



Section 4 Vulnerability Assessment and Loss Estimation

Contents of this Section

- 4.1 Interim Final Rule Requirements for Risk Assessments
- 4.2 Background and General Discussion of Vulnerability Assessment and Loss Estimation
- 4.3 Methodology for Identifying the most Significant Natural Hazards Statewide
- 4.4 Statewide Hazard Profiles
- 4.5 Vulnerability Assessment and Loss Estimation
- 4.6 Jurisdictions most Threatened, and most Vulnerable to Damage and Loss
- 4.7 Vulnerabilities of State Owned and Operated Facilities
- 4.8 Incorporation of Risk and Vulnerability Data from Local and Regional Hazard Mitigation Plans

Section 4.1 Interim Final Rule Requirements for Vulnerability Assessments and Loss Estimation

4.1.1 Interim Final Rule for Risk Assessments

The Interim Final Rule (IFR) Subsection (201.4 (c) (2)) requires that a State Hazard Mitigation Plan include: “Risk Assessments that provide the factual basis for activities proposed in the strategy portion of the mitigation plan. Statewide risk assessments must characterize and analyze natural hazards and risks to provide a statewide overview. This overview will allow the State to compare potential losses throughout the State and to determine their priorities for implementing mitigation measures under the strategy, and to prioritize jurisdictions for receiving technical and financial support in developing more detailed local risk and vulnerability assessments. The risk assessment shall include the following:

- (i) An overview of the type and location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate.
- (ii) An overview and analysis of the State’s vulnerability to the hazards described in paragraph (c) (2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned critical or operated facilities located in the identified hazard areas shall also be addressed.
- (iii) An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure and critical facilities located in the identified hazard areas.”

The IFR Subsection (201.4 (d)) states: “Review and Updates. Plan must be reviewed and revised to reflect changes in development...”



Section 4.2 Background and General Discussion of Vulnerability Assessment and Loss Estimation

General Discussion of Vulnerability and Risk

Prior to reading the following sections about Statewide risk, it is important to understand the meanings of several terms that appear in both the Federal hazard mitigation planning rules and throughout this plan. The terms *risk* and *vulnerability* appear many times in both places, and the terms are defined below and given some context in terms of this plan.

Definition of Risk

In the context of hazard mitigation planning, *risk* is analogous to *loss estimation*, and is defined as the expected future losses to a community, business or State from the effects of natural events. The concept has several other concepts embedded in it. These are described below.

Probability is the likelihood that events will occur. The ability of scientists and engineers to calculate probability varies considerably depending on the hazard in question. In many areas of the country, flood studies provide reasonably accurate estimates of how often water will reach particular places and elevations. On the other hand, tornados and earthquakes are nearly impossible to predict, except over very long periods of time and large areas. Probability is a key element of risk because it determines how often the events are likely to happen.

It is important to note that risk is cumulative. This means that although natural hazards may not affect a place in any particular year, the probability of one or more events (in some places multiple events) occurring "adds up" over time. Risk calculations incorporate all expected future events – usually with some limit on the time horizon that is considered – in order to account for both repetitive events and for the probabilities that accumulate over time. For example, although earthquakes are infrequent in most places, there is some possibility of an earthquake occurring in any year. Therefore, the possibility of an earthquake occurrence increases over time.

Severity is the measure of "how bad" a hazard event is. Severity is measured in various ways, depending on the hazard. For example, floods can be measured in terms of depth, velocity, duration, contamination potential, debris flow, and so forth. Tornados are measured primarily in terms of wind speed, although their duration on the ground can also be an important factor in their destructiveness.

Vulnerability is the extent to which something is damaged by a hazard. Vulnerability is very often measured using "damage functions." These are based on studies of how buildings perform when they are exposed to hazards. Similar functions are available for infrastructure and other physical assets. Injury and mortality functions (how many people are injured or die during events) are also sometimes used as indicators of vulnerability, but these are generally not as reliable as functions for physical assets because there are many more variables.

Value is how much it would cost to replace an asset that may be damaged or lost due to the impact of a natural hazard. There are many sources of this information, including standard cost-estimating guides, experience of local officials, and statistical studies.



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

Risk is expressed in dollars of future expected losses. It is calculated in this way so that different kinds of losses can be adequately compared. For example, without a common basis for comparison, it would be virtually impossible to determine if the risk of injury from future earthquakes is greater than damage to vehicles in future floods. When the expected losses are converted to and expressed in dollars, the damages can be compared and prioritized. In combination with the concepts discussed above, almost any kind of hazard can be quantified and its risk expressed. The exceptions to this idea are *infrequent* or *highly unpredictable* events such as meteors impacting the earth, or manmade hazards such as terrorism. In the cases, the element of probability is virtually impossible to characterize, and the risk calculus cannot be accurate without it.

Risk calculations often start with an annualized (yearly) loss figure, which is then projected into the future for some pre-determined period of time, then *discounted* to today's value using a discount rate. This is a standard economic methodology that is required by the Federal government for analyses of many of its programs, including FEMA's mitigation initiatives. Those who are interested can read more about the required methodology, which is described in Office of Management and Budget (OMB) Circular No. A-94.

The risk calculation techniques that were used as the basis for this plan are carefully described in the sections that follow, and conform to standard methodologies that FEMA and other Federal agencies have been using for many years. As required by OMB, a discount rate of 7 percent is used in all calculations unless otherwise specified. The sections in the plan dealing with specific mitigation activities sometimes use other time horizons, and these are noted in text.



Section 4.3 Methodology for Identifying the most Significant Statewide Natural Hazards

Although the Interim Final Rule (Appendix B) requires that all natural hazards affecting the State must be included in a detailed overview, it is not practical or necessary to perform detailed risk assessments on all these hazards. This is because many of the hazards have little probability of affecting the State in any significant way. Because of this, the Mitigation Core Team, the State Hazard Mitigation Team and FEMA Region II determined that it would be desirable to reduce the initial list of 12 hazards to those that have the most potential for damaging the State or its citizens in the future. In order to reduce the overall number of hazards that will be afforded detailed more detailed risk assessments, NJOEM used a qualitative system to rank the overall list of natural hazards in seven subject areas:

1. **Potential deaths**
2. **Potential injuries**
3. **Degree to which critical facilities are likely to be affected**
4. **Degree to which lifelines are likely to be affected**
5. **Potential property damage**
6. **Potential environmental impact**
7. **Potential economic and social impact**
8. **Likelihood of occurrence**

This ranking was completed by the MCT at its February 5, 2008 meeting. The minutes of the meeting are in Appendix F.



State of New Jersey
 2007 State Hazard Mitigation Plan
 Section 4 Vulnerability Assessment and Loss Estimation

Table 4-3.1
State of New Jersey Qualitative Hazard Ranking Subject Areas and Ranking Criteria

↓ Subject Area	Rating →	Very Low	Low	High	Very High
Potential deaths		0-4	4-10	10-50	50+
Potential injuries		0-4	4-50	50-2,000	2,000
Potential impacts on critical facilities		Temporary relocation	Closed a few days	Loss of 50% capacity	Long disruption
Potential impacts on lifelines		Temporary interruption	Multi-day interruption	Week interruption	Long-term interruption
Potential property damage		Minimal	Localized	Localized, severe	Widespread, severe
Potential environmental impact		Minimal	Localized	Localized, severe	Widespread, severe
Potential economic and social impacts		Temporary	Temporary/widespread	Extended, widespread	Long-term disruption
Likelihood of occurrence		200-300 years	100-200 years	30-100 years	1-30 years [see note]
Score		1	2	3	4-6 [see note]

Note: 10-30 year likelihood receives a score of 4; 3-10 years score is 5; 1-3 years is 6.



