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## Section 2 Executive Summary

### 2.1 Background

On October 20, 2000, the United States Congress passed the Disaster Mitigation Act of 2000, also known as DMA2K. A copy of the Act is included in this Plan as Appendix A. Among its other features, DMA2K established a requirement that in order to remain eligible for certain categories of federal disaster assistance and grant funds, States and localities must develop and adopt Hazard Mitigation Plans. On February 26, 2002, the Federal Emergency Management Agency (FEMA) published an Interim Final Rule (IFR) that provided the guidance and regulations under which such Plans must be developed. The IFR provides detailed descriptions of both the Planning process that States and localities are required to observe, as well as the contents of the Plan that emerges. It is included as Appendix B.

New Jersey officially adopted its initial State Hazard Mitigation Plan in 2005. The State completed the current 2008 State Plan update to meet the requirements of Interim Final Rule Section 201.4(d), which mandates that States update their mitigation Plans every three years “to reflect changes in development, progress in Statewide mitigation efforts, and changes in priorities.”

Hazard mitigation ensures that fewer New Jerseyans and fewer communities become victims of natural and technological disasters. It is sustained action taken to reduce or eliminate the long-term risk and impact to people and property from natural hazards. It results in safer communities that resist becoming victims when disaster strikes. Mitigation measures reduce risk for individuals, small and large businesses, and critical service locations such as hospitals, public safety facilities and utility stations.

The State Hazard Mitigation Plan is the demonstration of New Jersey’s commitment to reduce risks from natural hazards and serves as a guide for both State and local decision makers as they commit resources to reducing the effects of natural hazards on lives and property. New Jersey’s State Hazard Mitigation Plan (SHMP) is prepared in compliance with Federal requirements for Standard State Mitigation Plans in the **Stafford Act**, as amended by the **Disaster Mitigation Act of 2000** (42 U.S.C. 5165). It is designed to outline a strategy to reduce risks from natural hazards in New Jersey, and to aid State and local emergency management officials in developing hazard reduction programs. This Plan also establishes the framework for coordination between the Federal Emergency Management Agency (FEMA) and the State Hazard Mitigation Team (SHMT) for hazard mitigation programs.

44 CFR Part 201, Hazard Mitigation Planning, establishes criteria for State and local hazard mitigation planning authorized by Section 322 of the Stafford Act, as amended by Section 104 of the Disaster Mitigation Act. After November 1, 2004, local governments applying for Pre-Disaster Mitigation (PDM) funds through the States must have an approved local mitigation plan prior to the approval of local mitigation project grants. States are also required to have an approved Standard State mitigation plan in order to receive PDM funds for State or local mitigation projects after November 1, 2004. Therefore, the development of State and local multi-hazard mitigation plans is key to maintaining eligibility for future PDM funding for:

1. Property acquisition or relocation of hazard prone property for conversion to open space in perpetuity;
2. Structural and non-structural retrofitting (including designs and feasibility studies when included as part of the construction project) for wildfire, seismic, wind or flood hazards (e.g., elevation, storm shutters, hurricane clips);
3. Minor structural hazard control or protection projects that may include vegetation management, and stormwater management (e.g., culverts, floodgates, retention basins); and,



4. Localized flood control projects, such as certain ring levees and floodwall systems that are designed specifically to protect critical facilities and that do not constitute a section of a larger flood control system.

Further, approved State and local mitigation plans are now required for any applicant to be eligible to obtain funding assistance for any categories of “permanent work” under the FEMA Public Assistance Program:

1. **Category C:** Roads and Bridges. Repair of roads, bridges and associated features such as shoulders, ditches, culverts, lighting and signs.
2. **Category D:** Water Control Facilities. Repair of irrigation systems, drainage channels and pumping facilities. Repairs of levees, dams and flood control channels within the limitations of the Public Assistance Program.
3. **Category E:** Buildings and Equipment. Repair or replacement of buildings, including their content and systems; heavy equipment and vehicles.
4. **Category F:** Utilities. Repair of water treatment and delivery systems; power generation facilities and distribution lines; and sewage collection and treatment facilities.
5. **Category G:** Parks; Recreational Facilities and Other Items. Repair and restoration of parks, playgrounds, pools, cemeteries and beaches, as well as any work or facility that cannot be characterized by Categories A-F

**Note regarding the 2008 Plan Update:** By consensus between NJOEM and FEMA Region II, the present plan update document constitutes a significant reorganization of the 2005 document. As required by the FEMA IFR related to State Hazard Mitigation Plan updates, NJOEM has indicated where changes have been made, and the process that was used in its review and update. In many cases changes were so extensive that individual changes are not notated as they are in some other areas. The planning team has made every effort to highlight where changes have been made, and to clarify the updates. Throughout the document NJOEM has used blue text to indicate areas that are retained from the original plan, and black text to indicate updates and additions.

## 2.2 Organization of the Plan

The updated New Jersey Hazard Mitigation Plan is organized to parallel the structure provided in the Interim Final Rule (IFR). The Plan has nine sections.

- Table of Contents
- Executive Summary
- Planning Process
- Risk Assessment
- Mitigation Strategy
- Coordination of Local Planning
- Plan Maintenance
- Approval and Adoption

There are references to the IFR throughout the Plan. Where possible these provide specific section and subsection notations for the convenience of reviewers.



## 2.3 Highlights of the Plan

The purpose of the State Hazard Mitigation Plan is to rationalize the process of identifying and implementing appropriate hazard mitigation actions. The Plan includes

1. Characterization of natural hazards Statewide, including occurrences, impacts and probability
2. Vulnerability assessment and loss estimation
3. Identification of jurisdictions most at risk
4. Goals, objectives, strategies and actions that will guide the State's mitigation activities
5. A comprehensive evaluation of progress towards achieving the original 2004 goals, strategies and actions
6. A process for implementing and monitoring the Plan

The following paragraphs briefly describe each section of the updated Plan.

### 2.3.1 The Planning Process

Section 3 of the 2008 Plan includes a detailed description of the process and the individuals and agencies who were involved in the update. The process used to develop the initial Plan was closely modeled on the FEMA "How-To" series for hazard mitigation Planning.

**Note on 2008 Update:** NJOEM developed a strategy for updating each section of the Plan under a very constricted schedule. NJOEM led the update of all sections of the Plan, with support from the Mitigation Core Team (MCT), the State Hazard Mitigation Team (SHMT) and consultants Jeffrey S. Ward and Associates, and Vissering Pardue and Associates. Subject matter experts were solicited for specific information regarding hazards, risks, capabilities and strategies. MCT and SHMT members reviewed the mitigation strategies identified in the original Plan, and provided feedback on progress towards achieving the goals and completing the actions. A key part of the update process was to reorganize and update the strategies portion of the HMP (Section 5). SHMT members provided interim reviews of draft sections as appropriate throughout the update process. After all sections were completed and comments incorporated, the Plan was submitted to FEMA and the SHMT for review.

