Appendix 19: Borough of Sayreville

The Borough of Sayreville participated in the 2015 Middlesex County Hazard Mitigation Plan (HMP) update. This appendix includes the locally-specific information about the Borough. The following sections detail the planning process and participants; the current population, building stock, and land development trends; hazards that specific to the Borough and corresponding risk assessments; the Borough's mitigation strategy, and a local capability assessment.

1. Plan Development

After the County submitted its Planning Grant Funding application on 2/10/2014, the OEM Coordinator signed an "Intent to Participate" letter and became the point of contact for the HMP update. This individual worked with other municipal employees, consultants, volunteers, and other stakeholders through the formation of a Local Planning Committee, as listed below. The local planning committee worked to gather the necessary information to support the plan update and reviewed all drafts. The LPC met with the Plan consultant on December 1st, 2015 to review the mitigation strategy and draft plan.

Table 19-1: Borough of Sayreville Local Planning Committee Members

Name	Title	Organization
Barry Eck	OEM Coordinator	Borough of Sayreville
Dan Frankel	Business Administrator	Borough of Sayreville
Kirk J. Miick	Construction Official/Director of Construction Department	Borough of Sayreville

2. Community Profile

2.1 Physical Location

The Borough of Sayreville has a total area of 18.704 square miles and is located on the south bank of the Raritan River, Middlesex County, New Jersey. Sayreville Borough is bordered by the South River on the west (with the Borough of South River and East Brunswick across the river), Old Bridge Township to the south, South Amboy to the northeast, Perth Amboy, Woodbridge and Edison to the north across the Raritan River, and Staten Island across the Raritan Bay to the northeast.

Major transportation routes through Sayreville include the Garden State Parkway, Route 9, Route 35, and County Routes 535 and 615. There are three bridges over the Raritan from Sayreville: the Driscoll Bridge (GSP), The Edison Bridge (Route 9) and the Victory Bridge (Route 35). New Jersey Transit provides bus service, and there are no commuter rails in Sayreville.

2.1.1 Hydrography and Hydrology

Sayreville Borough is mostly located in the Raritan River Basin, but also has a sizable portion of land in the Atlantic Coast Basin. From the southern-most point of the Borough, the South River flows north to the Raritan River, delineating the western boundary of Sayreville Borough. The Raritan River creates the northern boundary of Sayreville before flowing into the Raritan Bay. Small tributaries such as Duck Creek and Pond Creek flow from central Sayreville south into the South River and Burt Creek flows from central Sayreville, north into the Raritan. Both major rivers are tidally influenced as they flow past the Borough.

2.2 History and Governance

Sayreville was formally incorporated on April 6, 1876 as a Township from portions of South Amboy, and it became a Borough on April 29, 1919. The Borough is governed under the Borough form of government, and has an elected Mayor and six Council members. The Mayor is elected directly to a four-year term of office. Town Council members are elected to serve three-year terms on a staggered basis, with two seats coming up for election every year. The Borough Council holds monthly meetings open to the public where it discusses legislation under consideration.

2.3 Demographics

2.3.1 Population Trends

According to the U.S. Census Bureau, the population in 2010 was 42,704.[1] This is a 5.8% increase from 2000. The Borough of Sayreville has a population density of 2,695.7 persons per square mile. It is the 18th densest municipality within the County. A summary of major population and household characteristics may be found in the following tables.

[1] U.S. Bureau of the Census. American Fact Finder "Sayreville Borough, NJ". http://factfinder.census.gov/ . Retrieved 9/10/15.

Table 19-2: Borough of Sayreville Population Summary Estimates (2010 Census) [2]

Population	Quantity	Percent of Municipal Population
Total Population	42,704	100
Median Age	38.6	N/A
17 years and under	9,650	22.6
65 years and over	5,186	12.1
Race		
White	28,630	67.0
Black/African-American	4,573	10.7
Native American/Alaskan Native	100	0.2
Asian	6,882	16.1
Native Hawaiian/Pacific Islander	18	0.0
Other Race (unspecified)	1,495	3.5
Two or More Races	1,006	2.4
Hispanic or Latino	5,258	12.3

Population statistics may further reveal potential vulnerabilities in the community. The following table details the distribution of two groups included in vulnerable population analyses (children and the elderly) according to household description. Residents living alone, particularly the elderly, may have fewer coping mechanisms and resource than those in household groups, therefore may constitute a demographic that could require assistance in mitigating their vulnerability.

Table 19-3: Borough of Sayreville Household Characteristics Summary Estimates (2010 Census) [3]

Households	Quantity	Percent of Total
Total Households	15,636	100
Family Households (related)	11,411	73.0
Family Households w children under 18	5,159	33.0
Non-Family Households (unrelated)	4,225	27.0
Non-Family Households, living alone	3,510	22.4
Non-Family Households, living alone Male over 65 years	351	2.2
Non-Family Households, living alone Female over 65 years	900	5.8

2.3.2 Vulnerable Populations

Vulnerable populations include those groups that may require special assistance, considerations, accommodation or other needs during emergency events to facilitate their effective and safe compliance with emergency instructions. This includes, but is not limited to, those individuals needing mobility assistance (strollers, wheelchairs, etc.), those with financial needs (cannot afford hotel rooms, food, necessities, during evacuation periods, etc.), those requiring translation or interpretation services to understand emergency information (non-English-speaking populations, Deaf and hard of hearing), persons considered legal minors, those persons with cognitive impairments, persons with specialized

[2] Ibid.
[3] Ibid.

medical needs (electric dependent equipment, refrigerated medications, use of Personal Assistants for routine and basic care, medical transportation needs, etc.), and populations with social disadvantages other needs that may require unique considerations during emergency events.

Identifiable vulnerable populations in Sayreville include (but may not be limited to) the following:

Table 19-4: Borough of Sayreville Vulnerable Population Estimates (2010)

Population Type	Population Estimate (2010 Census)[4]
Under 5 years of age	2,799
Under 18 years of age	9,650
Over 65 years of age	5,186
Limited English Proficiency (LEP)	5,040 (equals 12.4% of population over 5 years old)
Institutionalized	193
Living in Group Quarters	7

In addition to these statistics, approximately 5.7% of the population lives below the poverty line. The mean household income is $92,960, with the per capita income at approximately $34,440 (2013 estimates).[5]

2.4 Land Use and Development

The Borough of Sayreville is an historic industrial town, largely developed and defined by its Raritan and South River waterfronts. Approximately 50 percent of the Borough is classified as Urban. Between 2002 and 2012, the Borough saw an increase in "Urban" area and a decrease in wetlands and forested areas.

Table 19-5: Borough of Sayreville Land Cover Summary

Land Cover Class	Percent of Total Land[6]	2002 (acres)	2007 (acres)	2012 (acres)	Percent Change[7]
Agriculture	0.26%	15.72	27.50	28.97	84.27%
Barren Land	3.58%	405.26	220.41	403.23	-0.50%
Forest	15.95%	1922.16	1825.01	1794.29	-6.65%
Urban	52.08%	5612.02	5890.56	5859.78	4.41%
Water	10.73%	1157.02	1173.68	1206.88	4.31%
Wetlands	17.41%	2139.51	2114.53	1958.55	-8.46%

2.4.1 Open Space

The Borough of Sayreville has over 1,000 acres of open space, but less than 20 percent of this land is within the Special Flood Hazard Area. Just over 4 percent of the SFHA is preserved.

[4] Ibid.
[5] U.S. Bureau of the Census. American Fact Finder "Sayreville Borough, NJ". http://factfinder.census.gov/ . Retrieved 9/10/15.
[6] Percent based on acres of land in 2012
[7] Change is calculated between 2002 and 2012

2.4.2 Buildings and Development

Table 19-6: Borough of Sayreville Housing Statistics

Housing Characteristics	Estimate
Total Occupied Housing Units	15,672
Percent Owner-occupied	68.3
Percent Renter-occupied	31.7
Percent built after 2000	7.7
Percent built before 1979	68

2.4.3 Recent and Expected Development

Project Name	Type	Number of Structures	Locations	Known Hazards	Description/Status
Townlake	Residential	300 apartments/ 400 SFH	Main St/Washington	None	Under construction
Ernston Road	Residential	1000 units	Near Parkway off Ernston Road	None	A large scale development that is currently underway

2.5 Critical Facilities and Infrastructure

2.5.1 Essential Facilities

The Borough maintains several municipal facilities including the Police Department, Borough Hall, Emergency Operations Center, Senior Center, Public Library, 4 Firehouses, 2 First Aid Squads, and a recreation center.