State of New Jersey
 2007 State Hazard Mitigation Plan
 Section 4 Vulnerability Assessment and Loss Estimation

Table 4-3.2
State of New Jersey Qualitative Hazard Ranking

Hazard ↓	Criterion →	Deaths	Injuries	Critical Facility	Lifelines	Property Damage	Environ Impacts	Econ Impacts	Likelihood	Total
Flooding		2	2	2	2	3	3	3	6	23
Hurricanes (wind)		2	3	3	3	3	2	4	3	23
Nor'easters		2	2	2	2	2	2	2	4	18
Winter storms		1	2	2	3	2	1	2	5	18
High Winds and Tornadoes		1	2	2	2	2	2	1	4	16
Earthquakes		2	3	2	2	3	1	2	1	16
Drought		1	1	1	1	2	2	2	3	13
Wildfire		1	2	1	1	2	2	2	2	13
Geological Hazards*		1	2	1	2	1	1	1	2	11
Hail		1	1	1	1	2	1	1	3	11
Extreme Temperatures		1	2	1	1	1	1	1	2	10

*Includes landslides, abandoned mines, sinkholes, and subsidence

This classification process was presented to the State Hazard Mitigation Team during its general meeting on January 15, 2008. Note that for the 2007 update, hurricane hazards were divided into wind and flooding, and merged into those categories in the risk assessment. For simplicity, hurricanes remain as a discreet hazard in this table, but they are treated as wind and flood hazards in other sections of the plan. The data in this table is intended only to give a general sense of the significance of hazards in the State, relative to each other.



Section 4.4 Statewide Hazard Profiles



Section 4.5 Vulnerability Assessment and Loss Estimation

4.5.1 Introduction

As described in the FEMA IFR for State-level hazard mitigation planning, loss estimation forms the basis of a rational decision-making process for mitigation actions:

“Risk Assessments [that] provide the factual basis for activities proposed in the strategy portion of the mitigation plan. Statewide risk assessments must characterize and analyze natural hazards and risks to provide a Statewide overview. This overview will allow the State to compare potential losses throughout the State and to determine their priorities for implementing mitigation measures under the strategy, and to prioritize jurisdictions for receiving technical and financial support in developing more detailed local risk and vulnerability assessments. The risk assessment shall include the following...”

- (iii) An overview and analysis of potential losses to the identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure and critical facilities located in the identified hazard areas.

This section of the Plan focuses on hazard vulnerabilities in the State of New Jersey, and provides a detailed calculation of potential future flood losses (risk). Required information about other specific hazards are found in Subsection 4.4, and some of these include risk calculations as well as profiles.

As noted earlier, the FEMA Interim Final Rule (IFR) related to State hazard mitigation planning draws a distinction between vulnerability and loss estimation (risk). In fact, most standard definitions of risk incorporate vulnerability as a component in risk calculation. The present subsection of the 2008 New Jersey Hazard Mitigation Plan (HMP) maintains the distinction established in the IFR. In the following subsection, the Plan establishes several measures of vulnerability and uses analysis of best available data to describe vulnerabilities on both the Statewide and County levels. This subsection also includes a detailed examination of flood risk for jurisdictions across New Jersey.

4.5.2 Definitions of Vulnerability and Loss Estimation

Vulnerability

Vulnerability assessments are most often done on a site-by-site (or asset-by-asset) basis because almost all buildings, people and operations have some specific qualities that determine how much they will be damaged when hazards affect them. However, such highly specific vulnerability assessments are well outside the purview of a State Hazard Mitigation Plan. Nevertheless, there are some very effective methods for characterizing Statewide vulnerabilities. In addition to forming the basis of the State risk assessment, the results of studies such as these can be used to inform local and regional planning efforts, and to help the State set mitigation priorities.



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

In the context of natural hazards, vulnerability is generally defined as the degree to which something is damaged at a given level of exposure to a hazard. For example, there is a robust body of knowledge about the amount of damage that buildings will experience at different levels of flooding. There are many ways to measure or estimate vulnerabilities. These methods vary by the kinds of assets and the specific natural hazard that are being assessed. As discussed in Section 4.2, vulnerability is one of three essential parts of a risk assessment, the other two elements being value and the probability and severity of hazard impacts. Section 4.2 also discussed the three general categories of risk:

- Direct physical losses to structures, infrastructure, contents of buildings, etc.
- Injuries and deaths
- Loss of function, i.e. interruption or cessation of business or government operations

These categories are well established in FEMA rules and guidance, which are in turn based on other federal directives, such as the Interim Final Rule (discussed at length elsewhere in this Plan) and the President's Office of Management and Budget (OMB) Circular No. A-94, which describes how most federal agencies are supposed to conduct analyses of the effectiveness of their programs and activities.

It is worth noting that there is a natural increase in uncertainty in vulnerability determinations as the scale of the analysis increases, so information in this subsection should be considered only a general indicator. Most information about the effects of natural hazards on the built environment is compiled on a County basis, which makes it readily adaptable to a State mitigation plan.

While vulnerability information about specific facilities (buildings, for example), would typically include a wide range of very specific data, State-level vulnerability determinations rely on more general indicators such as:

- Population, and concentrations of population
- The value of assets that may be exposed to hazards
- Records of damages to public facilities (including where they occurred)
- Percentage of Counties and States in flood zones

Although proximity to known hazard areas is often considered a measure of vulnerability, in fact location is a determinant of probability of impact (and severity), not vulnerability, so this factor is not discussed in the present section of the HMP.

Loss Estimation (Risk Assessment)

For the purposes of this Hazard Mitigation Plan, Loss Estimation is the same as Risk Assessment. Risk is defined as *expected future losses* expressed in monetary terms. There are several well-established methods for calculating risk, and the choice of methods is generally determined by the scale of the assessment (i.e. Statewide versus a single site) and the kind of data that is available. The methodologies used in these risk assessments are explained in the individual sections below. Risk is generally limited to three categories:

- Direct physical damages to assets and contents
- Injuries and casualties
- Interruptions or loss of functions



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

Loss estimations are included in the hazard profiles in Subsection 4.4. In accordance with the requirements described in OMB Circular No. A-94 (which describes how most federal agencies should determine the benefits of their programs and activities), all the calculations use a 7% discount rate, and limit the results to those that can legitimately be counted as “benefits” in program assessments. It should be noted that the accuracy of these risk assessments is entirely dependent on the quality of data that is available to conduct them.

4.5.3 General Indicators of Vulnerability

4.5.3.1 Population Demographics and Location

New Jersey has over 8.4 million residents in its 12,535 square mile area, making it the most densely populated State in the nation. This figure represents an increase of nearly nine percent from the 1990 census. The oceanfront counties of Monmouth, Ocean, Atlantic and Cape May have a permanent population of over 1.3 million, while the Delaware Bay shore counties of Cumberland and Salem have a permanent population of over 200,000. In addition, the areas affected by riverine flooding, including Bergen, Essex, Hudson, Mercer, Middlesex, Somerset and Union counties have a permanent population of almost 3.8 million people.

As noted earlier, in many cases population and population density offer insight into vulnerabilities, particularly where populations are concentrated in areas that are subject to natural hazards. Table 4.5-1 below is from the 2005 version of the New Jersey Hazard Mitigation Plan, and shows

Table 4.5-1
New Jersey Population Projections by County
(from 2005 version of State Hazard Mitigation Plan)

County	Census on April 1,		NJDOJ Projections to July 1,			MPO Projections			
	1990	2000	2005	2015	2020	2005 Forecast	2015 Forecast	2020 Forecast	2025 Forecast
Bergen	825,380	884,118	904,900	948,000	975,500	896,181	923,745	937,051	950,844
Hudson	553,099	608,975	624,100	678,400	700,200	629,951	688,258	704,007	733,161
Passaic	453,302	489,049	504,500	532,700	551,300	501,305	519,511	526,785	533,371
Sussex	130,943	144,166	151,400	166,500	176,700	148,537	162,130	164,760	171,103
Essex	777,964	793,633	811,700	868,900	896,200	805,291	834,165	844,099	858,741
Morris	421,361	470,212	488,900	523,300	540,800	481,289	513,196	529,781	542,886
Union	493,819	522,541	536,200	563,300	579,800	527,115	534,745	538,459	542,512
Warren	91,607	102,437	110,000	121,600	128,300	106,819	119,055	125,873	130,257
Hunterdon	107,802	121,989	128,200	140,500	147,700	129,173	148,125	158,736	167,449
Middlesex	671,811	750,162	793,700	869,200	910,600	779,191	844,329	859,268	894,402
Somerset	240,245	297,490	319,700	361,000	384,600	308,283	341,393	363,364	376,053
Mercer	325,824	350,761	363,400	380,200	395,700	362,090	385,530	395,970	404,850
Monmouth	553,093	615,301	643,200	691,000	719,400	657,072	687,320	703,494	731,557
Ocean	433,203	510,916	551,700	633,000	677,000	527,010	558,961	574,279	590,081



