pose some level of tsunami risk to the Atlantic seaboard.</li> <li>NOAA/WDS Tsunami Event Database did not indicate any tsunami or tsunami-like events that impacted Burlington County.</li> <li>Burlington County is bounded by coastal waters in the southeastern portion of the County. Although the County is mostly shielded by barrier islands, the impacts from a tsunami could flow in through one of the inlets and up the Mullica River. However, the probability of a large tsunami impacting the coast of New Jersey and Burlington County is very small.</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP</li> <li>NOAA / WDS</li> <li>Planning Committee Input</li> </ul>
Volcano	No	No	<ul style="list-style-type: none"> <li>The NJ HMP does not identify volcano as a hazard of concern for the State of New Jersey or its counties and jurisdictions.</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP</li> <li>Planning Committee Input</li> </ul>
Wildfire	Yes	Yes	<ul style="list-style-type: none"> <li>Wildfires are not an uncommon occurrence in NJ, especially in the Pine Barrens. Fires which burn more than 1,000 acres occur, on average, once every 10 years in the Pine Barrens. In May 2007, a wildfire along the border of Ocean and Burlington Counties burned more than 12,000 acres (~19 square miles).</li> <li>Between 1929 and 2006, there were 2,233 wildfire incidents in Burlington County. They burned over 42,000 acres and destroyed 831 acres.</li> <li>In Burlington County, over 195 square miles are located within the extreme wildfire fuel hazard area; over 11 square miles in the very high area; over 106 square miles in the high area; over 86</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP</li> <li>NJFFS</li> <li>NOAA – NCDC</li> </ul>



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			square miles in the moderate area; and over 165 square miles in the low. <ul style="list-style-type: none"> <li>According to the NOAA-NCDC, a total of eight wildfires have occurred in Burlington County between 1996 and 2013.</li> </ul>	
Windstorm	Yes	Yes	Please see Severe Storm	

- CAFRA Coastal Area Facility Review Act
- DR Presidential Disaster Declaration Number
- EM Presidential Disaster Emergency Number
- FEMA Federal Emergency Management Agency
- HMP Hazard Mitigation Plan
- NCDC National Oceanic and Atmospheric Administration National Climatic Data Center
- NJ New Jersey
- NJDEP New Jersey Department of Environmental Protection
- NJFFS New Jersey Forest Fire Service
- NJGWS New Jersey Geological and Water Survey
- NOAA National Oceanic and Atmospheric Administration
- NRCC Northeast Regional Climate Center
- ONJSC Office of New Jersey State Climatologist
- SHELDUS Spatial Hazard Events and Losses Database for the U.S.
- SPC Storm Prediction Center
- TSTM Thunderstorm
- USGS U.S. Geologic Survey



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According to input from the Planning Committee, and review of all available resources, a total of eight natural hazards of concern were identified as significant hazards affecting the entire county, to be addressed at the regional level in this Plan:

- Coastal Erosion
- Drought
- Earthquake
- Flooding (Riverine, Flash, Coastal, Dam)
- Landslides
- Severe Storm (Hail, Wind, Lightning, Thunderstorm, Tornado, and Hurricane)
- Severe Winter Storm (Heavy Snow, Blizzard, Freezing Rain/Sleet, Nor'Easters, and Ice Storms)
- Wildfire

Other natural hazards of concern have occurred within Burlington County, but have a low potential to occur and/or result in significant impacts within the County. Therefore, these hazards will not be further addressed within this version of the Plan. However, if deemed necessary by the Planning Committee, these hazards may be considered in future versions of the Plan.