### 2.3.2 Vulnerability Assessment and Loss Estimation

**Section 4** includes a detailed description of the process that was used to identify, characterize and assess the natural hazards that can affect New Jersey. **Section 4.4** provides hazard profiles for the 10 natural hazards that are most likely to affect that State. These comprise:

- Floods
- Hurricanes and tropical storms
- Nor'easters
- Winter storms
- High winds and tornadoes
- Earthquakes
- Drought
- Wildfires
- Geological hazards
- Hail



- Extreme temperatures
- Coastal erosion

**Section 4.5** characterizes the State's vulnerabilities to natural hazards, and **Section 4.6** follows with a summary of the jurisdictions that are at risk from the effects of natural hazards. Because this Plan is partly intended as a resource for local and regional planners, NJOEM wished to avoid any ranking or scoring of hazards or jurisdictions, because this might suggest that planners should ignore some of the lower-ranking hazards or vulnerable areas. The State HMP provides a general framework to guide State-level mitigation strategies. In carrying out their own planning processes, jurisdictions should perform more detailed and locally-focused hazard profiles and risk assessments to develop appropriate strategies and actions.

New Jersey is comprised of 21 Counties, all of which have some risk of most of the natural hazards on the list above. It is important for local jurisdictions to understand that while State-level risk may appear to be concentrated in Counties where there are high populations and large infrastructure, there are areas of high risk in every County, and in many jurisdictions within the Counties. It should also be noted that a wide range of mitigation actions and strategies exist for most hazards, and that the costs and effectiveness of these measures also varies significantly. The implication of this is that both the State and local jurisdictions must be aware that the ultimate effectiveness of mitigation is based both on risk and the action that is used to reduce it.

### 2.3.3 Mitigation Strategy

**Section 5** describes the State's mitigation strategy, goals, actions and capabilities. The Mitigation Core Team (MCT) and State Hazard Mitigation Team (SHMT) modified the 2005 version of the plan to remove two goals, and add one related to developing and maintaining an understanding of risks. The four goals for the Plan update are:

1. Protect life
2. Protect property
3. Increase public preparedness
4. Develop and maintain an understanding of risks
5. Enhance the capability of NJOEM to continuously make New Jersey less vulnerable to hazards.

For the 2008 update, the MCT and SHMT reviewed the State's hazard mitigation goals and determined that two of them (Promote a sustainable economy, and Protect the environment) are outside the purpose of a mitigation plan, and should be deleted. The MCT added a goal to the list (Develop and maintain an understanding of risks). The Mitigation Core Team also completed a STAPLEE assessment for all of the updated strategies and actions.

As required by FEMA, the MCT and SHMT completed a comprehensive evaluation of the mitigation strategies and actions from the original plan, and reported on the status of each of them in a new, secondary table in the section.



### 2.3.4 Coordinating Local Planning

**Section 6** describes how the State provides assistance and guidance to local jurisdictions for developing their hazard mitigation Plans, how information from the State and local Plans is linked and integrated, and how the State prioritizes funding opportunities for local jurisdictions. As noted in various places throughout the document, only a few local or regional mitigation plans had been approved at the time the 2008 State HMP update was completed. It is NJOEM's intent to use the State Plan as a way to provide data to local and regional governments to support their mitigation planning processes, and to provide guidance on best practices.

### 2.3.5 Plan Maintenance

**Section 7** describes how the Plan will be periodically evaluated and updated. The Interim Final Rule requires that the State Hazard Mitigation Plan be updated and re-submitted to FEMA for review and re-approval every three years. In addition to meeting this requirement, the State, under the direction of NJOEM, will review the Plan annually, based on criteria that are described in **Section 7.2**. The criteria are:

1. New Presidential Disaster or Emergency Declarations
2. Progress in completing tasks listed in the Mitigation Strategies section of the Plan
3. Changes in development
4. Progress in Statewide mitigation activities, including meeting State Mitigation Goals
5. Changes in priorities
6. Changes in available funding sources and programs
7. Advances in GIS, data acquisition and other technologies
8. Increases in available information
9. Changes in State or Federal laws, including amendments to FEMA rules and guidance; and
10. Other factors affecting the Plan, as described in the section.

Other parts of **Section 7** describe how the State will monitor mitigation activities and measure progress toward achieving the goals that are described in **Section 6**.

### 2.3.6 Approval and Adoption

**Section 8** of the Plan describes the Plan approval and adoption processes and provides assurances as required by the IFR. It also includes documents related to Plan adoption, including an approval letter from the Director of the New Jersey Office of Emergency Management (NJOEM), and a letter of endorsement and support from the Governor.

The New Jersey State Hazard Mitigation Plan was adopted by the Governor through the authority delegated to NJOEM. As noted elsewhere in the Plan (see Section 3), each State Hazard Mitigation Team (SHMT) member was provided a full draft copy of the Plan for review, comment and endorsement prior to adoption by the Governor. NJOEM retains the comments and changes. The Plan was approved by the Director of the New Jersey Office of Emergency Management through authority delegated by the Governor.

Upon completion, this Plan Update will be approved and adopted through the same mechanism used for the 2005 Plan.



## Section 3 Planning Process

### Contents of this Section

- 3.1 Interim Final Rule Requirements for the Planning Process
- 3.2 Description of the Planning Process
- 3.3 Coordination with State and Federal Agencies, and Interested Groups
- 3.4 Integration into other Ongoing State Planning Efforts
- 3.5 Integration into other FEMA Mitigation Programs and Initiatives
- 3.6 Incorporation of Local Plans

### 3.1 Interim Final Rule for the Planning Process

“An effective planning process is essential to developing and maintaining a good plan. The mitigation planning process should include coordination with other State agencies, appropriate Federal agencies, interested groups, and be integrated to the extent possible with other ongoing State planning efforts as well as other FEMA mitigation programs and initiatives.”

The IFR Subsection 201.4 (c) (1) requires that the plan include:

“Description of the *planning process* used to develop the plan, including how it as prepared, who was involved in the planning process, and how other agencies participated.”

2008 Update note to reviewers: this document constitutes the State of New Jersey’s required three-year mitigation plan update. Although the State and FEMA Region II concurred that the 2005 plan document required considerable edits to make it more closely compliant with FEMA requirements, some aspects and text from the original version of the plan remain in this version. In the draft and final draft versions of the document, these holdovers are in blue font.

### 3.2 Description of the Planning Process

This section of the State Hazard Mitigation Plan describes the processes used by the State to develop the original Plan, and to update the document in 2008. In this updated 2008 version of the Plan, the description of the 2005 planning process was significantly edited for clarity and brevity. The longer original description can be reviewed in the 2005 Plan, which is available through the New Jersey Office of Emergency Management (NJOEM).

The 2005 HMP was prepared by NJOEM with technical assistance from the Stevens Institute of Technology and a planning consultant, with collaboration from the interagency State Hazard Mitigation Team (SHMT) and its State Hazard Mitigation Planning subcommittee. Meeting minutes from the original Plan development process are included in the 2005 version of the State Hazard Mitigation Plan, but not in the update.