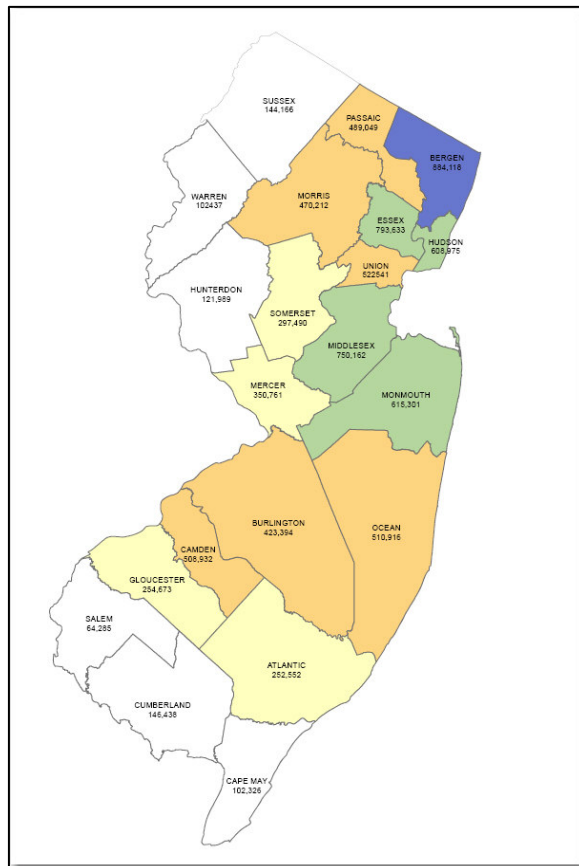
State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

County	Census on April 1,		NJDOJ Projections to July 1,			MPO Projections			
	1990	2000	2005	2015	2020	2005 Forecast	2015 Forecast	2020 Forecast	2025 Forecast
Burlington	395,066	423,394	446,100	481,100	505,700	438,780	476,550	496,490	513,450
Camden	502,824	508,932	515,000	536,400	550,500	511,770	512,790	514,760	513,530
Gloucester	230,082	254,673	267,800	292,300	309,500	265,500	292,940	308,330	322,520
Atlantic	224,327	252,552	263,500	286,300	296,700	266,316	295,766	311,451	330,367
Cape May	95,089	102,326	103,200	104,900	107,500	106,518	114,863	119,019	123,066
Cumberland	138,053	146,438	149,600	155,700	159,200	152,276	167,453	174,479	181,481
Salem	65,294	64,285	64,900	66,400	67,700	64,446	66,435	67,271	67,500
Statewide	7,730,188	8,414,700	8,4741,700	9,400,700	9,780,600	8,664,913	9,817,258	9,417,726	9,679,180

Sources: New Jersey Department of Labor 2003; North Jersey Transportation Authority for Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union and Warren Counties 2003; South Jersey Transportation Organization for Atlantic, Cape May, Cumberland, and Salem Counties 2003; Delaware Valley Regional Planning Commission for Burlington, Camden, Gloucester and Mercer Counties 2003

Figure 4.5-1 shows the population of all Counties in the State of New Jersey. Population is a relatively reliable and straightforward proxy for vulnerability because the presence of large numbers of people by itself creates risk from injuries and deaths, and also implies the presence of manmade assets and operations, the exposure of which to hazards creates risk.

**Figure 4.5-1
Graphical Depiction
of County Population,
State of New Jersey**





State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

4.5.3.2 Value and Exposure of Assets (Structures) and Contents Statewide

As noted earlier, ignoring variations in exposure to hazards, a key measure of vulnerability is simply the value of various assets Statewide. Although this metric does not directly quantify vulnerability, it is nevertheless a key component in any risk calculation, as a general indicator of potential loss. Data in the next table (4.5.2) shows the total value of structural and contents assets for all counties in New Jersey, ordered by total value. This information was extracted from HAZUS (Hazards U.S., the FEMA risk assessment software). Local or regional planners can obtain this information through NJOEM in spreadsheet form. In a full risk calculation, HAZUS uses this information in combination with other data (such as damage functions, probabilities, etc.) to determine the amount of damage that can be expected under various hazard scenarios. Although it is not used in that manner in the present section, the values of structures and assets is a very general proxy for vulnerability on a County level.



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

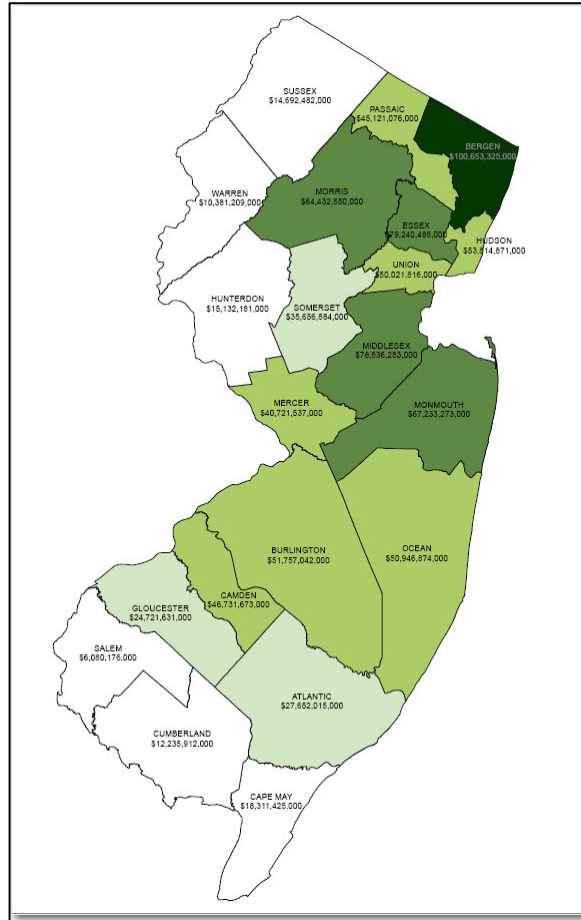
Table 4.5-2
Exposure (value) of Assets and Contents in New Jersey by Land Use Type, Sorted by Total Value
(Source: FEMA HAZUS) [ref: NJMHP2 structure exposure_HAZUS data sorted_122607_with sum]