2.5.2 Transportation

The Borough of Sayreville sits at the mouth of the Raritan Bay. The Garden State Parkway runs North and South in the eastern section of the Borough. State Routes 9 and 35 run alongside the Parkway. There are a number of County roads that connect Sayreville to its surrounding municipalities. There are also a few freight railroad lines that run through the Borough. There are no passenger lines through the Borough, but there is a N.J. Transit bus line through the Borough.

2.5.3 Critical Utilities and Infrastructure

The Borough provides a public water supply to residents and businesses. It operates two water treatment plants. The primary treatment plant did not experience any damage in recent storms and is not considered to be vulnerable to natural hazard events. The MacArthur Ave plant did have flood damage from Sandy. The Borough has since relocated contents to other locations to prevent future loss. The Borough also maintains its own sewer lines and lift stations for wastewater. Wastewater treatment is handled by the MCUA. JCP&L services the Borough with electricity and PSE&G provides natural gas. The Borough reports that both services are reliable, with interruptions only during major storm events.

3. Hazard Identification and Risk Assessment

This section describes the natural hazards and risks that can affect the Borough of Sayreville Like all the other municipalities in Middlesex County, Sayreville is potentially subject to the effects of all the hazards that are considered in this mitigation plan. However, only a few of these hazards have significant impacts that are unique to the community. The remaining hazards are discussed in detail in the County part of this mitigation plan. FEMA mitigation planning guidance requires that County mitigation plans include a risk assessment section that "assess[es] each jurisdiction's risks where there vary from the risks facing the entire planning area" (44CFR 201.6 (c) (2) (iii). Because the Middlesex County HMP update includes separate appendices for each municipality, this requirement is met in the appendices, while risks that affect the entire County uniformly are discussed in the County part of the HMP.

Table 19-7
Borough of Sayreville
Hazard Identification and Prioritization

Hazard	Priority
Coastal Erosion	L
Dam/Levee Failure	L/M
Drought	L
Earthquakes	L
Extremely High Temps	M
Extremely Low Temps	M
Floods*	H
Hurricanes/Tropical Storms*	H
Nor'easters	H
Power Outages	M
Severe Weather	M
Hazardous Substances	H
Wildfire*	L/M
Winter Storm	L

3.1 Background and Hazard Rankings

One of the first steps in developing jurisdictional appendices was for participating municipalities to review and prioritize the hazards that can affect them. This was done based on how often a hazard has occurred, how significant effects have been in the past, the difficulty and cost of recovering from such events. Municipalities ranked the list of hazards as high, medium, low, or no concern.

Table 19-7 shows community hazard rankings. To the extent possible, the level of discussion and detail about specific hazards in this section are based on these rankings. However, in many cases there is insufficient hazard information available at the level of the jurisdiction to allow detailed discussion or risk estimates. For some hazards there is limited jurisdiction-level tabular data included in the County portion of the HMP, and users should refer to those subsections for more detail. The hazards marked with asterisks in the table above are included in this appendix; the others are included in the County portion of this HMP, but not discussed in detail here.

The Borough has listed Hazardous Substances as High due to the uncertainty associated with materials in transit. The Borough works with the State and the County to ensure that its Emergency Management staff is trained and aware of potential risks. The Borough actively is working to reduce its risks and vulnerabilities to the other natural hazards.

3.2 Flood Hazard

3.2.1 Type, Location, and Extent

The Borough of Sayreville is located in central Middlesex County. The predominant sources of flooding in this jurisdiction are the Raritan River, which forms the northern border of the Borough, and the Washington Canal and South River, which form the western border.

The jurisdiction is also exposed to flooding in other areas, from direct exposure to Raritan Bay, as well as to Cheesequake Creek, which passes through Sayreville on the Borough's eastern end before draining into the bay. There are several areas here and on at the jurisdiction's northern end that are classified by FEMA as "V-zones", meaning that they are subject to storm-induced wave action. These areas are shown in pink shading in the map immediately below.

One of the best resources for determining flood risk in a jurisdiction is Flood Insurance Rate Maps (FIRMs), which are produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the jurisdiction. At the time the Middlesex County HMP was being updated, the effective FIRM for the Borough of Sayreville is dated July 6, 2010. While the effective FIRM is the approved map and is used for regulatory purposes, the Middlesex County hazard mitigation plan update was developed in 2015, and the best available flood mapping at that time was the FEMA revised Preliminary Flood Map (released on January 30, 2015). This map is shown below in Figure 19-1.

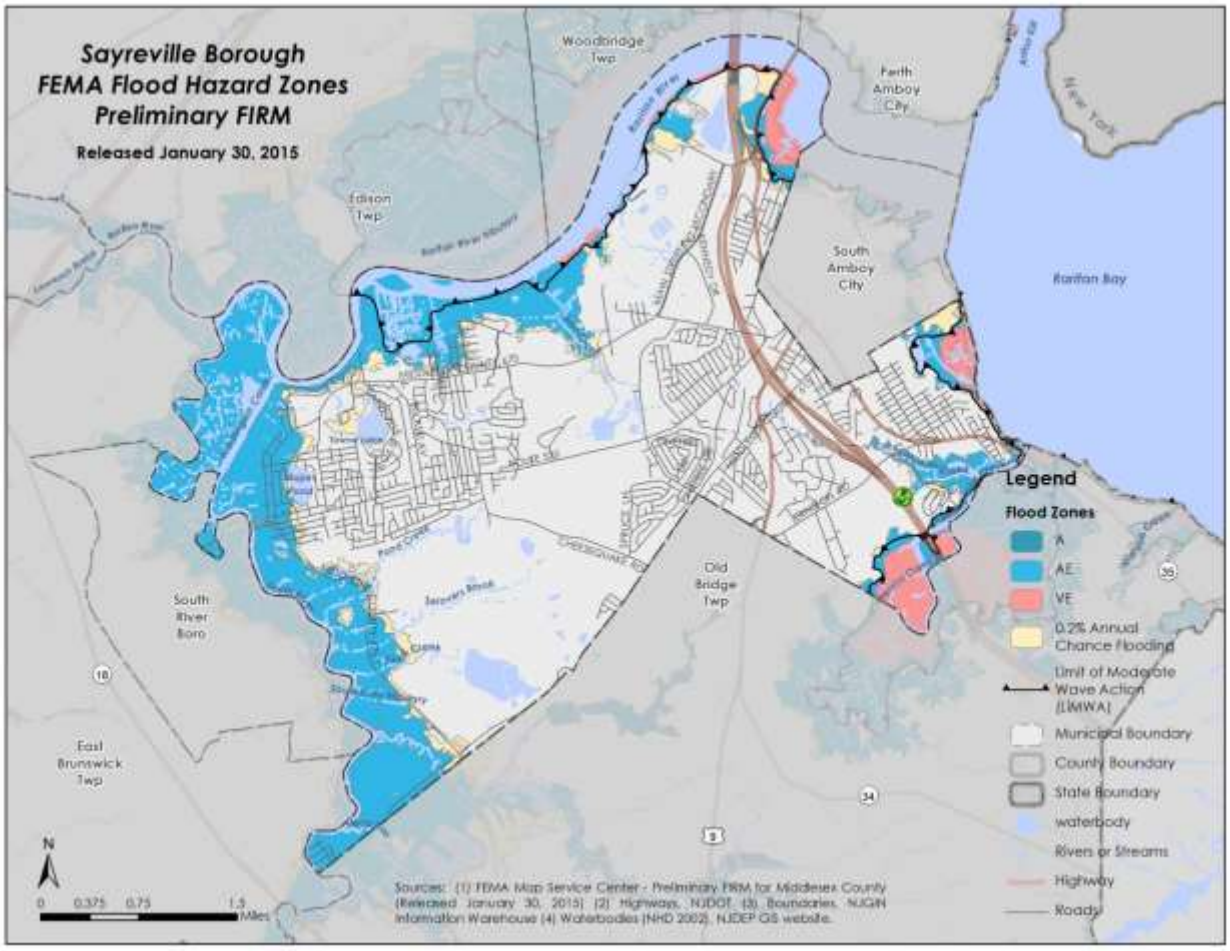
As shown in Table 19-8 below, floodplain comprises a large area (and percentage coverage) in Sayreville, which is one of the larger jurisdictions in Middlesex County. Is it notable that in addition to having a large land area in the floodplain, there are also a very high percentage of parcels with centroids in the floodplain, relative to other jurisdictions in the County. This suggests significant vulnerabilities to flooding.