For the 2008 Plan update, NJOEM secured the services of planning consultants Jeffrey S. Ward and Associates, Inc., and Vissering Pardue and Associates, Inc. These firms facilitated the process and performed much of the technical work related to hazard identification, vulnerability determinations and risk assessment.



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By concurrence between NJOEM and FEMA Region II, the 2008 update to this Plan includes more extensive changes than would normally be part of such an effort. FEMA guidance related to plan updates requires States to describe the process used to update the plan, specifically, determinations by the State and/or planning team about which sections require(d) updates, and how the updates were completed. Each section of this plan includes a brief description of the process used in the update, and where indicated, specific details about how technical aspects of the update were carried out.

Where appropriate or necessary, NJOEM has indicated where parts of the original document have been retained, and where additions have been made as part of the update. The plan update was completed on a relatively short schedule, so the process was highly streamlined, as outlined below.

1. Comprehensive review of all plan sections, and a written gap analysis to compare the 2005 version of the plan to IFR and "Blue Book" requirements.
2. Consultation with FEMA Region II to discuss the 2005 version of the HMP, especially areas where FEMA believes that there is opportunity for improvement.
3. Comprehensive update to the Hazard Identification and Profiling, and Vulnerability Assessment and Loss Estimation sections of the plan, as the basis of other planning elements.
4. Detailed review and update of the Mitigation Strategy Section. The update process was completed by the NJOEM, the Mitigation Core Team and the State Hazard Mitigation Team through a detailed review of the existing plan to identify progress on the actions it described, and development of additional goals, strategies and actions based on new results of the vulnerability assessment and loss estimation.
5. Creation of a new appendix dedicated to the FEMA Severe Repetitive Loss mitigation program, and New Jersey's strategy to implement it in the State.
6. Development of an array of new and updated technical data and maps, most of which can be used by local and regional planners as they create hazard mitigation plans Statewide over the next year.

The Mitigation Core Team (MCT, described below) and the State Hazard Mitigation Team (SHMT) met multiple times during the plan update process to discuss progress and technical aspects of the work. These groups were provided draft sections of the plan at key points in the development process, for review and comment. Toward the end of the Plan development, the draft document was posted on the websites for the New Jersey Association of Floodplain Management, the New Jersey Department of Environmental Protection, the New Jersey League of Municipalities, and the New Jersey Office of Emergency Management. The organizations sent emails to their membership advising them of the postings, encouraging them to review the documents, and providing an email address where they could send feedback. The comments were compiled and reviewed by the MCT, and where appropriate changes were made in the draft to reflect this feedback.

The focus of New Jersey's Statewide hazard mitigation effort is centered in the New Jersey Office of Emergency Management (NJOEM), located in the Division of State Police in the New Jersey Department of Law and Public Safety. NJOEM provides administrative support to the State Hazard Mitigation Team (SHMT). The SHMT is chaired by a representative of the Governor's Office. Other State agencies represented on the SHMT and actively involved in hazard mitigation include the Department of Environmental Protection (NJDEP), the Department of Community Affairs (NJCA), the Department of Transportation (NJDOT), and the Department of Banking and Insurance (NJDOBI). The Executive Order establishing the SHMT is attached to this plan as Appendix C.

Two groups were mainly responsible for the 2008 Plan update, the Mitigation Core Team (MCT) and the State Hazard Mitigation Team (SHMT). Membership in these groups is shown in Tables 3.2.1-1 and 3.2.3-1.



### 3.2.1 The Mitigation Core Team

For the 2008 Plan update, NJOEM determined that the planning process should be facilitated by a group of subject matter experts who would be responsible for decision making, technical input and document review. This group was named the Mitigation Core Team (MCT), and was comprised of the individuals shown in Table 3.2.1-1. The third column in the table describes the responsibilities of each member of the team in the 2008 update process.

**Table 3.2.1-1  
Membership of the New Jersey State Hazard Mitigation Plan Update  
Mitigation Core Team (MCT)**

Core Team Member	Organization	Role in the Planning Process
Sgt. Jeffrey Crapser	New Jersey Office of Emergency Management	Project manager for State. Chairman of the Updated Plan, responsible for leading the teams and meetings, supporting data collection requests, overall project coordination. Liaison with FEMA Region II.
Pete Dennen	New Jersey Office of Emergency Management	Lead coordinator from NJOEM for all data collection, dissemination and organization for the MCT and SHMT. Primary liaison with consultant team, MCT and SHMT. Primary technical reviewer for all sections of the plan update.
Tom Rafferty	New Jersey Office of Emergency Management	Lead IT and GIS coordinator. Coordinated HAZUS-related activities. Liaison with State Treasury for matters related to inventories of State-owned facilities and the LBAM database. Staff responsible for HAZUS tabular data extracts used in flood and wind risk assessments. Coordinated land use/land cover analyses and provided technical review.
Joe Ruggeri	NJDEP, State NFIP Coordinator's Office	Primary technical reviewer for all flood-related aspects of the mitigation plan update. Technical advice on NFIP, dam safety, and flood-related regulations.
Helen Owens	New Jersey Department of Environmental Protection	Expertise in land use, environmental issues, floodplain management and hazards statewide.
Mike Drake	NJ Forest Fire Service	Technical review of all hazard sections, focus on those related to fire hazards, fire regulations and fire history.
Jeffrey Burns	New Jersey Department of Treasury	Expertise in grants, budget and management of critical facilities. Input on State facilities aspects of the plan update.
Karl Muessig	New Jersey Geological Survey	Primary technical reviewer for all geological hazards. Technical expertise in earthquakes, landslides, and subsidence statewide.
David Robinson	NJ State Climatologist	Primary reviewer for all weather-related hazards covered in the plan.



### 3.2.2 Consultant Team

The State was supported by a consultant team led by Jeffrey S. Ward and Associates (JSWA), with support from Vissering Pardue and Associates (VPA) and Princeton Hydro (PH). The consultant facilitated numerous aspects of the process, and provided technical support for certain key aspects, such as the risk assessment. The MCT met four times during the course of the Plan update. Meeting dates and general subject matter are shown in Table 3.2.2-1. Meeting minutes are located in Appendix F.