County	Residential	Commercial	Industrial	Agriculture	Education	Government	Religious	Total
Bergen	\$71,286,615,000	\$20,729,149,000	\$6,349,758,000	\$128,554,000	\$1,013,166,000	\$343,583,000	\$802,500,000	\$100,653,325,000
Middlesex	\$56,158,892,000	\$15,473,435,000	\$5,333,036,000	\$106,606,000	\$1,024,059,000	\$320,120,000	\$824,337,000	\$79,240,485,000
Essex	\$55,926,456,000	\$15,341,625,000	\$5,437,665,000	\$106,606,000	\$906,746,000	\$292,848,000	\$824,337,000	\$78,836,283,000
Morris	\$51,139,977,000	\$11,857,457,000	\$2,818,921,000	\$201,415,000	\$454,813,000	\$206,510,000	\$554,180,000	\$67,233,273,000
Monmouth	\$48,570,222,000	\$11,266,338,000	\$3,214,894,000	\$195,557,000	\$455,704,000	\$201,208,000	\$528,627,000	\$64,432,550,000
Hudson	\$36,072,515,000	\$14,087,688,000	\$2,445,376,000	\$13,892,000	\$497,565,000	\$79,195,000	\$618,640,000	\$53,814,871,000
Union	\$36,239,637,000	\$11,707,425,000	\$2,372,047,000	\$609,120,000	\$250,395,000	\$123,210,000	\$455,208,000	\$51,757,042,000
Burlington	\$37,789,825,000	\$10,457,448,000	\$1,371,565,000	\$603,173,000	\$243,119,000	\$101,950,000	\$379,794,000	\$50,946,874,000
Camden	\$37,720,752,000	\$8,689,025,000	\$2,585,581,000	\$63,443,000	\$344,167,000	\$120,087,000	\$498,761,000	\$50,021,816,000
Ocean	\$37,589,243,000	\$6,806,591,000	\$1,438,328,000	\$51,638,000	\$340,608,000	\$107,471,000	\$397,794,000	\$46,731,673,000
Passaic	\$32,290,303,000	\$8,432,506,000	\$3,306,420,000	\$51,096,000	\$289,718,000	\$234,331,000	\$516,702,000	\$45,121,076,000
Mercer	\$28,489,113,000	\$7,015,330,000	\$1,328,580,000	\$50,726,000	\$2,925,936,000	\$422,792,000	\$489,060,000	\$40,721,537,000
Somerset	\$26,535,205,000	\$6,278,643,000	\$1,959,663,000	\$69,474,000	\$402,613,000	\$111,328,000	\$299,958,000	\$35,656,884,000
Atlantic	\$21,246,799,000	\$4,773,038,000	\$617,441,000	\$49,260,000	\$511,721,000	\$196,074,000	\$257,682,000	\$27,652,015,000
Gloucester	\$18,857,500,000	\$3,497,256,000	\$1,761,208,000	\$80,902,000	\$235,982,000	\$56,173,000	\$232,610,000	\$24,721,631,000
Cape May	\$15,830,334,000	\$2,019,397,000	\$168,963,000	\$20,324,000	\$68,484,000	\$41,701,000	\$162,222,000	\$18,311,425,000
Sussex	\$11,892,557,000	\$2,132,672,000	\$705,032,000	\$65,582,000	\$142,649,000	\$40,635,000	\$153,054,000	\$15,132,181,000
Hunterdon	\$11,560,317,000	\$2,124,176,000	\$597,985,000	\$65,582,000	\$151,716,000	\$39,652,000	\$153,054,000	\$14,692,482,000
Cumberland	\$9,248,998,000	\$1,801,904,000	\$831,467,000	\$50,728,000	\$86,029,000	\$57,162,000	\$159,624,000	\$12,235,912,000
Warren	\$8,167,150,000	\$1,499,989,000	\$366,838,000	\$42,054,000	\$182,016,000	\$23,010,000	\$100,152,000	\$10,381,209,000
Salem	\$4,672,675,000	\$887,637,000	\$303,289,000	\$28,204,000	\$51,606,000	\$28,537,000	\$108,228,000	\$6,080,176,000
Total	\$657,285,085,000	\$166,878,729,000	\$45,314,057,000	\$2,653,936,000	\$10,578,812,000	\$3,147,577,000	\$8,516,524,000	\$894,374,720,000



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

Figure 4.5-2
Total Value of Assets in New Jersey Counties



4.5.3.3 FEMA Public Assistance Program Project Worksheets

The third method for conducting a general assessment of vulnerabilities at the State level is to analyze FEMA Public Assistance (PA) Program Project Worksheets (PWs). Following Presidentially-declared disasters, FEMA engineers visit damage sites and prepare reports (PWs) that describe the damages and estimate the costs to repair them. The PWs are the first step in the process of applicants receiving FEMA grant funds for repairs. The PWs are entered into a database with key information parameters, such as date of loss, amount of loss, how much insurance was paid, etc. The database is a good source of information about damages to public facilities throughout the State.

As part of the 2008 Plan update, the State of New Jersey contacted FEMA Region II and requested PW records. The Region provided detailed records for the six most recent Presidentially-declared disasters. These are summarized in Table 4.5-3 below. Appendix D includes detailed descriptions of these events.



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

Table 4.5-3
Summary of Recent Presidentially-declared Disasters in New Jersey
(six recent disasters for which data was provided by FEMA Region II)

FEMA Disaster #	Disaster Date	# Counties	Type of Disaster
DR-1295	09/18/1999	9	Hurricane Floyd
DR-1337	08/17/2000	2	Severe storms, flooding and mudslides
DR-1530	07/16/2004	2	Severe storms and Flooding
DR-1563	10/01/2004	4	Tropical Depression Ivan
DR-1653	07/07/2006	3	Severe storms and Flooding
DR-1694	04/26/2007	12	Severe storms and Flooding

Table 4.5-4 summarizes the project worksheet data from these six disasters. Appendix P includes summary spreadsheets on each of these six disasters, showing the data underlying this summary. Note that in performing the analysis, NJOEM included what were presumed to be insurance payments to the applicants that would normally be deducted from PW amounts under duplication of benefits rules applied by FEMA. In this case these amounts are included because they reflect total losses regardless of who paid them. This is considered a more accurate figure than the FEMA PWs alone.

Table 4.5-4
Losses by New Jersey County from Recent Presidentially-Declared Disasters,
all FEMA Public Assistance Categories, ordered by Amount of Loss
(Source: FEMA Region II, September 2007)

County	DR-1295	DR-1337	DR- 1530	DR-1563	DR-1653	DR-1694	Total
Bergen	\$15,886,075	\$0	\$0	\$0	\$0	\$4,902,608	\$20,788,683
Somerset	\$12,556,858	\$28,383	\$0	\$0	\$0	\$2,211,389	\$14,796,630
Union	\$8,629,782	\$0	\$0	\$0	\$0	\$1,377,291	\$10,007,073
Essex	\$5,228,770	\$0	\$0	\$0	\$0	\$1,877,623	\$7,106,393
Sussex	\$102,213	\$6,018,541	\$0	\$167,252	\$13,451	\$478,339	\$6,779,796
Passaic	\$3,754,788	\$0	\$0	\$0	\$0	\$2,048,494	\$5,803,282
Burlington	\$0	\$0	\$4,140,560	\$0	\$0	\$1,090,170	\$5,230,730
Middlesex	\$2,383,231	\$0	\$0	\$0	\$0	\$2,431,601	\$4,814,832
Warren	\$158,978	\$0	\$0	\$2,981,911	\$213,099	\$161,839	\$3,515,827
Morris	\$2,074,306	\$640,050	\$0	\$0	\$0	\$0	\$2,714,356
Mercer	\$701,307	\$0	\$0	\$358,633	\$788,499	\$557,387	\$2,405,826
Hunterdon	\$1,619,290	\$0	\$0	\$322,836	\$266,573	\$0	\$2,208,699
Camden	\$0	\$0	\$369,476	\$0	\$0	\$953,235	\$1,322,711
Hudson	\$20,877	\$0	\$0	\$0	\$0	\$642,157	\$663,034
Gloucester	\$0	\$0	\$179,795	\$0	\$0	\$249,584	\$429,379
Atlantic	\$0	\$0	\$0	\$0	\$0	\$292,703	\$292,703
Monmouth	\$0	\$0	\$0	\$0	\$0	\$1,875	\$1,875
Total	\$53,116,475	\$6,686,974	\$4,689,831	\$3,830,632	\$1,281,622	\$19,276,295	\$88,881,829

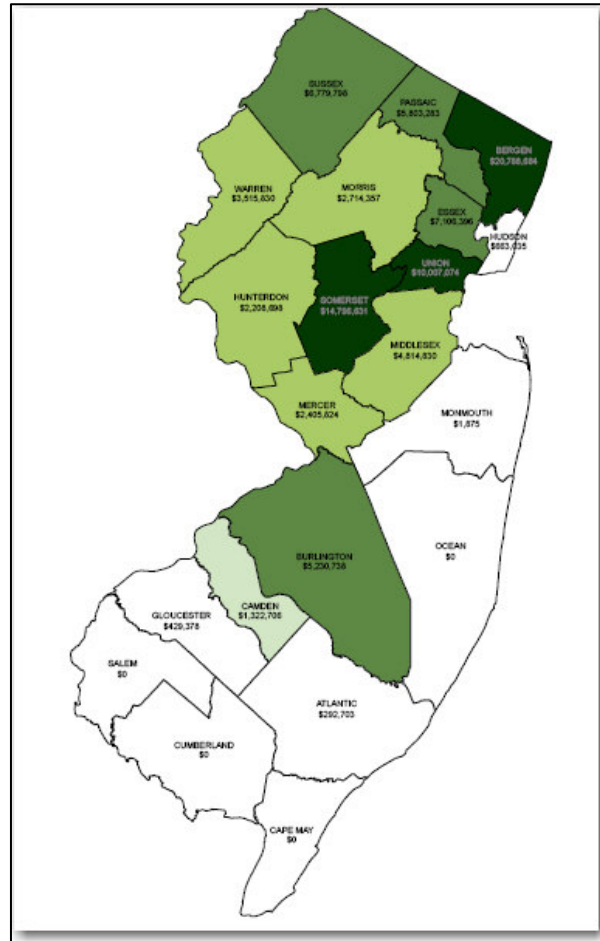


State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

Note: Cape May, Cumberland, Ocean and Salem Counties were not in the data provided by FEMA Region II, presumably because they were not included in the Presidential disaster declarations.