Table 19-8
Floodplain and Parcel Data for the Borough of Sayreville
(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, January 2014)

Data Type	Value
Jurisdiction area in square miles	17.58
Square miles within 100-year floodplain	5.16
Jurisdiction area within 100-year floodplain	29.37%
Number of parcels in jurisdiction	18,180
Number of parcels with centroids within 100-year floodplain	1,451
Parcels with centroids within 100-year floodplain	7.98%

[Note: the table refers to centroids, which are the geographic center of a parcel. This is a better indicator of flood exposure than simple intersection with the floodplain, although it does not necessarily mean that any structures or infrastructure are within the boundaries of the Special Flood Hazard Area].

Figure 19-1
Sayreville portion of FEMA Revised Preliminary Flood Insurance Rate Map



(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, January 2014)

Current FEMA guidance uses the term *extent* as analogous to potential severity. The extent of the flood hazard in Sayreville is very significant. Based on an evaluation of NFIP flood insurance claims, many of the flood events that have occurred in Sayreville have resulted in large insurance claims, suggesting that structures experienced relatively deep flooding (there are other possible reasons for high claims amounts, including contamination, debris impacts, etc., but there is no specific reason to believe these factors were at work in Sayreville).

3.2.2 Previous Occurrences and the Probability of Future Floods

Although flood insurance claims in Sayreville go back several decades, by far the most significant two events in terms of flooding were Tropical Storm Irene (2011) and Superstorm Sandy (2012). The large majority of claims were from those two events, and, as discussed below, most of the flooding has been

concentrated in two or three specific areas. Both Irene and Sandy and Irene caused very significant damage in western Sayreville, mainly on Weber Avenue and MacArthur Avenue, which are parallel roads immediately east and in close proximity to the South River. Another area in the northwest part of Sayreville also experienced significant damage during Sandy – the area adjacent to the Raritan, around Marsh Avenue and Miller Avenue was the site of numerous insurance claims, although this was likely related to storm surge because there is no claims history there prior to Sandy. The probability of floods in the most vulnerable areas will likely stay constant, except that areas close to the Raritan will likely see increases in the numbers and severity of floods because of the effects of sea level rise.

3.2.3 Flood Impacts and Vulnerabilities to Flooding

The impacts from past floods in this jurisdiction have been very significant in both Tropical Storm Irene and Hurricane Sandy. Multiple hundreds of structures flooded in the two areas described above (and illustrated on the claims map below). Flooding on Weber Avenue and MacArthur Avenue was widely reported in the media, and the areas are currently part of ongoing FEMA acquisition activities. Figure 19-2 shows Weber Avenue houses after Sandy impacted the area.

Figure 19-2
Weber Street, Sayreville, after Superstorm Sandy (2012)

3.2.4 National Flood Insurance Program and Repetitive Loss Properties

To provide a sense of the flood risk in a community it is also beneficial to summarize the policies in force and claims statistics from the National Flood Insurance Program (NFIP). There is a discussion of the NFIP in the County section of this hazard mitigation plan. The Borough Sayreville has been a member of the NFIP since 1981.

Table 19-9
NFIP Policies and Claims

Number of Parcels:	
Sayreville:	18,180
Middlesex County:	283,276
Number of Policies In-Force:	
Sayreville:	320
Middlesex County:	4,489
Number of Claims:	
Sayreville:	318
Middlesex County:	3,478
Total Paid Claims	
Sayreville:	$17,381,933
Middlesex County:	$109,727,837

FEMA NFIP statistics indicate that as of February 2015, federal flood insurance policies were in-force on 320 properties in Sayreville. Between 1978 and 2015, there have been a total of 318 NFIP insurance claims in the Borough of Sayreville, with a total claims value of $17,381,933.[8] Table 19-9 compares the number of policies in-force and paid claims in the jurisdiction. The table shows that Borough of Sayreville comprises 7.1% of the NFIP policies in-force in Middlesex County, and accounts for slightly less than 16 percent of paid claims. Notably, the average NFIP claim in Sayreville ($54,660) is almost twice that of the overall County, which is $31,549. This suggests relatively deep flooding and possibly longer-duration flooding in areas with high claims amounts.

The Borough of Sayreville is not presently a member of the Community Rating System (CRS), a voluntary program for communities participating in the NFIP. The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. For CRS participating communities, flood insurance premium rates are discounted in increments of 5% based on creditable activities.[9] CRS communities are ranked between 1 and 10, with Class 1 communities receiving a 45% premium discount.

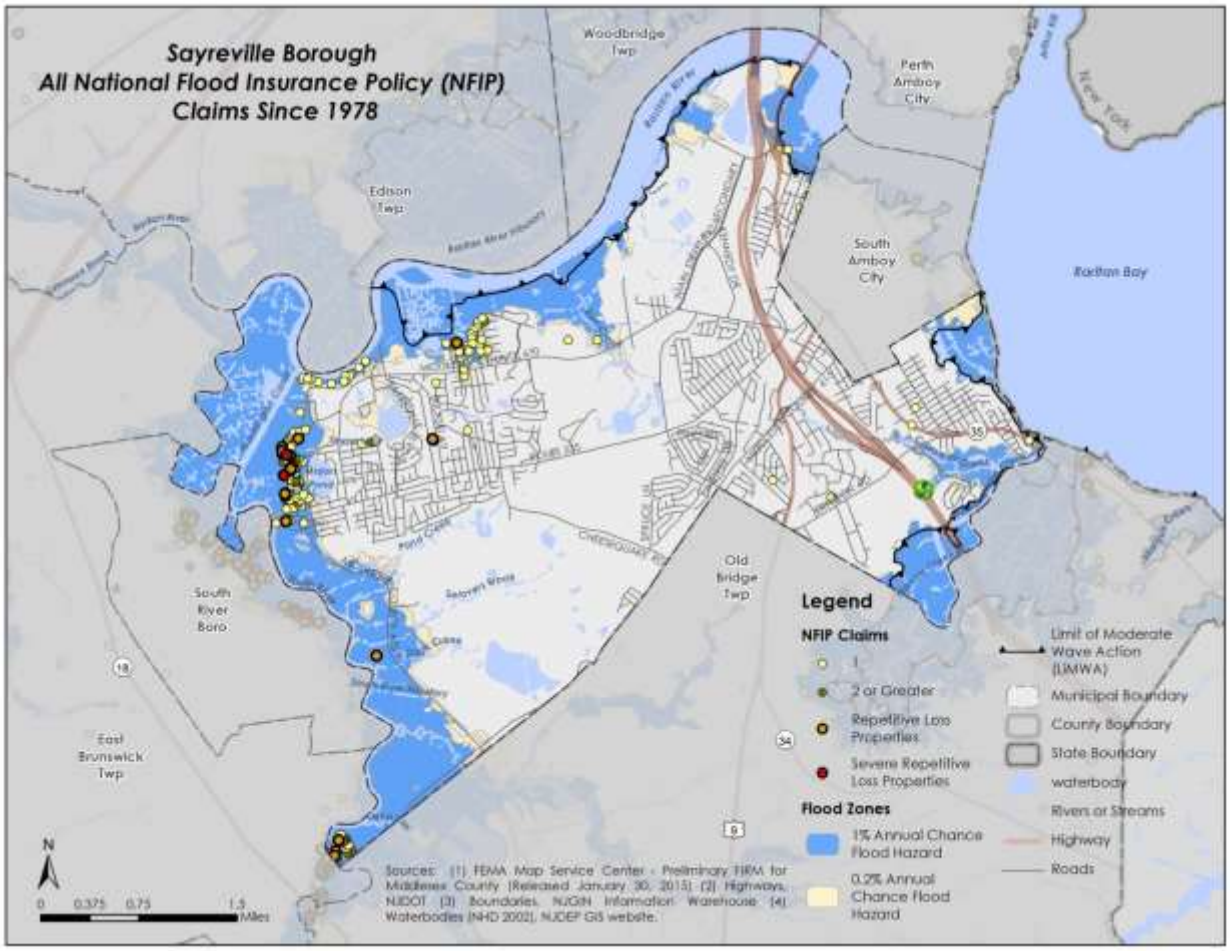
It should be noted that NFIP claims are not a direct or completely accurate proxy for flood risk in a community. The data does not include flood damages to structures that had no flood insurance. Also, in some cases, structures or contents may have been underinsured. The NFIP claims data also does not include any damages to public facilities, which may be insured via other means (such as self-insurance or non-FEMA policies); such damages may also be addressed through other federal programs such as FEMA's Public Assistance Program.