**Table 3.2.2-1  
Meeting Dates and Subject Matter for Mitigation Core Team  
during the 2008 NJ State Mitigation Plan Update**

<b>MCT meeting date</b>	<b>Subject Matter</b>
28 August 2007	Initial kickoff, review old plan to new plan gap analysis, discussed roles and responsibilities, discussed makeup of MCT and SHMT, and reviewed update plan structure
02 October 2007	Status of work completed to date, overview of meeting with FEMA RII, finalized make up of SHMT, update on HAZUS runs, identify State owned and critical facilities
28 November 2007	Hazard identification, and risk assessment, review and update actions from original, MCT feedback on draft sections
15 January 2008	Comprehensive review of all plan sections, STAPLEE process on actions
05 February 2008	Final pre-draft review of all plan sections, with changes from 1/15 meeting

### 3.2.3 The State Hazard Mitigation Team (SHMT)

The SHMT consists of representatives identified under Executive Order #115 (Florio) with responsibilities that include, but are not limited to, the following:

1. Identifying hazards, monitoring changes in hazard vulnerability, and implementing measures for reducing potential damage by providing a mechanism for follow-up activities crucial to the successful implementation of team recommendations.
2. Developing and maintaining a comprehensive state hazard mitigation plan for the reduction of natural hazards.
3. Promoting public awareness of risks associated with known hazards and preparedness among residents of the State.
4. Serving as an advisory group to the Governor's Advisory Council on Emergency Services (GACES) and preparing post-disaster hazard mitigation recommendations for all applications for assistance.
5. Investigating and recommending cost-effective hazard mitigation opportunities to the NJOEM and the GACES as part of any disaster recovery effort.



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**Table 3.2.3-1  
Membership of the New Jersey State Hazard Mitigation Plan Update  
State Hazard Mitigation Team (SHMT)**

Name	Affiliation or Agency	
Jeffrey Crapser	New Jersey Office of Emergency Management	State Hazard Mitigation Officer and project manager for State. Chairman of the Updated Plan, responsible for leading the teams, supporting data collection requests, overall project coordination.
Jack Donnelly	Office of the Governor	Chairman of the SHMT and authority on behalf of the Governor.
Paul Miller	New Jersey Office of Emergency Management	Provide the team with work completed since 2005 approved plan.
Peter Dennen	New Jersey Office of Emergency Management	Lead coordinator from NJOEM for all data collection, dissemination and organization for the MCT and SHMT.
Kathy Lear	New Jersey Office of Emergency Management	Expertise in FMA/HMGP planning and projects.
Stacey Murphy	New Jersey Office of Emergency Management	Expertise in PDM planning.
Thomas Rafferty	New Jersey Office of Emergency Management	Lead IT and GIS coordinator.
Helen Owens	New Jersey Department of Environmental Protection	Expertise in land use, environmental issues, floodplain management and hazards statewide.
Joseph Ruggeri	New Jersey Department of Environmental Protection	Expertise in NFIP, dam safety, and flood-related regulations.
Gary Rice	New Jersey Department of Environmental Protection	Expertise in Green Acres program for NJ.
Vince Mazzei	New Jersey Department of Environmental Protection	Expertise on coastal area regulations, projects and issues.
Michael Drake	New Jersey Department of Environmental Protection	Expertise in fire hazards, fire regulations and fire history.
Maris Gabliks	New Jersey Department of Environmental Protection	Expertise in fire hazards, fire regulations and fire history.
Robert Sudol	New Jersey Department of Transportation	Expertise in road construction, drainage related road construction, policies enforced by DOT regarding contraflow and evacuation routes, emergency management, and the budget and CIP processes at DOT.
Lisa Webber	New Jersey Department of Transportation	Expertise in road construction, drainage related road constructions, policies enforced by DOT regarding contraflow and evacuation routes, emergency management and the budget and CIP processes at DOT.
Susan Bauer	New Jersey Department of Banking and Insurance	Expert in insurance industry regulations and work with insurance industry to promote mitigations efforts within industry, industry standards and with the insured.
Steve Mattson	New Jersey Department of Banking and Insurance	Expert in insurance industry regulations and work with insurance industry to promote mitigations efforts within industry, industry standards and with the insured.



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Name	Affiliation or Agency	
Carmine Giangiruso	New Jersey Department of Community Affairs	Expertise in Building Code and Standards, Smart Growth processes, and inspectors programs (to ensure enough inspectors are available to jurisdictions faced with a disaster/emergency)
Stephen Iaquinto	New Jersey Division of Military and Veterans Affairs	Liasion to the US Army Corp of Engineers and expertise with National Guard/ NJ military capabilities
Charles Guylas	New Jersey Division of Military and Veterans Affairs	Liasion to the US Army Corp of Engineers and expertise with National Guard/ NJ military capabilities
Thomas Balaint	New Jersey Office of the Attorney General	Expert in NJ Statutes, regulations and legal review of plan
Carl Wyhopen	New Jersey Office of the Attorney General	Expert in NJ Statutes, regulations and legal review of plan
Jeff Burns	New Jersey Department of Treasury	Expertise in grants, budget and management of critical facilities
Karl Muessig	New Jersey Geological Survey	Technical expertise in earthquakes, landslides, and subsidence statewide.
Richard Dalton	New Jersey Geological Survey	Technical expertise in earthquakes, landslides, and subsidence statewide.
Dave Robinson	New Jersey State Climatologist	Expertise in weather-related hazards statewide.
Jim Watt	Office of the State NFIP Coordinator	Technical expertise in flood insurance program policy and regulations.
Steve Jandoli	NJDEP	Expertise in NFIP, dam safety, and flood-related regulations.

The State Hazard Mitigation Team met once during the plan update process and was provided a detailed explanation of the process, the preliminary results of the vulnerability assessment and loss estimation, and a discussion of the Mitigation Strategy section. When the draft plan was completed in mid-February, each member of the SHMT was sent an email requesting their review and comment on the document. The draft plan was made available to the SHMT via postings on the various sites noted above, and via email, depending on individual needs. The SHMT was provided an email address where they could send feedback. When the planning team received this feedback, it was compiled into a single document and circulated to the MCT, so this group could determine on a case-by-case basis which comments should be incorporated.

The plan update was carried out on the schedule shown in Table 3.2.3-2.

**Table 3.2.3-2  
Development Schedule, 2008 New Jersey State Hazard Mitigation Plan Update**

Description	Begin	End	Participation
Initial meeting with NJOEM staff	08/28/07	08/28/07	NJOEM, JSWA
General data collection	08/28/07	12/31/07	JSWA, MCT
Hazard data collection	08/28/07	12/31/07	JSWA, MCT
First MCT meeting	10/02/07	10/02/07	MCT, JSW
Hazard ranking/identification/profiling	08/29/07	11/02/07	JSWA, MCT
Secondary data development (hazards)	08/29/07	11/02/07	JSWA, MCT
Mitigation goals/objectives/strategies	08/29/07	11/28/07	JSWA, MCT
Implementation strategy	08/29/07	11/02/07	JSWA, MCT



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Description	Begin	End	Participation
Risk Assessment	08/29/07	11/02/07	JSWA, MCT
Second MCT Meeting	11/28/07	11/28/07	Staff, MCT, JSWA
SHMT and MCT meetings	01/15/08	01/15/08	SHMT, MCT, JSWA
Draft mitigation plan to NJOEM	01/15/08	01/15/08	JSWA
Third MCT meeting	02/05/08	02/05/08	Staff, MCT, JSWA
Final draft mitigation plan	--	02/15/08	JSWA
Review by SHMT, other groups	02/15/08	02/29/08	MCT/SHMT/Others
Final edits, final review	03/01/08	03/07/08	MCT, JSWA
NJOEM final review	03/10/08	03/14/08	MCT/NJOEM
Submit to FEMA Region II	--	03/17/08	NJOEM
Review/comment by FEMA Region II	TBD	TBD	FEMA Region II
Plan adoption	03/21/08	04/28/08	NJOEM

### 3.2.4 Plan Submission and Maintenance

Upon the FEMA Regional Director's written acknowledgment to the Governor that the New Jersey State Hazard Mitigation Plan update has been approved, the Plan will be distributed to the SHMT and to the Governor's Advisory Council on Emergency Services (GACES) and will be made available to interested parties via posting on the NJOEM web site, and by request to the State Hazard Mitigation Officer. NJOEM coordinated distribution of the updated SHMP to county and local emergency management officials and other appropriate organizations.