Figure 4.5-4 graphically depicts the data in the table above.

Figure 4.5-4
Total Dollar Value of Losses Reported through FEMA Public Assistance
Program Records for Six most Recent Declared Disasters



Although FEMA Public Assistance records cannot be used to draw a direct inference about vulnerabilities, where there is a sufficient amount of data they nevertheless offer an alternative way to study where damages are most likely to occur, based on past experience. In the context of a hazard mitigation plan, risk and its component vulnerability are closely related to the presence of manmade assets, people and operations. Because of this, areas that are heavily developed and populated tend to be the most at risk, other factors being equal. Of course, not all other factors are equal, and the exposure to the hazards, effective use of development controls, and so forth, can significantly alter the potential for damages from hazards when they do impact an area.



4.5.4 Flood Vulnerabilities

4.5.4.1 Flood Vulnerability

Flood Vulnerability Measure 1: County Land Area in FEMA-Designated A, V, and X Flood Zones

Given that flooding is the most significant natural hazard in New Jersey, the primary method of assessing vulnerability to this hazard on a Statewide basis is to determine the potential exposure to flooding as measured by the amount of land area that is in FEMA-designated floodplains. The information in the following four tables is drawn from GIS analysis of FEMA “Q3” and Digital Flood Insurance Rate Maps (DFIRMs). These types of maps generally represent the best available data for general analysis of flood risk, i.e. loss estimation over a broad geographic area. Similar data is used in the Risk Assessment section of this Plan. Note that the information in these tables can be obtained by local, County and regional jurisdictions by contacting NJOEM.

The tables below order data by area in “A”, “V”, and “X” flood zones by area, and by percentage of County land in the two zone designations. The area figure has more utility as a Statewide comparative measure of vulnerability, whereas the percentage figure may be more useful as a measure of vulnerability internal to the Counties. It is important to recognize that the figures do not suggest that the Counties with the highest areas or percentages in the zones are at more risk, because there is no indicator of how many manmade assets (and operations) are in the zones. These metrics are discussed in more detail in the Risk Assessment section of the Plan.

Table 4.5-5
Land Area and Percentage of County in FEMA-designated “A” Flood Zones,
New Jersey Counties, ordered by Number of Acres in Zone.

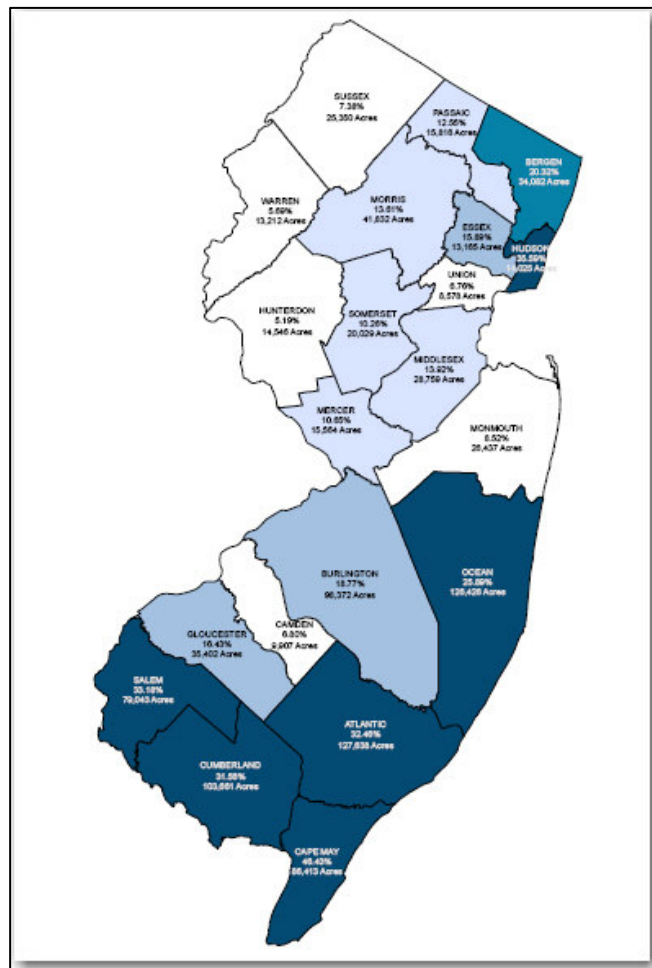
County	Acres in A Zones	Percentage of County in A Zones
Atlantic	127,638	32.46%
Ocean	126,426	25.89%
Cumberland	103,661	31.56%
Burlington	98,372	18.77%
Cape May	86,413	46.43%
Salem	79,043	33.18%
Morris	41,832	13.61%
Gloucester	35,402	16.43%
Bergen	34,082	20.32%
Middlesex	28,759	13.92%
Monmouth	26,437	8.52%
Sussex	25,350	7.38%
Somerset	20,029	10.26%
Passaic	15,816	12.55%
Mercer	15,564	10.65%
Hunterdon	14,546	5.19%



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

County	Acres in A Zones	Percentage of County in A Zones
Hudson	14,025	35.59%
Warren	13,212	5.69%
Essex	13,165	15.89%
Camden	9,907	6.80%
Union	8,578	6.76%
Statewide	938,258	

Figure 4.5-5
Land Area and Percentage of Counties in New Jersey
In FEMA-designated "A" Flood Zones,



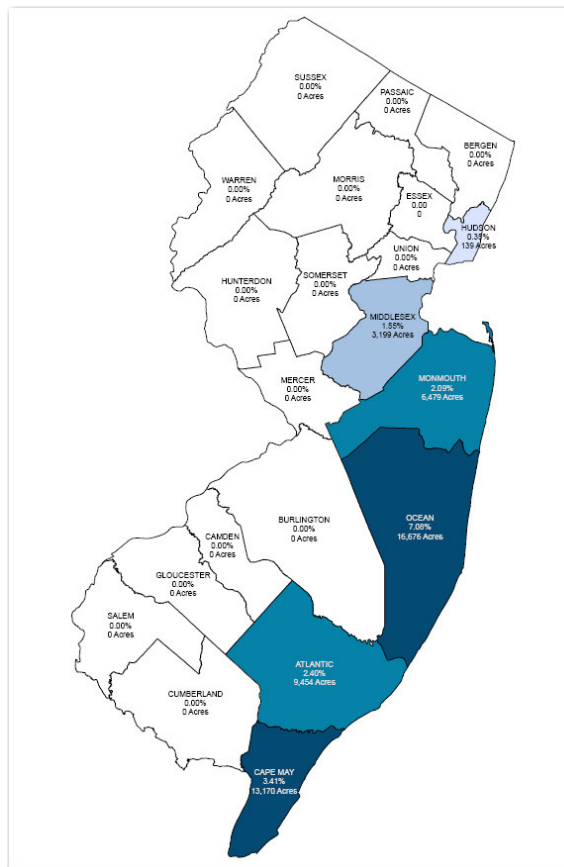


State of New Jersey
 2007 State Hazard Mitigation Plan
 Section 4 Vulnerability Assessment and Loss Estimation

Table 4.5-6
Land Area and Percentage of County in FEMA-designated “V” and “VE” Flood Zones,
New Jersey Counties, ordered by Area in Acres (non-zero Counties only)

County	Acres in V and VE Zones	% in V and VE Zones
Ocean	16,675	3.41%
Cape May	13,170	7.08%
Atlantic	9,454	2.40%
Monmouth	6,479	2.09%
Middlesex	3,199	1.55%
Hudson	139	0.35%
Totals	49,118	

Figure 4.5-6
Land Area and Percentage of Counties in New Jersey
In FEMA-designated “V” and “VE” Flood Zones





State of New Jersey
 2007 State Hazard Mitigation Plan
 Section 4 Vulnerability Assessment and Loss Estimation

**Flood Vulnerability Measure 2:
 Land Uses in FEMA-Designated Flood Zones**

Using GIS technology and open-source data, NJOEM compiled data about the range of land uses in New Jersey, and the area of these land uses that is in FEMA-designated floodplains. Although this information is not absolutely complete (and the uncertainty in it cannot be accurately characterized), it nevertheless offers a good supplement to other data in this section. Table 4.5-7 summarizes the results of the analysis.