Figure 19-3 shows all NFIP claims in Sayreville between 1978 and 2015. Note the dense concentrations of claims along the east bank of the South River, with numerous repetitive loss and severe repetitive loss properties in that area. These are discussed in the subsections below. There is also a notable

[8] FEMA – Policy and Claim Statistics for Flood Insurance
[9] FEMA – Community Rating System (CRS).

concentration of claims on the south bank of the Raritan, east of where the South River drains into it from the south.

Figure 19-3
Map of NFIP Claims in the Borough of Sayreville (1978 to 2015),
Including Repetitive Loss and Severe Repetitive Loss Properties
(Source: FEMA National Flood Insurance Program, February 2015)



3.2.5 Flood Risk to Repetitive Loss Properties in Sayreville

FEMA requires a discussion of NFIP Repetitive Loss and Severe Repetitive flood loss statistics in hazard mitigation plans. In 2012, the Biggert Waters act redefined repetitive loss property as a structure covered by a contract for flood insurance made available under the NFIP that has incurred flood-related damage on two occasions, in which the cost of the repair, on average, equaled or exceeded 25% of market value of the structure at the time of each such flood event. This definition is being used to prioritize properties for mitigation funding. The data about Repetitive Loss properties in this subsection are based on the previous definition. Under the revised definition above, Sayreville has six RL properties. See Section 4 of the County portion of this HMP for more details on repetitive loss properties in the County.

Table 19-10
NFIP Policies and Claims

Repetitive Loss (RL) Properties:	
Sayreville:	21
Middlesex County:	429
Total Building (RL)	
Sayreville:	$3,975,616
Middlesex County:	$44,015,885
Total Contents (RL)	
Sayreville:	$662,668
Middlesex County:	$5,106,609
Number of Claims (RL)	
Sayreville:	58
Middlesex County:	1,322
Average Claim (RL)	
Sayreville:	$79,970
Middlesex County:	$37,158
Severe Repetitive Loss (SRL) Properties:	
Sayreville:	2
Middlesex County:	77
Total Building (SRL)	
Sayreville:	$448,482
Middlesex County:	$14,512,761
Total Contents (SRL)	
Sayreville:	$8,037
Middlesex County:	$910,122
Number of Claims (SRL)	
Sayreville:	7
Middlesex County:	385
Average Claim (SRL)	
Sayreville:	$65,217
Middlesex County:	$40,059

The flood risk assessment in this section is based in part on analysis of NFIP data on repetitive flood loss properties. As of February 2015, Middlesex County had 429 such properties based on a query of the FEMA BureauNet NFIP interface. Of this total, 21 properties were located within Sayreville; this comprises 4.8 percent of the County total. Table 19-10 provides a comparison of the residential repetitive loss claims for Middlesex County and Sayreville. The tables below include the number of repetitive loss properties, building and contents damages, the total number of claims, and the average claim amounts.

The 21 repetitive loss properties in Sayreville were responsible for a total of 58 insurance claims, totaling $4,638,284. This is 9.4% of the County total. Table 19-11 provides summary repetitive loss statistics for the community. Not only does Sayreville comprise a disproportionate number of insurance claims, but as the table shows, the average amounts of claims are above the County average.

Table 19-11
Repetitive Loss Statistics in the Borough of Sayreville and Middlesex County
(Source: FEMA National Flood Insurance Program, February 2014)

City/County Name	Properties	Total Building	Total Contents	Total Losses	# of Claims	Average Claim
Borough of Sayreville	21	$3,975,616	$662,668	$4,638,284	58	$79,970
Middlesex County	429	$44,015,885	$5,106,609	$49,122,494	1,322	$37,158

The next table shows the streets in Sayreville with the most insurance claims. For reasons of confidentiality, this mitigation plan does not show specific addresses.

Table 19-12
Streets in the Borough of Sayreville with Highest Numbers and Amounts of NFIP Claims
(Repetitive Loss Properties)
(Source: FEMA National Flood Insurance Program, February 2014)

Street Name	Building	Contents	Total	# of Claims	Average
Charles Street	$148,564	$26,731	$175,295	6	$29,216
McArthur Avenue	$1,129,916	$5,105	$1,135,021	15	$75,668
Weber Avenue	1,330,491	55,146	1385636.58	21	$65,983

The next table provides the results of a simple risk projection for repetitive loss properties. This is done by annualizing past insurance claims and using this as the basis for estimating future losses. This method employs standard FEMA statistical techniques, and may be used for developing a sense of flood risk, i.e. total future losses over the 100-year planning horizon. The results below should be considered general and preliminary. It is possible to complete more accurate risk assessments for specific projects using FEMA software and methodologies, combined with information about sites and facilities.

Table 19-13
100-Year Risk Projection for NFIP Repetitive Loss Properties in the Borough of Sayreville

Data	Value
Period in years	21
Number of claims	58
Average claims per year	2.76
Total value of claims	$4,638,284
Average value of claims per year	$220,871
Projected risk, 100-year horizon	**$3,151,825**

3.2.6 Flood Risk to Severe Repetitive Loss Properties in Sayreville

Severe Repetitive Flood Loss was also redefined in the Biggert Waters Act as properties that have "incurred flood-related damage for which four or more separate claims payments have been made under flood insurance coverage under this title, with the amount of each claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made under such coverage, with the cumulative amount of such claims exceeding the value of the insured structure." The data about Severe Repetitive Loss properties in this subsection are based on the previous definition. Under the revised definition above, Sayreville has 12 SRL properties. Table 19-14 provides basic information about the SRL properties in this jurisdiction. SRL properties are also shown graphically in Figure 19-3 above.

Table 19-14
Statistics on NFIP Severe Repetitive Loss Properties in the Borough of Sayreville
(Source: FEMA National Flood Insurance Program, February 2015)

City/County Name	Properties	Total Building	Total Contents	Total Losses	# of Claims	Average Claim
Borough of Sayreville	2	$448,482	$8,037	$456,519	7	$65,217
Middlesex County	77	$14,512,761	$910,122	$15,422,883	385	$40,059

The next table shows the results of a simple risk (future losses) projection for severe repetitive loss properties. This is done by annualizing past losses and using this as the basis for estimating future losses. This method uses standard FEMA techniques, and may be used for developing a sense of flood risk. The results below should be considered general and preliminary. It is possible to complete more accurate risk assessments for specific projects using FEMA software and methodologies.