## 3.3 Coordination with State and Federal Agencies, and Interested Groups

### 3.3.1 Coordination with State Agencies

Due to its early colonization and development, New Jersey's land development patterns and emergency management programs were established long ago. Partnerships were formalized by creation of the 1984 State Hazard Mitigation Plan, and the State agency partners have continued to participate in developing revisions to that plan. While this current State Hazard Mitigation Plan is in a new format prescribed by FEMA which has challenged existing state emergency planning structures, the legacy of several decades of significant coordination between and among state agencies in implementing hazard mitigation projects and plans remains intact.

This planning effort was undertaken by representatives of the key State agencies involved in preparing for, responding to, recovering from and mitigating natural hazards. These entities comprised the State Hazard Mitigation Planning subcommittee: The New Jersey Office of Emergency Management, the New Jersey Department of Environmental Protection, the New Jersey Department of Community Affairs, the New Jersey Department of Treasury, the New Jersey Department of Transportation, the Department of Banking and Insurance, the New Jersey Board of Public Utilities, the New Jersey Office of Information Technology, the New Jersey State Climatologist and the Office of the Attorney General.



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In addition to providing memoranda, maps, digital data and narratives identifying natural hazards and specific program responsibilities for inclusion within this plan, the respective roles of these agencies in this planning process were, and continue to be, as identified in Table 3.3.1-1.

Table 3.3.1-1  
State Agency Coordination, New Jersey State Hazard Mitigation Plan

State Agency	Roles
Office of Emergency Management (New Jersey Department of Law and Public Safety, Division of State Police)	Oversight and management of state and local hazard mitigation plan preparation process; identification and evaluation of mitigation planning programs and opportunities; coordination of mitigation planning with preparedness, response and recovery planning and event management; coordination of natural hazard mitigation with mitigation of manmade hazards, including terrorism.
Department of Environmental Protection	Provision and analysis of digital data and research publications and memoranda; assessment of natural hazards, identification of management programs; direct participation of the State Coordinator for the National Flood Insurance Program, the Office of Land Use Regulation, Forest Fire Service, Geologic Survey and other experienced personnel; coordination with state and federal programs affecting natural hazard mitigation including open space conservation, historic preservation, water resources management, dam safety and shore protection.
Department of Community Affairs	Assessment of building codes and their development, oversight and enforcement affecting hazard mitigation; coordination of state and local planning policies and initiatives affecting land use and infrastructure investments through State Development and Redevelopment Plan and needs for hazard mitigation; oversight of local government fiscal management; technical support for local redevelopment and revitalization initiatives that provide opportunities for hazard mitigation.
Department of Treasury	Identification of resources available for program implementation through oversight of state agency budgets; identification and management of state property and state owned and leased facilities potentially vulnerable to natural hazards.
Department of Transportation	Planning, management and integration of all transportation facilities to ensure the safe, efficient and effective movement of people and goods; planning and project implementation to reduce vulnerabilities to natural hazards and to mitigate potential impacts of natural hazards on critical transportation infrastructure; identify and reduce vulnerabilities of people and materials to natural hazards through emergency evacuation or other needs and initiatives.
Department of Banking and Insurance	Identification of opportunities to improve the collection of data regarding property losses associated with natural hazard events; identification of opportunities to ensure that hazard mitigation is given proper consideration in private sector banking, insurance and real estate transactions.
Board of Public Utilities	Provision and analysis of natural hazard information affecting the provision of electric power, telecommunications, public water, sewage collection and treatment, and other regulated public utilities.
Office of Information Technology	Provision of digital data and identification of opportunities for establishing, organizing and enhancing data necessary to improve identification and mitigation of natural hazards.
State Climatologist	Collection and management of weather, hydrologic and associated meteorological data; identification of opportunities to analyze and present data in ways that facilitate hazard mitigation planning and decision making.



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State Agency	Roles
Office of the Attorney General	Define policies and procedures for hazard mitigation planning and project implementation consistent with appropriate precedent and practice.

Each participating agency presented its programs, identified mitigation programs and opportunities, and subsequently discussed revisions to the plan required by FEMA. Each of the State agency members contributed data and analytical information to the plan (including the hazard and vulnerability analysis), provided draft narrative for inclusion in the plan, assisted in development and selection of mitigation strategies, reviewed all drafts of all sections of the plan and, through discussions at meetings of the planning subcommittee and of the State Hazard Mitigation Team, provided other relevant information on their subject areas of expertise. Plans and programs provided by or through New Jersey state agencies for hazard mitigation measures and funding are discussed throughout this plan. For the 2008, each of the agencies noted in the table above were either included in the process (as described earlier), or received separate notification that the draft plan update was available for review.

Throughout the development of the updated Plan, the NJOEM Mitigation Unit, the State Hazard Mitigation Officer (SHMO) and members of the SHMT informed the public about the updated plan, reached out to organizations to help educate, review and encourage participation by their members in hazard mitigation plans, and solicited comments from the public at various venues. Table 3.2-1-1 provides a brief overview of these efforts.

**Table 3.3.1-2  
Public Outreach Efforts during the 2008 Plan Update Process**

Event	Organization	Date
New Jersey Association for Floodplain Management Annual Conference	New Jersey Association of Floodplain Management	October 18-19, 2007
<i>Department of Environmental Protection, the New Jersey Office of Emergency Management, the National Weather Service. Testimony concerning flood mitigation and response from the New Jersey.</i>	Public Hearing before Assembly, Statewide Flooding legislative panel	September 24, 2007
Delaware River Greenway Partnership (DRGP) Fall forum	Delaware River Greenway Partnership	October 29, 2007
<i>United States Army Corps of Engineers, the New Jersey Association for Floodplain Management, the New Jersey State League of Municipalities, distinguished experts from the academic community. Testimony concerning flood mitigation.</i>	Panel Meeting of Statewide Flooding legislative panel	October 10, 2007
NJ League of Municipalities Annual Conference	NJ League of Municipalities	November 13-15, 2007

- The Coordination Role of the State Hazard Mitigation Team

As noted in Subsection 3.2.2, the State Hazard Mitigation Team (SHMT), which was established by Governor's Executive Order #115 (Florio), is the means that NJOEM uses to coordinate its mitigation activities with other State agencies. Since the first version of the NJ All Hazard Mitigation Plan (Plan) was approved in April, 2005, members of the SHMT have been meeting quarterly to assess mitigation projects,



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prioritize applications for submittal, and determine if there are any changes to the Plan. Table 3.3.-1-3 shows meeting dates and agenda items for SHMT meetings from fall, 2005 to the present.