Note that the source dataset included a much larger range of land uses than what is shown in these tables. These included a variety of open-space and differentiated forest and wildland areas that are not normally considered “at risk” when they are exposed to natural hazards, so they were removed from the list in this analysis. It should also be noted that some similar land uses were combined in order to simplify the analysis and results. For example, there were numerous sub-categories of “residential” land uses (single-family, multi-family, etc.), for which these distinctions are irrelevant in vulnerability assessments.

**Table 4.5-7
 Areas of Selected New Jersey Land Uses in FEMA Flood Zones (in acres),
 ordered alphabetically by Land Use**

Land Use	A	D	V and VE	X and X-500	Total
Agriculture	102,791	839	15	559,657	663,303
Airport Facilities	1,466	0	0	1,579	3,045
Altered Lands	33	0	0	28	60
Commercial/Services	16,406	1,274	146	111,894	129,720
Extractive Mining	1,618	15	11	16,172	17,816
Industrial	15,398	118	29	50,500	66,045
Major Roadway	2,086	10	17	17,736	19,847
Residential	96,991	4,761	671	811,098	913,521
Stadiums, Theaters, Cultural, Zoos	365	0	0	806	1,171
Stormwater Basin	78	0	0	1,055	1,133
Transportation, Communications, Utilities	11,720	952	100	25,281	38,053
Urban	19,235	858	42	71,267	91,401
Total	268,186	8,826	1,032	1,667,072	1,945,116



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

**Flood Vulnerability Measure 3:
Analysis of FEMA National Flood Insurance Program Records**

The next measure of flood vulnerability discussed in this Plan is FEMA National Flood Insurance Program (NFIP) records. New Jersey has one of the highest rates of claims payments of any State in the U.S. In addition to suggesting a high level of risk (discussed here and in the Risk Assessment section of this Plan), the data accumulated by the NFIP over the more than 30 years of its history offers a rich source of information that can be used to inform the vulnerability assessment.

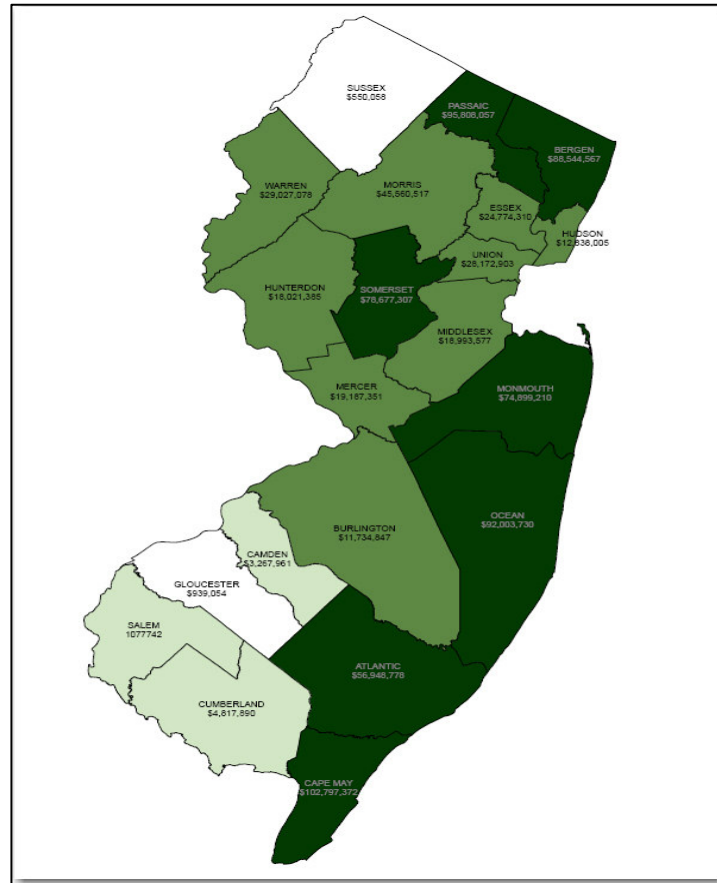
Table 4.5-8
Selected Data Parameters Related to Insurance Claims in the State of New Jersey,
1979-2007, ordered by Dollar Amount of Total Historical Claims
[Source: FEMA Headquarters, query June 30, 2007]

County	# Historical Claims	Total Historical Claims	Average Claim
Cape May	15,599	\$102,797,372	\$6,590.00
Passaic	7,921	\$95,808,057	\$12,095.45
Ocean	12,765	\$92,003,730	\$7,207.50
Bergen	6,304	\$88,544,567	\$14,045.78
Somerset	3,121	\$78,677,307	\$25,209.01
Monmouth	7,079	\$74,899,210	\$10,580.48
Atlantic	8,464	\$56,948,778	\$6,728.35
Morris	4,977	\$45,560,517	\$9,154.21
Warren	1,034	\$29,027,078	\$28,072.61
Union	3,317	\$28,172,903	\$8,493.49
Essex	2,646	\$24,774,310	\$9,362.93
Mercer	1,710	\$19,187,351	\$11,220.67
Middlesex	1,782	\$18,993,577	\$10,658.57
Hunterdon	947	\$18,021,385	\$19,029.97
Hudson	1,034	\$12,838,005	\$12,415.87
Burlington	1,077	\$11,734,847	\$10,895.87
Cumberland	644	\$4,817,890	\$7,481.20
Camden	894	\$3,267,961	\$3,655.44
Salem	399	\$1,077,742	\$2,701.11
Gloucester	299	\$939,054	\$3,140.65
Sussex	108	\$550,058	\$5,093.13
Total	82,121	\$808,641,699	



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

Figure 4.5-7
Historic flood claims in the State of New Jersey,
1979-2007, ordered by Dollar Amount of Total Historical Claims
[Source: FEMA Headquarters, query June 30, 2007]



There are several results of this table that have some bearing on the State's vulnerability to the flood hazard. First, the total amount and number of historical claims are perhaps the best measures of vulnerability because they indicate the amount of monetary losses and claims experienced in the various Counties over a relatively long period of time. Second, the average amount of claims may be even a more significant measure of vulnerability because it often indicates the relative severity of events (deeper water, or faster-moving water tends to cause more damages, and these are measures of severity for floods). Note that Somerset and Warren Counties in the table above have relatively high average claims, which may suggest that further information-gathering may be warranted. The most common reason for very high average claims is that only one or two very significant events impacted an area, and that there have been relatively few minor events that would bring the average closer to the Statewide mean. This is discussed in more detail in the Risk Assessment Section, but is nonetheless a valid indicator of vulnerability to floods.

It should be noted that damages related to flooding may be under-represented in these figures for various reasons, such as the fact that not all citizens and businesses are insured, that losses that are not covered by insurance (such as those to government operations, or ones that are simply not included in policy coverages) are not represented, and that some policyholders may have been under-insured.



**Flood Vulnerability Measure 4:
 HAZUS Critical Facilities in Floodprone Areas**

This vulnerability measure is based on information about critical facilities that are represented in the FEMA HAZUS database. As shown in Table 4.5-9, a State query of HAZUS indicates that New Jersey has 3,754 critical facilities in the categories shown in the left column (Type). Of these, 56 are in FEMA-designed A (various iterations of A, including AO, etc.), V and VE zones. The majority of facilities are in X-zones. The abbreviation ANI indicates “area not included”, meaning that the flood zone designation was not available through GIS resources. In addition to the ANI designations, there were numerous null fields for flood zone designation in the database – these were merged with the ANI designations.