Figure 19-15
100-Year Risk Projection for NFIP Severe Repetitive Loss Properties in the Borough of Sayreville

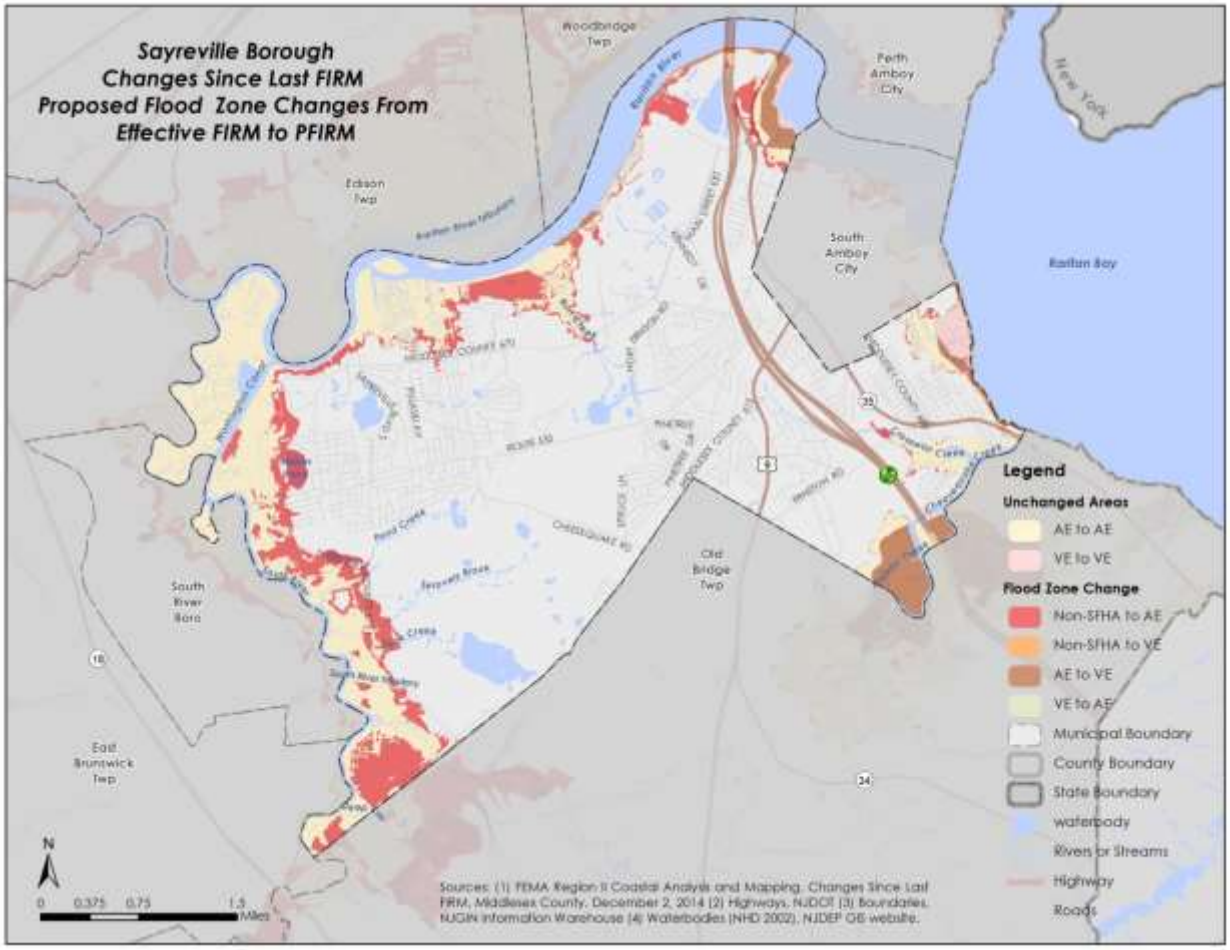
Data	Value
Period in years	21
Number of claims	7
Average claims per year	0.33
Total value of claims	$456,519
Average value of claims per year	$21,739
Projected risk, 100-year horizon	**$310,216**

3.2.7 Changes in Floodplain Boundaries

Prior to Sandy in 2012, FEMA had begun a coastal flood study to update Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) reports for portions of New York and New Jersey, including Middlesex County, using improved methods and data to better reflect coastal flood risk. Much of the

resulting information is publicly available from the FEMA Region II Coastal Analysis and Mapping website. Figure 19-4 below indicates changes in various flood zones in Carteret. The Changes Since Last FIRM (CSLF) dataset compares information shown on the preliminary FIRM with that of the effective FIRM. This includes a comparison of the floodplain boundaries and zones, Base Flood Elevation changes, and where applicable, the regulatory floodway. See the main body of the 2015 Middlesex County Plan update (Section 3.3.7) for additional information about the CSLF dataset.

Figure 19-4
Changes in Floodplain Boundaries in the City of Sayreville
(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, September 19, 2014)

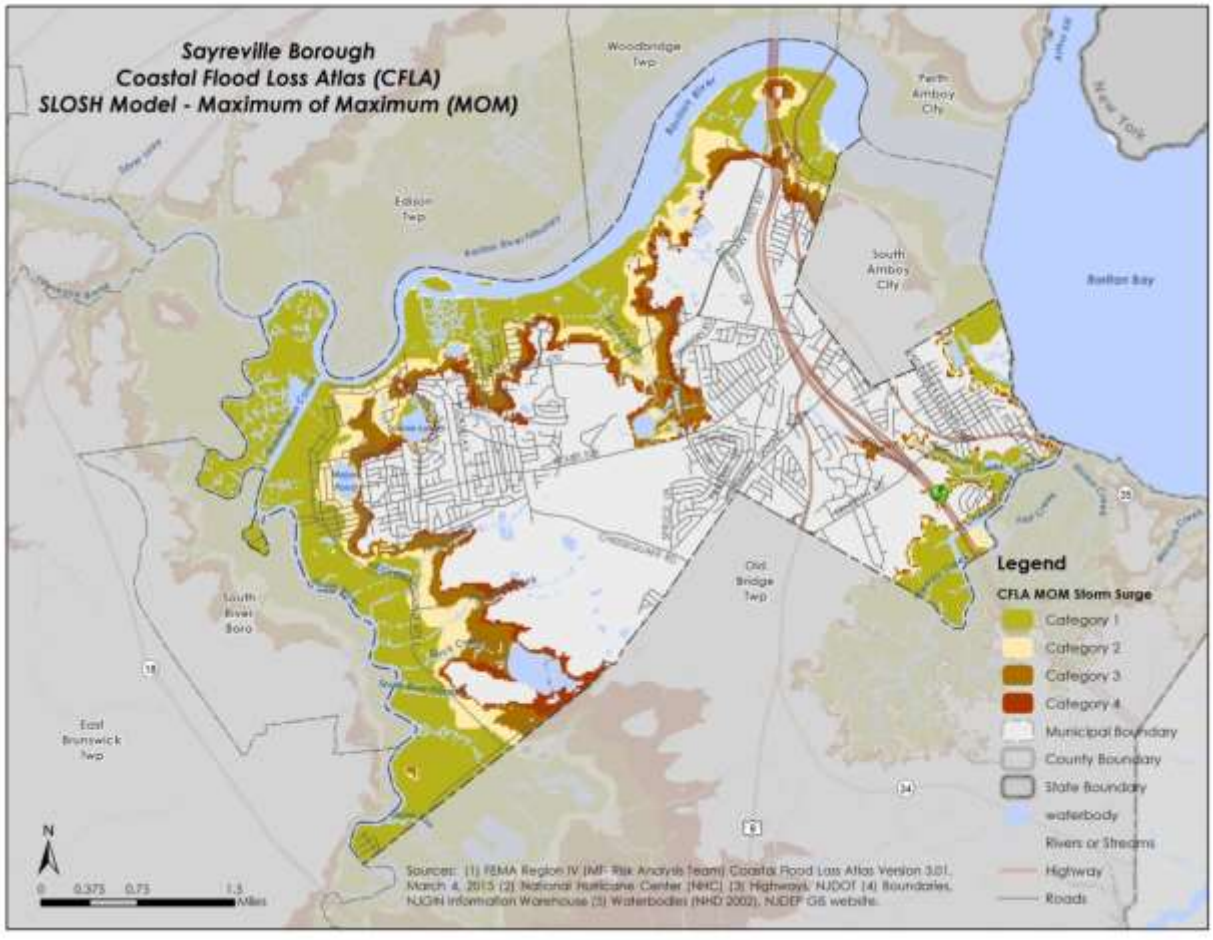


3.3 Storm Surge

Of the 25 jurisdictions in Middlesex County, 13 have some risk from storm surge. Sayreville is among these, due its exposure to overbank flooding from both the South and Raritan Rivers. It is useful to discuss statistics that are clearly related to surge. Various studies and GIS analysis provide information about the jurisdiction's exposure to various levels of storm surge.