**Table 3.3.1-3  
General Agendas for SHMT Meetings 2005-2007**

Meeting Date	Agenda
September 6, 2005	<ul style="list-style-type: none"> <li>Call to Order</li> <li>Update on the Status of the Stevens PDM Planning Project</li> <li>Update on continued revisions required for the State Hazard Mitigation Plan</li> <li>Update on General Program Status: HMGP for DR 1530 and 1563; PDM FY 05 Applications and FY 06 Application Period; FMA FY 05 Applications received</li> <li>Review of Letters of Intent Submitted for DR-1588</li> <li>New Business</li> </ul>
November 22, 2005	<ul style="list-style-type: none"> <li>Call to Order</li> <li>Status on obtaining additional staff member for Mitigation Unit</li> <li>Review of the Letters of Intent (20 received)</li> <li>Update on current projects</li> <li>Discussion of upcoming PDM workshops to encourage remaining 18 counties to apply for PDM planning grant funds</li> <li>Review of All Hazard Mitigation Plan</li> </ul>
January 27, 2006	<ul style="list-style-type: none"> <li>Call to Order</li> <li>Review of DR 1530, DR 1563 and DR 1588 plan and projects</li> <li>Discussion of FY 2003 PDM Human Services Project – to be completed end of 1-2006</li> <li>Review of FY 06 PDM planning applications (Of 11 applications, five were sent to FEMA). Five were prioritized by NFIP data, the Counties with the most repetitive losses were selected: Bergen, Cape may, Monmouth, Passaic and Somerset.</li> <li>Review of FMA planning</li> <li>Review FMA projects</li> <li>Review of the All Hazard Mitigation Plan</li> </ul>
April 12, 2006	<ul style="list-style-type: none"> <li>Call to Order</li> <li>Review of Applications under FY 06 PDM, FMA and DR 1588</li> <li>Review of the Status of Current Projects</li> <li>Review and Task Assignment for the State Hazard Mitigation Plan</li> <li>New Business</li> </ul>
September 20, 2006	<ul style="list-style-type: none"> <li>Call to Order</li> <li>Review status of Current Projects for DR 1530, 1588, 1563, and 1653.</li> <li>Status of Counties and PDM grants for planning</li> <li>Discussion of increasing SHMT membership</li> <li>Request for SHMT to support Fire Service Efforts on tree removal along the Garden State Parkway</li> </ul>
January 10, 2007	<ul style="list-style-type: none"> <li>State of the State Plan</li> <li>Update on Mitigation Unit activities</li> <li>Prioritize 2007 PDM-C applications</li> <li>Discuss 2007 FMA and RFC applications</li> <li>Addressing Severe Repetitive Loss Structures</li> <li>Review future meeting dates</li> <li>Issues of concern</li> <li>Adjourn</li> </ul>
April 18, 2007	<ul style="list-style-type: none"> <li>Call to Order</li> <li>Update on the State of the Status's Mitigation Plan</li> <li>Announcement of Benefit/Cost Training</li> <li>Report from the Federal Grant Coordination Sub-Committee</li> <li>Creation of other Working Sub-Committees</li> <li>Status of 2007 Federal Applications</li> </ul>



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Meeting Date	Agenda
August 8, 2007	Call to Order State Hazard Mitigation Plan revision assistance Review of Current Projects Review of HMGP Process Review of the LOIs submitted under DR 1694 and next steps Discuss use of 5% set aside for state mitigation projects New Business
January 15, 2008	Meeting was dedicated to discussion of all section of draft State Hazard Mitigation Plan

### 3.3.2 Coordination with FEMA Region II and Other Federal Agencies

Early in the 2008 Plan update process, NJOEM contacted FEMA Region II to advise them of the process that the State would follow, and to request Regional cooperation in developing the document. This was particularly important because of the relatively short time frame allotted to complete the update. FEMA Region II agreed that it would best serve the interests of the State to significantly re-structure and edit the HMP to ensure that the updated version is well organized and correctly responds to FEMA Interim Final Rule requirements.

The relationship between the State Hazard Mitigation Officer, the Mitigation Unit and FEMA Region II is very informal. Conversation, guidance and coordination between the various FEMA program managers and NJOEM are almost a daily occurrence. Formalized training occurs upon request from the SHMO to FEMA. NJOEM conducts various workshops throughout the year with FEMA support as requested or required.

During the yearly program rollouts, naturally the amount of coordination between Region II and NJOEM significantly increases. Application development coordination is especially important and has been very successful cooperative effort. Project development and administration has required an informal and close working relationship with the FEMA Region. As NJOEM or FEMA has become aware of significant changes within program guidance or laws and regulations, more formal meetings or training will take place involving all of the appropriate personnel at the State and federal agency level.

Due to the nature of the work, much of the coordination and collaboration were done through telephone calls, emails and in person meetings. Due to staffing constraints, NJOEM relies heavily on the guidance of its FEMA Region II partners for help in the development of applications; technical assistance, local plan questions, implementation support and Hazard Plan Update guidance. Regions II support and assistance is an invaluable asset to the NJOEM and the SHMT to meet their mitigation priorities, goals and actions. In addition to ongoing work, Region II has been a source of guidance and assistance with updating the HMP by providing a Disaster Assistance Employee to help with hazard data collection and analysis, dedicating time and resources to review sections of the plan, attends SHMT meetings, and answer any questions the MCT has as it updates the plan.

In addition routine, formal and informal communications took place between State personnel and personnel from FEMA and other Federal agencies closely associated with the planning, regulatory and investment activities of the State agencies. For example, NOAA, the United States Army Corps of Engineers and USEPA typically oversee or implement programs through the New Jersey Department of Environmental Protection, which in turn related Federal opportunities and constraints regarding potential natural hazard mitigation efforts for the State Hazard Mitigation Plan through its representatives on the State Hazard Mitigation Team. The New Jersey Department of Transportation addresses natural hazard mitigation issues in the course of its coordination of policies, plans and projects with agencies within and associated with the United States Department of Transportation. Federal land holding agencies in New Jersey, such as the Department of Defense and the National Park Service and Fish and Wildlife Service of



the United States Department of the Interior, actively cooperate in mitigation planning, funding, and resource sharing in fuel reduction and wildfire suppression activities on and around their properties. The United States Department of Agriculture, Forest Service is a major provider of funding, training, and standards for all wildfire programs in New Jersey. As an example of the cooperation shared with these agencies, the “East Plains Fire Shed Management Plan,” being developed with National Fire Plan monies provided by the USDA Forest Service, will work to mitigate wildfires caused by errant bombs on the Warren Grove Bombing Range. This wildland/urban interface mitigation plan covers 75,000 acres in six municipalities within two counties surrounding the range.