**Table 4.5-9
 Selected HAZUS Critical Facilities and FEMA Flood Zone Designations**

Facility Type	A zone	V or VE Zone	X zone	X500 zone	ANI/na	Total
Police Stations	6	1	503	15	76	601
Fire Stations	8	1	630	23	80	742
EOCs	2	0	117	9	2	130
Health Care	3	0	84	2	10	99
Hazmat Sites	35	0	1,502	106	539	2,182
Total	54	2	2,836	155	707	3,754



Section 4.6

Jurisdictions most Threatened, and most Vulnerable to Damage and Loss

Holding other factors constant, jurisdictions with the most assets, infrastructure and people are the most vulnerable to damage and loss. However, for the most significant hazards in New Jersey, the exposure to hazards is related to location and elevation, and by definition varies from place to place. Flooding is clearly the hazard that has caused the most damage to the State, and has the most potential for future damage (risk). The subsection on Flood Hazard Identification and Profiling describes this in detail.

Table 4.6-1
Relative Statewide Natural Hazard Vulnerabilities

Hazard	Vulnerability	Measurement Methodology
Flooding	High	Historical records, floodplain calculations, statistics
Hurricanes (wind and storm surge)	Medium	Historical records (NCDC, NOAA)
Nor'easters	Medium	Historical records (NCDC, NOAA)
Winter storms	Medium	Historical records (NCDC, NOAA)
Tornadoes and High Winds	Low	Historical records, calculations using FEMA software
Earthquakes	Low	HAZUS calculations, derivations
Drought	Medium	Historical records (NCDC, NOAA)
Wildfire	Medium	Historical records, GIS of burn threat and assets
Landslides	Low	Historical records, GIS of susceptible geology
Geological Hazards*	Low	Historical records, GIS of susceptible geology
Hail	Medium	Historical records (NCDC, NOAA)
Extreme Temperatures	Medium	Historical records (NCDC, NOAA)

* Includes subsidence, sinkholes and

Table 4.6-2 summarizes some of the metrics used in this Plan to characterize risk from natural hazards. As discussed in various other parts of the document, some of these figures (such as exposure and the percentages of Counties in flood zones) are measures of vulnerability, while others (such as the hurricane wind column) are actual risk calculations. Sections 4.4 and 4.5 include much more detailed explanations of these figures and how they should be used by the State and Counties in the context of hazard mitigation activities. This table is intended to provide a “snapshot” of various hazard parameters in order to comply with the requirements of the IFR, and to very generally identify where the State may want to assign higher priorities to mitigation activities and strategies.

It should be noted that not all of the hazards that are profiled earlier in this section are included on this list because there are no useful metrics to include in the table, and potential exposure is relatively uniform across the State.



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Risk Assessment

Table 4.6-2
Summary of New Jersey Jurisdictions most threatened by Natural Hazards,
selected data parameters

County	\$ Exposure [1000s]	% County A Zone	% County V Zone	NFIP Claims	# SRL	FEMA PA \$ Losses	Hurricane Wind	Geological*
Atlantic	\$27,652,015	32.46%	2.40%	8,464	5	\$292,703	\$340,117,818	TBD
Bergen	\$100,653,325	25.89%	0.00%	6,304	7	\$20,788,683	\$259,872,547	TBD
Burlington	\$50,946,874	31.56%	0.00%	1,077	0	\$5,230,730	\$82,893,850	TBD
Camden	\$50,021,816	18.77%	0.00%	894	13	\$1,322,711	\$94,436,126	TBD
Cape May	\$18,311,425	46.43%	7.08%	15,599	2	\$0	\$347,236,533	TBD
Cumberland	\$12,235,912	33.18%	0.00%	644	17	\$0	\$11,901,691	TBD
Essex	\$78,836,283	13.61%	0.00%	2,646	11	\$7,106,393	\$200,477,379	TBD
Gloucester	\$24,721,631	16.43%	0.00%	299	18	\$429,379	\$47,377,639	TBD
Hudson	\$53,814,871	20.32%	0.35%	1,034	15	\$663,034	\$142,527,681	TBD
Hunterdon	\$14,692,482	13.92%	0.00%	947	10	\$2,208,699	\$38,615,967	TBD
Mercer	\$40,721,537	8.52%	0.00%	1,710	14	\$2,405,826	\$67,353,749	TBD
Middlesex	\$79,240,485	7.38%	1.55%	1,782	12	\$4,814,832	\$843,335,832	TBD
Monmouth	\$64,432,550	10.26%	2.09%	7,079	9	\$1,875	\$770,678,760	TBD
Morris	\$67,233,273	12.55%	0.00%	4,977	3	\$2,714,356	\$143,626,697	TBD
Ocean	\$46,731,673	10.65%	3.41%	12,765	6	\$0	\$753,916,171	TBD
Passaic	\$45,121,076	5.19%	0.00%	7,921	1	\$5,803,282	\$123,497,878	TBD
Salem	\$6,080,176	35.59%	0.00%	399	0	\$0	\$12,420,301	TBD
Somerset	\$35,656,884	5.69%	0.00%	3,121	8	\$14,796,630	\$91,054,817	TBD
Sussex	\$15,132,181	15.89%	0.00%	108	0	\$6,779,796	\$44,528,420	TBD
Union	\$51,757,042	6.80%	0.00%	3,317	16	\$10,007,073	\$142,355,472	TBD
Warren	\$10,381,209	6.76%	0.00%	1,034	4	\$3,515,827	\$30,728,043	TBD

* This column includes earthquakes, landslide, subsidence, and sinkhole hazards.



State of New Jersey
2007 State Hazard Mitigation Plan
Section 4 Risk Assessment

Table 4.6-3 provides a subjective rating of the threat to New Jersey Counties from all the hazards that are included in this Plan. The high/medium/low rankings are based on a combination of past occurrences, the probability of future occurrences, and the potential severity of impacts. This table should be used for general guidance *only* – it should not be interpreted as a means to limit the efforts of local or regional jurisdictions in determining risks from natural hazards. Most Counties have at least some risk from all hazards, and in many cases potentially severe risks can be highly localized. The information presented in this table should be used for planning purposes only.

**Table 4.6-3
Summary of Relative Threat to New Jersey Counties from Natural Hazards**

County	Floods	Hurricane Wind	Drought	Geological	Hail	Tornado High Wind	Nor'easter	Winter Storm	Wildfire	Extreme Temps
Atlantic	H	M	M	L	L	L	M	M	H	L/M
Bergen	M	M	M	L/M	L	L	M	M	L	M
Burlington	L	M	M	L	L	L	L	M	H	M
Camden	L	M	M	L	L	L	L	M	H	M
Cape May	H	M	M	L	L	L	M	M	L	L/M
Cumberland	L	L	M	L	L	L	L	M	H	M
Essex	L	M	M	L/M	L	L	L	M	L	M
Gloucester	L	L	M	L	L	L	L	M	M	M
Hudson	L	M	M	L/M	L	L	L	M	L	M
Hunterdon	L	L	M	L	L	L	L	M	L	M
Mercer	L	L	M	L	L	L	L	M	L	M
Middlesex	L	M	M	L/M	L	L	L	M	H	M
Monmouth	L	H	M	L	L	L	L	M	L	M
Morris	M	M	M	L/M	L	L	L	M	L	M
Ocean	H	H	M	L	L	L	M	M	H	L/M
Passaic	M	M	M	L/M	L	L	L	M	L	M
Salem	L	L	M	L	L	L	L	M	L	M
Somerset	M	M	M	L	L	L	L	M	L	M
Sussex	L	L	M	L	L	L	L	M	M	M
Union	M	M	M	L/M	L	L	L	M	L	M
Warren	L	L	M	L	L	L	L	M	L	M



Section 4.7 Vulnerabilities of State Owned and Operated Facilities

Update note – the 2005 version of the HMP included a brief discussion of the State Homeland Security and Infrastructure Protection critical facilities list. The plan indicated that the list could not be included in the document for security reasons, but the facilities were considered by the SHMT and planning team as these groups developed and prioritized mitigation actions. This text was deleted from the plan update, but can be found in the 2005 version of the State HMP.