Figure 16-5 is a map of storm surge zones 1 through 4 in Sayreville. The map is notable because of the exceptionally large areas that will be impacted by even a Category 1 event, a observation that is borne out by the flooding from Sandy, which was primarily a surge and wind event (as opposed to one with heavy rainfall). Even areas relatively far away from the Raritan River and Bay experienced serious surge effects that were not seen in Irene just a year earlier (because Irene did not create a significant surge in this area). While not nearly as wide as Category 1, surge categories 2-4 encompass significant additional streets and structures.

Figure 19-5
Map of Storm Surge Zones, Categories 1-4, Borough of Sayreville
(Source: FEMA Region IV, Coastal Flood Loss Atlas (CFLA) SLOSH – March, 2014)



SLOSH inundation zones from the FEMA Coastal Flood Loss Atlas (CFLA) were used to complete the storm surge vulnerability assessment for Sayreville. The initial analysis included calculating the land area and parcels within Categories 1 - 4 for the jurisdiction. This portion of the risk assessment approach matches the vulnerability assessment completed for the State of New Jersey 2014 Hazard Mitigation Plan. Knowing the land area within each zone can help determine the overall impact to buildings and other infrastructure in the region a result of storm surge.

Table 19-16
Storm Surge Exposure Statistics for the Borough of Sayreville
(Source: FEMA Region IV, Coastal Flood Loss Atlas (CFLA) SLOSH – March, 2014, County GIS)

Storm Surge Category	Square Miles Impacted	Parcels Exposed
1	4.82	1,443
2	6.13	2,539
3	7.24	3,660
4	7.88	4,492

There is no reliable open-source information that allows assignment of specific probabilities to surge categories, so certain assumptions must be made in order to complete a risk assessment. The next table shows the assumptions used in a simple risk calculation for storm surge.

Table 19-17
Assumptions for Storm Surge Risk Assessment, Borough of Sayreville

Data Type	Value
Structures per parcel	1
Structure replacement value/s.f.	$150
Contents replacement value/s.f.	$75
Assumed square footage of average structure	2,000

The risk assessment is then based on FEMA depth-damage functions, i.e. indications of the percentage damage at a given flood depth for structure and contents. The main section of the mitigation plan includes a detailed description of the methodology. The results are intended only to provide a general sense of potential losses.

Table 19-18
Flood Risk in Storm Surge Scenarios, Borough of Sayreville

	Category 1	Category 2	Category 3	Category 4
Assumed annual probability	2%	1%	0.5%	0.01%
Assumed flood depth (feet)	1	2	3	4
Number of parcels impacted	1,443	2,539	3,660	4,492
Scenario risk	$188,311,500	$331,339,500	$477,630,000	$586,206,000
Annual risk	$3,766,230	$3,313,395	$2,388,150	$586,206
100-year risk	$53,744,102	$47,282,147	$34,078,901	$8,365,160

3.4 Hurricanes and Tropical Storms Hazard

Based on input from the hazard ranking process, Sayreville considers hurricanes and tropical storms significant hazards, and thus there is a short discussion in the present subsection.

3.4.1 Wind Risk Estimates

There are three significant hazards related to hurricanes, tropical storms, and to a lesser extent, nor'easters. These are: floods, storm surge, and high winds. Both floods and storm surge are addressed in the flood section of the present municipal appendix, as well as the County section of the hazard mitigation plan update. This subsection provides a preliminary quantification of hurricane wind risk based that was generated by FEMA's HAZUS-MH software (version 2.1, 2014). The calculations in Table 19-19 show a range of loss categories across the top row versus "occupancy classes" on the first column. The occupancy classes are various land uses that are represented in HAZUS. The last two columns indicate the projected 50-year and 100-year risks, i.e. the total amount of damage over those planning horizons. The figures are based on annualizing losses, then discounting them to present value using the software. There is more detailed information about the calculations and County-wide results in the main section of this HMP update.

Table 19-19
Probabilistic Wind Risk in Sayreville, 50- and 100-year Planning Horizons
(Source: FEMA, HAZUS-MH version 2.1)

Occupancy Class	Total SF	Building Damages	Contents Damages	Inventory Loss	Relocation Cost	Business Income Loss	Rental Loss	Lost Wages
Residential	19,531,130	$526,605	$144,418	$0	$36,016	$81	$17,427	$192
Commercial	4,139,565	$39,805	$18,987	$764	$6,484	$3,949	$3,540	$4,289
Industrial	1,607,452	$15,525	$11,243	$1,675	$985	$198	$177	$317
Agricultural	32,538	$317	$163	$20	$49	$3	$2	$1
Religious	115,855	$1,403	$526	$0	$199	$91	$18	$215
Government	76,042	$696	$367	$0	$157	$6	$40	$591
Education	160,619	$1,537	$671	$0	$281	$59	$11	$138
Totals	**25,663,201**	**$585,888**	**$176,376**	**$2,458**	**$44,171**	**$4,388**	**$21,215**	**$5,744**

Table 19-20
Probabilistic Wind Risk in Sayreville, 50- and 100-year Planning Horizons
(Source: FEMA, HAZUS-MH version 2.1)

Occupancy Class	Total Annualized Loss	50-year Risk	100-year Risk
Residential	$724,739	$10,002,124	$10,341,301
Commercial	$77,817	$1,073,954	$1,110,372
Industrial	$30,120	$415,690	$429,786
Agricultural	$556	$7,670	$7,930
Religious	$2,453	$33,848	$34,996
Government	$1,858	$25,637	$26,506
Education	$2,697	$37,221	$38,483
Totals	**$840,239**	**$11,596,143**	**$11,989,375**

3.4.2 FEMA Project Worksheets from Tropical Storm Irene and Hurricane Sandy

Following many natural disasters, FEMA engineers and field teams complete formal assessments of damage to community assets, and document these in project worksheets (PWs). The PWs are the basis of FEMA Public Assistance grants for repairs. There are seven categories of damage, indicated by the letters A through G. These are: A – debris removal; B – emergency protective measures; C – roads and bridges; D – water control facilities; E – public buildings; F – utilities, and; G – recreational facilities/other. The categories and amounts of the PWs are listed in Table 19-20 below for Tropical Storm Irene and Hurricane Sandy. Note that in some cases there are multiple different organizations in a community that are applicants for FEMA Public Assistance. In order to simplify the table, the PW amounts for all applicants in a community are combined.

Table 19-21
FEMA Public Assistance Expenditures in Tropical Storm Irene and Hurricane Sandy, by Category
(Source: FEMA Region II, Public Assistance)

Event Name/Public Assistance Category	A	B	C	D	E	F	G	Total
Tropical Storm Irene	$43,753	$34,894	$86,291	$0	$55,886	$0	$0	$220,824
Hurricane Sandy	$2,044,877	$2,247,940	$0	$0	$71,969	$483,430	$168,922	$5,017,137
Total	$2,088,630	$2,282,834	$86,291	$0	$127,854	$483,430	$168,922	$5,237,961

3.5 Wildfire Hazards

3.5.1 Type, Location, and Extent

Compared to many other states (particularly in the west and southwest), New Jersey has a relatively low level of wildfire risk. However, the Borough of South River is one of several jurisdictions in the County that has an elevated risk of wildfire compared to most other jurisdictions. As explained in the County portion of this plan, wildfire risk is a more dynamic phenomenon than other hazards. This is because risk is created by both static conditions such as the amount of burnable vegetation and the degree of wildland-urban interface, as well as changeable factors like the weather and presence of fuel load. Any truly accurate risk assessment for this hazard must consider real-time conditions. See the Wildfire section in the main plan for more details.

3.5.2 Previous Occurrences and the Probability of Future Occurrences

Previous occurrences of the wildfire hazards at the County level are discussed in detail in the main portion of this hazard mitigation plan (see Section X-X), and for reasons of brevity are not repeated here.