FEMA requires all municipalities to develop and adopt natural hazard mitigation plans to be eligible for a range of mitigation assistance and grants from FEMA. The Agency has provided significant funding assistance to New Jersey to develop hazard mitigation plans. Additional information regarding the preparation of local hazard mitigation plans in New Jersey is provided in Section 4 of the 2005 version of the State Hazard Mitigation Plan and Section 6 of the 2008 update.

### 3.3.3 Coordination with Other Interested Groups

In addition to its collaborative work with other State Agencies and FEMA, The NJOEM and the NJDEP work closely with various organizations, interstate Task Forces and Commissions that work on mitigation from a regional perspective. Members of the SHMT participate on the Flood Task Force for NJ and for DRBC. Table 3.3.3-1 lists the various organizations with which NJOEM regularly interacts on issues of hazards and hazard mitigation. Those that are not directly represented on the MCT and the SHMT were notified when the draft plan was available for review, and were requested to provide feedback to NJOEM.

**Table 3.3.3-1  
New Jersey Organizations with ongoing involvement with  
NJOEM on Hazard Mitigation and Mitigation Planning**

Organization	Mission	NJ State Representative
<b>Delaware River Basin Commission (DRBC)</b>	The Delaware River Basin Commission was created in 1961 by a federal-interstate compact. The Delaware River Basin Commission is a water resource agency with authority to regulate, plan and coordinate management of the water resources of the Delaware Basin. The Commission’s members are the governors of the states of New York, New Jersey, Pennsylvania and Delaware and a federal member appointed by the President. Since 1997, the federal member has been the North Atlantic Division Commander of the U.S. Army Corps of Engineers, based in Brooklyn, New York. Each commissioner has one vote of equal power with a majority vote needed to decide most issues. Unanimity is required for votes on the annual budget and drought declarations. The Commission holds business meetings and hearings on policy matters and water resource projects under regulatory review. These sessions, along with meetings of the commission’s various advisory committees, including their Flood Advisory Committee, are open to the public. DRBC’s Flood Advisory Committee (FAC) was established in 1999. The committee has since served to coordinate and leverage federal, state and local agencies efforts to improve the basin’s flood warning system and mitigate flood losses.	The members of the Delaware River Basin Commission are the governors of the four basin states and a federal representative. Each member appoints alternate commissioners. Governor Corzine is currently the Commissioner for NJ and NJDEP Commissioner Jackson is his alternate.



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Organization	Mission	NJ State Representative
<b>Delaware River Basin Interstate Flood Mitigation Task Force</b>	<p>The Delaware River Basin Interstate Flood Mitigation Task Force was assembled in October 2006 at the request of the governors of the four basin states (New York, New Jersey, Pennsylvania and Delaware). The Task Force is comprised of 32 members from a geographically diverse array of government agencies (legislative, executive, federal, state and local), private businesses and not-for-profit Organizations. The group has identified a total of 45 consensus recommendations in a report issued in July 2007 that calls for a proactive, sustainable, and systematic approach to flood damage reduction. The recommendations are based upon a set of six guiding principles concerning floodplain restoration, floodplain protection, institutional and individual preparedness, local stormwater management and engineering standards, and the use of structural and non-structural measures. The report is available online at <a href="http://www.drbc.net">www.drbc.net</a>.</p>	<p>NJ Members of the Interstate Task Force include: John Moyle, P.E., Manager, Bureau of Dam Safety and Flood Control, New Jersey Department of Environmental Protection (NJDEP); Sgt. Paul Miller, State Hazard Mitigation Officer, New Jersey Office of Emergency Management (NJOEM); David K. Burd, Emergency Management Coordinator, City of Lambertville, NJ; Marcia A. Karrow, Hunterdon and Warren Counties, NJ State Assemblywoman; Congressman Rush Holt (D-12), Member of the Delaware River Basin Congressional Task Force.</p>
<b>NJ Flood Mitigation Task Force</b>	<p>The Delaware River Basin Interstate Flood Mitigation Task Force was assembled in October 2006 at the request of the governors of the four basin states (New York, New Jersey, Pennsylvania and Delaware). The Task Force is comprised of 32 members from a geographically diverse array of government agencies (legislative, executive, federal, state and local), private businesses and not</p>	<p><b>Honorable Lisa P. Jackson*</b>, Commissioner of the New Jersey Department of Environmental Protection (DEP), <b>Carol Collier</b>, Executive Director of the Delaware River Basin Commission (DRBC), <b>Honorable David M. Del Vecchio</b>, Mayor of Lambertville, <b>Elizabeth Johnson</b>, Trenton Resident and CEO of Isles, Inc., <b>Robert Medina</b>, P.E., President of Medina Consultants, <b>John Miller</b>, P.E., CFM, Senior Water Resource Engineer for Princeton Hydro, LLC, <b>Sergeant First Class Paul Miller</b>, State Hazard Mitigation Officer for NJ State Police, <b>Professor James K. Mitchell</b>, Chairman of the Rutgers Department of Geography, <b>Honorable Douglas H. Palmer</b>, Mayor of Trenton, <b>Henry S. Patterson, III</b>, Executive Director of the New Jersey Water Supply Authority, <b>Lt. Colonel Robert J. Ruch</b>, Philadelphia District of the U.S. Army Corps of Engineers, <b>Jeff Scott</b>, Planning/zoning chair, Frenchtown Borough, <b>Cleighton D. Smith</b>, P.E., CFM, Senior Project Manager for Dewberry &amp; Davis, <b>Maya K.</b></p>



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Organization	Mission	NJ State Representative
		van Rossum, Delaware River Keeper, <b>Gregory J. Westfall</b> , USDA Natural Resources Conservation Service, <b>Honorable Harry L. Wyant, Jr.</b> , Mayor of Phillipsburg
<b>Delaware and Raritan Canal Commission</b>	Established in October, 1974, when Governor Brendan Byrne signed the D&R Canal State Park Law. The Commission was created to accomplish three main tasks: To review and approve, reject or modify any action by the State in the Canal Park, or any permit for action in the park; to undertake planning for the development of the Canal Park; and to prepare and administer a land use regulatory program that will protect the Canal Park from the harmful impacts of new development in central New Jersey	<b>David DelVecchio</b> , <i>Chairman</i> Martin D. Jessen, <i>Vice-Chairman</i> <b>Richard C. Albert</b> <b>Lisa P. Jackson</b> <b>David H. Knights</b> <b>John S. Loos</b> <b>Phyllis L. Marchand</b> <b>Alison Mitchell</b> <b>Douglas H. Palmer</b>
<b>NJ League of Municipalities</b>	New Jersey State League of Municipalities is a voluntary association created to help communities do a better job of self-government through pooling information resources and brain power. It is authorized by State Statute and since 1915, has been serving local officials throughout the Garden State. All 566 municipalities are members of the League. Over 560 mayors and 13,000 elected and appointed officials of member municipalities are entitled to all of the services and privileges of the League	<b>William Dressel</b> , Executive Director of the New Jersey League of Municipalities.
<b>NJAFM</b>	The New Jersey Association for Floodplain Management (NJAFM) is dedicated to reducing loss of life and property damage resulting from floods and promoting sound floodplain management at all levels of government. Our organization of 170 active New Jersey members is a chapter of the national Association of State Floodplain Managers (ASFPM), with 11,000 individual members and chapter members strong. Our goals are to heighten awareness of flood risk, provide education, promote mitigation and improve communication to protect public safety, property and the economy.	<b>Ms. Laura Tessieri</b> , Chair.