The State of New Jersey does not have a comprehensive GIS mapping database of State owned and leased facilities. The Department of Treasury is continually updating its GIS mapping capabilities for State owned and leased facilities. The Office of Management and Budget within the Department of Treasury has developed a centralized Statewide Land and Building Asset Management Database (LBAM) that is currently being populated with an updated and expanded inventory of land, building improvements, infrastructure and inspections data. Completion of the LBAM database is scheduled for within 2005. State agencies maintaining facilities included in LBAM include:

- Department of Corrections
- Department of Environmental Protection
- Juvenile Justice Commission
- Military and Veterans' Affairs
- Office of Counter Terrorism
- Transportation
- Department of Treasury

While extremely imprecise, the State Office of Emergency Management currently has the capability to apply general county hazard lists to a text listing of State owned and leased property, sorted by county, to provide a rudimentary analysis of State facilities that are vulnerable to hazards. The State of New Jersey, through its Department of Treasury, is currently working with the state's casualty insurers and others to determine the value of State infrastructure. Based on this valuation, it will be possible in the near future to determine the potential loss for State owned and leased facilities for inclusion in the next required revision to the New Jersey State Hazard Mitigation Plan.

In conducting the 2008 Plan update, the State and consultant team met with representatives of the State Department Treasury, and obtained the most current version of the LBAM database (see above). Although there appears to be progress in populating the various fields, a review and analysis of the data indicates that most facilities are not geocoded, and significant data fields for the majority of State-owned facilities are not sufficiently populated to allow NJOEM to determine if the facilities are in hazardous areas. Although the State expects to continue progress on populating these fields, staffing and financial constraints will likely limit this effort.

NJOEM is aware that one of the most important elements of the State HMP is to identify and prioritize State owned and operated facilities that may be at risk from the impacts of natural hazards. As noted in the Mitigation Strategy section, NJOEM intends to initiate a process to contact all major State agencies to request them to identify facilities that they consider critical, based on objective criteria such as function, numbers of people in buildings, size of facilities. The survey will also request information about known



vulnerabilities to natural hazards. The information collected in this process will allow NJOEM to prioritize facilities for additional study and data collection, depending on resources.

During the HMP update process, members of the planning team also contacted State staff responsible for matters related to insurance coverage for State facilities. Although this is potentially a rich source of information, the State does not presently keep any detailed records of past damages or insurance claims, either from the self-insurance fund or from reinsurance claims. As noted in Section 4.5 of this Plan, FEMA Region II provided detailed records of damages to public facilities during the last six Presidentially-declared disasters in the State. Table 4.7-1 shows data for New Jersey State agencies that applied for FEMA Public Assistance Grant Applications for six recent disasters. This information clearly does not identify the exact facilities that were damaged in the events (the large majority of damages are related to flooding). However, it does give a general sense of the level of damage to State-owned and operated facilities for the various FEMA Public Assistance categories.

**Table 4.7-1
Summary of FEMA Public Assistance Grant Application Amounts for
Six Recent Disasters**

Disaster	A	B	C	D	E	F	G	Total
DR-1694	\$21,019	\$2,959,810	\$95,290	\$47,600	\$111,517	\$0	\$209,583	\$3,444,819
DR-1653	\$117,294	\$1,363,469	\$0	\$0	\$0	\$0	\$0	\$1,480,763
DR-1563	\$27,108	\$658,701	\$344,167	\$0	\$495,967	\$40,700	\$10,426	\$1,577,069
DR-1530	\$61,083	\$659,490	\$480,610	\$332,107	\$235,068	\$0	\$180	\$1,768,538
DR-1337	\$0	\$3,283	\$0	\$199,689	\$38,807	\$0	\$0	\$241,779
DR-1295	\$938,911	\$3,439,527	\$336,040	\$465,194	\$289,189	\$52,402	\$1,975,249	\$7,496,512
Total	\$1,165,415	\$9,084,280	\$1,256,107	\$1,044,590	\$1,170,548	\$93,102	\$2,195,438	\$16,009,480

The FEMA Public Assistance categories are generally defined as follows

- Category A: Emergency work, primarily debris clearance.
- Category B: Emergency protective measures.
- Category C: Permanent repair work, roads and bridges.
- Category D: Permanent repair work, water control facilities.
- Category E: Permanent repair work, public buildings.
- Category F: Permanent repair work, utilities.
- Category G: Permanent repair work, parks and recreation facilities.

Source: FEMA.gov

Table 4.7-2 shows the dollar amounts of damages to facilities that appear to be State-owned or -operated, based on the applicants listed on the Project Worksheet summaries provided by FEMA Region II. With additional research it would be possible to identify the exact facilities that were damaged and the nature of the damage to them. However, because flood damages are highly related to specific sites, such information would offer only limited insight into vulnerabilities, except insofar as certain facilities have been damaged repeatedly.



State of New Jersey
2008 State Hazard Mitigation Plan
Section 4 Vulnerability Assessment and Loss Estimation

**Table 4.7-2
New Jersey State Government FEMA Public Assistance Grant Applicants
from Six Recent Presidentially-declared Disasters**

FEMA Public Assistance Grant Applicant	A	B	C	D	E	F	G	Total
Delaware River Joint Toll Bridge Commission	\$0	\$16,163	\$276,095	\$0	\$0	\$0	\$0	\$292,258
Banking and Insurance	\$0	\$13,126	\$0	\$0	\$0	\$0	\$0	\$13,126
Environmental Protection	\$189,768	\$1,527,988	\$165,691	\$916,449	\$27,653	\$10,125	\$589,890	\$3,427,564
Law and Public Safety	\$0	\$0	\$12,233	\$0	\$0	\$0	\$0	\$12,233
Treasury	\$0	\$30,215	\$0	\$1,440	\$468,314	\$0	\$9,570	\$509,539
Meadowlands Conservation Trust	\$0	\$0	\$0	\$47,600	\$0	\$0	\$0	\$47,600
Board of Public Utilities	\$0	\$2,420	\$0	\$0	\$0	\$0	\$0	\$2,420
Dept. of Corrections	\$0	\$105,082	\$0	\$0	\$0	\$0	\$0	\$105,082
Health and Senior Services	\$0	\$6,173	\$0	\$0	\$0	\$0	\$0	\$6,173
Dept. of Agriculture	\$0	\$2,074	\$0	\$0	\$0	\$0	\$0	\$2,074
Dept. of Community Affairs	\$0	\$203,254	\$0	\$0	\$0	\$0	\$0	\$203,254
Dept. of Human Services	\$0	\$296,397	\$3,013	\$0	\$252,839	\$0	\$0	\$552,249
Military/Veteran's Affairs	\$0	\$1,400,746	\$0	\$0	\$0	\$0	\$0	\$1,400,746
Highway Authority [Garden State Parkway]	\$74,424	\$0	\$29,925	\$0	\$0	\$0	\$0	\$104,349
Office of Emergency Management	\$0	\$0	\$3,227,803	\$0	\$0	\$0	\$0	\$3,227,803
State Dept. of Transportation	\$674,082	\$1,048,624	\$495,964	\$0	\$0	\$0	\$0	\$2,218,670
NJ Transit	\$98,189	\$666,236	\$273,424	\$0	\$382,934	\$52,402	\$1,216,218	\$2,689,403
NJ Water Supply Authority	\$67,870	\$148,612		\$82,075		\$30,575		\$329,132
State Police		\$725,362			\$38,807		\$1,795	\$765,964
State University of New Jersey		\$76,188	\$18,131					\$94,319
Total	\$1,104,333	\$6,268,660	\$4,502,279	\$1,047,564	\$1,170,547	\$93,102	\$1,817,473	\$16,003,958



Section 4.8 Incorporation of Risk and Vulnerability Data from Local and Regional Hazard Mitigation Plans

At the time of the 2008 State mitigation plan update, no local plans had been approved anywhere in the State of New Jersey, although every County and local jurisdiction was either already engaged in the required planning development, or had obtained grant funds and was commencing the process. FEMA guidance related to local plans is fairly prescriptive in terms of requirements for risk and vulnerability information that must be provided. NJOEM expects that the plans will include a significant amount of information that can be incorporated into the State plan eventually. In addition to using this data in future updates, the State commits to the following, to ensure that the local plans include sufficient data about risks and vulnerabilities.

- NJOEM will provide technical information such as NFIP data about severe repetitive loss and repetitive loss data to local and regional planners. This information will include the risk calculations completed as part of the plan update process.
- To the extent practicable, NJOEM will offer advice and feedback on key technical sections of local and regional mitigation plans as they are developed.
- NJOEM will encourage local and regional planners to include vulnerability assessments and risk calculations in all plans, as required by the FEMA IFR. This will be emphasized during the State-level review process, and the State will provide detailed feedback on these sections.