3.5.3 Wildfire Impacts and Vulnerabilities to the Hazard

The present subsection considers two of the static factors as the basis for a risk discussion. The first of these is the presence of fuel hazard in the community. In this respect, Sayreville is above average among jurisdictions in Middlesex County with any wildfire risk. The community has 2.8% of the extreme fuel hazard (0.131 square miles); 16.1% of the very high fuel hazard area in the County (0.898 square miles); 13.92% of the high hazard area (0.1.66 square square miles); 0.7.97% of the moderate hazard area (2.048 square miles); and 2.98% of the low hazard area (2.53 square miles).

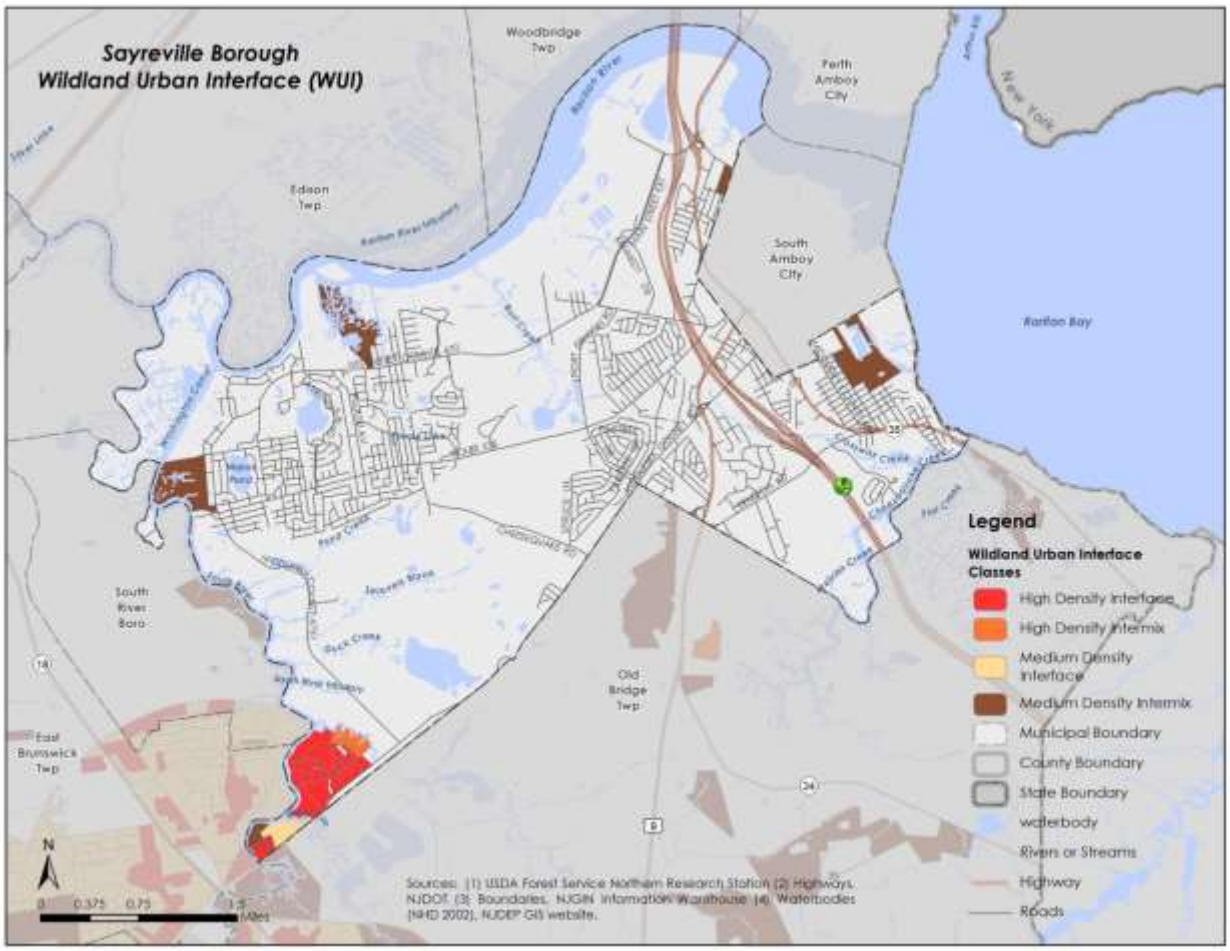
The second wildfire risk factor is the amount of wildland-urban *interface* and *intermix* in the community (see main plan for definitions). Interface areas are those where the built environment is immediately adjacent to potential wildfire fuel sources, and intermix areas are those where potential fuel sources are spread throughout. Table 19-22 shows the population and housing units that are within various interface and intermix zones, Data in the table is based on the 2010 census.

Table 19-22
Summary of Wildland-Urban Interface and Intermix Data, Borough of Sayreville

	Housing Units	Population
High-density interface	4,755	12,623
High-density intermix	195	422
Medium-density interface	2,748	8,960
Medium-density intermix	113	280

Figure 19-6 shows areas of wildland-urban intermix and interface in Sayreville. The intermix and interface areas are scattered in various parts of the jurisdiction.

Figure 19-6
Wildland-Urban Wildfire High- and Medium-Density Interface and Intermix Zones, Borough of Sayreville



Absent a more detailed evaluation of fuel loads and characteristics of the structures that are near burnable areas it is not possible to complete a quantitative risk assessment of the wildfire hazard. The areas of highest vulnerability are clearly those nearest to vegetation, but, generally speaking, fire detection and suppression capabilities are very good in this area of the country, and this significantly reduces wildfire risk.

4. Capability Assessment

Each community within the planning area has a unique set of capabilities and priorities that affect its mitigation strategy. The following tables detail the capabilities assessed for the Township of Cranbury during this plan update.

4.1.1 Planning and Regulatory

Tool / Program (code, ordinance, plan)	(Yes/No)	Code Citation and Comments
Master Plan	Y	
Capital Improvements Plan	Y	
Floodplain Management / Basin Plan	N	
Stormwater Management Plan	Y	
Open Space Plan	Y	
Stream Corridor Management Plan	N	
Watershed Management or Protection Plan	N	
Economic Development Plan	Y	
Comprehensive Emergency Management Plan	Y	
Emergency Operation Plan	Y	
Post-Disaster Recovery Plan	Y	
Transportation Plan	N	
Strategic Recovery Planning Report	Y	
Zoning Ordinance	Y	
Subdivision Ordinance	Y	
NFIP: Cumulative Substantial Damages	N	
Growth Management Ordinances	N	
Site Plan Review Requirements	Y	
Stormwater Management Ordinance	Y	
Municipal Separate Storm Sewer System (MS4)	Y	
Combined Sewer Overflows (CSO)	-	
Natural Hazard Ordinance	N	
Post-Disaster Recovery Ordinance	N	
Real Estate Disclosure Requirement	N	
Other [Special Purpose Ordinances (i.e., sensitive areas, steep slope)]	N	

4.1.2 Staff/Personnel

Resources	Is this in place? (Y/N)	Department/ Agency/Position
Planning Board	Y	
Mitigation Planning Committee	Y	
Environmental Board/Commission	Y	
Open Space Board/Committee	Y	
Economic Development Commission/Committee	Y	
Maintenance Programs to Reduce Risk	Y	
Mutual Aid Agreements	Y	
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	

Resources	Is this in place? (Y/N)	Department/ Agency/Position
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	
Planners or engineers on staff with a strong understanding of natural hazards	Y	
NFIP Floodplain Administrator	Y	
Surveyors	-	
GIS layers and maps	N	
Personnel trained in GIS	N	
Personnel trained in HAZUS	N	
Emergency Manager	Y	
Grant Writer	N	
Staff with expertise in cost/benefit analysis	N	
Professionals trained in conducting damage assessments	Y	

4.1.3 Education/Outreach and Community Classifications

Program	Do you Participate in/Use this Program (Yes/No)	Classification (if applicable)	Date Classified (if applicable)
Community Rating System (CRS)	N		
Building Code Effectiveness Grading Schedule (BCEGS)			
Public Protection (ISO Fire Protection Classes 1 to 10)	Y		
Storm Ready	-		
Firewise	N		
Disaster/Safety Programs in/for Schools	Y		
Organizations with Mitigation Focus (advocacy group, non-government)	-		
Public Education Program/Outreach (through website, social media)	Y		
Public-Private Partnerships	N		

4.1.4 Fiscal Capabilities

	Yes/No
Do you have a line item in your operating budget for mitigation project funding?	N
If no, will you look at mitigation actions when allocating funding in the future?	Y
Do you have a line item in the Capital Improvement Budget for mitigation project funding?	N
Have you provided funding for mitigation projects identified in the hazard mitigation plan?	Y
Does your town have the authority to Levy Taxes for specific purposes?	Y
Does your town have user fees for water, sewer, gas or electric service?	Y
Do you impose impact Fees for homebuyers or developers of new development/homes?	N
Does your community have an open space acquisition fund?	N
Do you use bonds to finance projects (general obligation bonds, special tax bonds, private activity bonds)	Y

5. Mitigation Strategy

This section describes what projects, initiatives, and other actions the Borough has undertaken or plans to implement to reduce risk and loss within its jurisdiction. This includes the status of previously identified actions and any other projects that have been completed since the 2010 Plan was adopted. The additional actions were determined by the LPC based on self-determined priorities and experience.

5.1 Past Mitigation Actions

The table below lists the mitigation projects and actions that were included in the original 2010 Plan.

Mitigation Action	Responsible Party	Status
Backup power (generator) and/or utility protective measures at Palaske Ave Water Tower for Communications Equipment	Municipal OEM	Not completed due to lack of funding
Backup power (generator) and/or utility protective measures at Bordentown Ave Water Tower for Communications Equipment	Municipal OEM	Not completed due to lack of funding
Evacuation Exercise for Sayreville Twp	Municipal OEM	Completed
Acquisition/elevation of 1 Repetitive Loss Property on 6th Street.	Municipal Engineering Department	completed

5.2 Other Mitigation Activities

In addition to the acquisition of the single repetitive loss property listed above, there have been 153 acquisitions to date within the Borough through the NJDEP Blue Acres program. There will another 30-50 acquisitions dependent on homeowner interest. As indicated below, the Borough will continue to strongly support the acquisitions of repetitive loss properties and properties that are highly vulnerable to storm surge and flood events.

The Borough is also working to improve the resiliency of its pump stations. One pump station is currently being elevated to 1-foot above freeboard and the Borough has actions below to address the remaining pump stations.

The Borough recently upgraded the generator for the Police Station and the EOC to maintain Emergency Operations during a hazard event. The Borough has also worked to make sure the firehouses, first aid squads, designated shelters, and other critical facilities have back-up power supplies.

5.3 Proposed Mitigation Actions

The table below details the mitigation initiatives the Borough of Sayreville would like to pursue to minimize future effects of hazard events. These actions have been determined through a local assessment of current risk and needs. The LPC met with the Plan Consultant to review all hazard and risk assessment data and evaluate the strategy. These initiatives are dependent upon funding and may change based on municipal priorities and future hazard events.

For each new mitigation action, the Borough has ranked as 'High', 'Medium', or 'Low', based on the evaluation criteria outlined in Section 5.

Proposed Action	Anticipated Benefits	Responsible Party	Funding or Implementation Mechanism	Timeline	Priority
Acquire or elevate repetitive loss properties	Reduction in property loss from flooding	Construction Department/NDJEP /County	Grants	1-3 years	M
Raise all pump stations	Continuity in service throughout storm events	OEM/Public Works	Capital Funds/Grants	1-5 years	H
Generator for Borough Hall	Continuity of operation for critical municipal services	OEM	Grants	1-5 years	L
Investigate options and feasibility for Regional Shelter	Provide sheltering services for 1,500 residents	OEM	Staff time	1-3 years	M
Upgrade EOC facilities and communication equipment	Provide space for Emergency Response staff for long-term response needs. Improve capacity for communication in all emergency events.	OEM	Grants/Capital	1-5 years	H

Upgrade back-up EOC to store Emergency Management equipment and vehicles, as well as serve as a training facility for Emergency Response.	Protect critical emergency response equipment and vehicles, while increasing capabilities for trainings.	OEM	Grants	2-5 years	H
Investigate possibility of creating a levee/public access flood protection project along South River	Improve public access to the South River while creating flood protection for existing properties.	Administration	Staff Time	2-5 years	L
Purchase boats for rescue/preventative maintenance.	Increased capacity to respond to emergency needs and improve channel maintenance capabilities.	OEM	Grants	1-3 years	M
Pursue CRS application	Reduction in flood insurance premiums for residents and businesses	Administration/County Planning Department	Staff Time/County Support	1-3 years	M

6. Plan Implementation

The LPC shall document, as needed and appropriate:

- Hazard events and losses in Sayreville and the effects that mitigation actions have had on impacts and losses,
- Progress on the implementation of mitigation actions, including efforts to obtain outside funding for projects,
- Any obstacles or impediments to the implementation of actions,
- Additional mitigation actions believed to be appropriate and feasible,
- All public and stakeholder input and comment on the Plan that has been received by the Borough.
- Copies of any grant applications filed on behalf of the Borough

Continued Public Input

The Borough of Sayreville is committed to incorporating public input into its ongoing hazard mitigation planning. The public will have an opportunity to comment on the Plan prior to any changes and during the 5-year plan update. The annual progress reports will be posted on the County mitigation website in addition to the adopted Plan.

All public comments and input on the plan will be recorded and addressed, as appropriate. Opportunity to comment on the plan will be provided directly through the County's website. Public comments can also be submitted in writing to the County's HMP Coordinator. All public comments shall be addressed to: Middlesex County Office of Emergency Management c/o All Hazards Pre-disaster Mitigation Plan Coordinator, 1001 Fire Academy Drive, Sayreville, NJ 08872.

The Borough of Sayreville's LPC shall ensure that:

- Copies of the latest approved Plan are available for review at Borough Hall along with instructions to facilitate public input and comment on the Plan.
- Public notices are made as appropriate to inform the public of the availability of the Plan, particularly during Plan update cycles.
- For minor changes to this appendix, the Borough of Sayreville will post a notice on the Borough's website and invite the public to review and comment.
- For major changes involving Borough Council approval, the Borough will use its standard public notice procedures inviting the public to review the document and provide feedback.

Plan Adoption

On [insert date] Middlesex County submitted the initial draft of the 2015 Plan Update to NJOEM for review and comment. After addressing NJOEM comments in the document, the HMP was resubmitted

for final consideration and approval by NJOEM and FEMA. FEMA approved the plan on [insert date], and the Plan update was forwarded to the Middlesex County Board of Chosen Freeholders for adoption, which occurred on [insert date].

The Borough Council approved the plan on [insert date]. The Borough resolution for adoption is provided below, the County's adoption resolution is provided as Appendix F of the 2014 HMP update. Following adoption, the plan update was resubmitted to FEMA for final approval, which occurred on [insert date]. The FEMA approval letter is included as Appendix G.

Plan Maintenance

The Borough of Sayreville will review this Appendix of the County's hazard mitigation plan appendix each year and give the County's HMP Coordinator an annual progress report. The OEM Coordinator is responsible for convening the LPC, initiating the plan review, and submitting the annual progress report. The LPC may use worksheets #1 and #3 in the FEMA 386-4 guidance document, to facilitate the review and progress report. FEMA guidance worksheets are provided in Appendix H. Local progress reports shall be provided to the County HMP Coordinator at least two weeks prior to the annual plan review meeting.

Additionally, the LPC will convene and review the plan when major hazard events impact the jurisdiction, potentially yielding opportunities for mitigation grant funding, or when new information suggests that plan elements do not accurately reflect the community's risk or its mitigation priorities.

If necessary, the OEM Coordinator will convene a meeting of the LPC to review and approve all changes. The Borough retains the discretion to implement minor changes to the document without formal procedures involving the Borough Council subject to local policies and regulations.

In addition to the annual progress report, the Borough of Sayreville will provide Middlesex County with a copy of the written notice of any changes to the jurisdictional appendix at the time such changes are implemented.