In addition to the agencies and organizations listed in the table above, the 2005 version of this Plan listed several additional offices and agencies with some involvement with hazard mitigation. This section is retained verbatim from the original plan.

### **New Jersey Office of Smart Growth**

In response to the need for increased coordination between the State Planning Commission and other agencies of state government with the New Jersey Office of Emergency Management, the Office of Smart Growth (Department of Community Affairs) has taken action to ensure that emerging issues related to mitigation and planning are effectively addressed.

Policies promoting hazard mitigation planning incorporated into land use and infrastructure plans at all levels of government were incorporated into the revised New Jersey State Development and Redevelopment Plan prepared under New Jersey's State Planning Act and adopted by the New Jersey State Planning Commission, and independent, quasi-legislative body, in March 2001. Agencies participating in the State Hazard Mitigation Team, either as members of the State Planning Commission itself or as members of the Interagency Smart Growth Team,



have an opportunity to alert the State Planning Commission and Office of Smart Growth when any proposed changes to the State Development and Redevelopment Plan may encourage development in hazard prone areas, cause potential threat to nearby areas, or reduce open space that provides flood storage. Proposed changes to the State Development and Redevelopment Plan were being identified, evaluated and negotiated in early 2005 as this State Hazard Mitigation Plan was prepared. Through initiatives such as the “endorsement” of local land use plans by the State Planning Commission, local governments are encouraged to incorporate local hazard mitigation planning in “smart growth” initiatives.

In addition, a member of the Office of Smart Growth Executive Management Team serves on the State Hazard Mitigation Team. This individual reports issues of concern to the Office of Smart Growth Executive Director who serves as NJOSG’s primary interface with the State Planning Commission. Information is also shared with the State Hazard Mitigation Team from the State Planning Commission through a similar process.

The Office of Smart Growth serves as staff to the State Planning Commission and coordinates and facilitates two implementation teams. The Interagency Smart Growth Team, representing twelve state agencies, serves as a deliberative body for smart growth policy and strategy including emerging hazard mitigation issues. The Smart Growth Project Review Team (also interagency) facilitates the completion of redevelopment projects in Planning Areas 1, 2 and Designated Centers as defined in the State Development and Redevelopment Plan.

One recent major project, under development in Bloomfield, New Jersey, involved potential flood plain issues. Through the cooperative efforts of the Department of Environmental Protection, Office of Smart Growth, local officials and the developer, plans were created to mitigate any potential flood issues. These steps were taken to ensure that no loss of life or property would occur as a result of this important redevelopment project.

The staff member who represents the Office of Smart Growth on the State Hazard Mitigation Plan Team and communicates issues of concern to the State Planning Commission leads both teams. Recommendations of the State Hazard Mitigation Plan Team will be communicated to the Chairperson of the State Planning Commission for inclusion in the State Development and Redevelopment Plan prior to its next adoption.

## **Floodplain Management Committee**

In 2004, a newly formed Floodplain Management Committee was established under the New Jersey Section of the American Water Resources Association. NJOEM is represented on this committee. This committee’s work can be identified as a new initiative to develop a plan to address flood hazards and mitigation. In January 2005 the Association mailed a survey to all NJ municipal mayors to determine local capabilities, needs and interests regarding floodplain management, in order to facilitate the development of programs to address these needs. Expanded use of GIS and other tools may be developed to facilitate the local’s needs. Results of the survey will be available at [http://www.awra.org/state/new\\_jersey/](http://www.awra.org/state/new_jersey/).

In 2006, the Floodplain Management Committee became a chapter of the Association of State Floodplain Managers, under the name New Jersey Association for Floodplain Management. The purpose of the organization is described in the organization’s constitution, and includes a range of floodplain management-related issues, including promoting public awareness of proper floodplain management, encouraging the exchange of ideas about floodplain management, informing concerned individuals about pending floodplain and coastal management legislation, and studying and supporting floodplain management legislation, among other missions.



## **New Jersey Department of Transportation Capital Project Planning**

The New Jersey Department of Transportation coordinates its capital planning with hazard mitigation through four routinely updated documents (including the date of the most recent update):

1. "Ranking for Statewide drainage Projects" (updated annually, last update 08/07)
2. "Division of Design Services - Status of NJDOT Dams 2005" (last update 02/08)
3. "Overall Scour Report-State -Owned Bridges" (continuously updated)
4. "Overall Scour Report-County-owned Bridges" (continuously updated)

## **3.3 Integration into other Ongoing State Planning Efforts**

### **NJ State Development and Redevelopment Plan.**

Office of Smart Growth/ State Planning Commission/Department of Community Affairs. The State Planning Act of 1985, N.J.S.A. 52:18A-196 et seq., empowered the State Planning Commission with the responsibility to prepare, revise, and readopt the New Jersey State Development and Redevelopment Plan (State Plan) every three years. The State Plan was adopted using the process of Cross-acceptance, a legislatively mandated process whereby planning policies are reviewed by government entities at all levels and the public to assess their consistency with each other and with the State Plan. The State Plan was developed for the purpose of promoting cooperative planning among municipalities, counties, regional entities and the State, to change the way land use decisions have been made in our State over the past 30 years, and to promote sustainable economic growth in a way that sensibly balances the need to protect open space. Thanks to years of work evaluating the goals, policies and strategies of the State Plan, we now have a clear framework for what the landscape of New Jersey should look like in 2025.

## **State Facilities Risk Management Program**

The State of New Jersey addresses hazard mitigation for State-owned and State-leased properties through the Bureau of Risk Management in the Department of the Treasury in association with its insurance carrier(s). Each facility is required to have an emergency response plan in place along with a loss prevention and control program that includes a "red tag permit system" supervising all fire protection water supply valve closures, an electrical system maintenance program and a risk assessment of all plans for additions or other changes to building construction, protection or building use.

In advance of Hurricane Isabel, the Bureau of Risk Management distributed copies of a detailed, four-page Flood Checklist to each State department specifying actions to be taken when flood threatens, after a flood, and each year prior to flood season. In addition, Flood Emergency Response Plans have been developed, or are being developed, and updated each February for each State facility. These plans include:

1. An overview of the flood threat, identifying the source of potential flooding and the depth of 100 year and 500 year floods relative to the floor heights of each facility;
2. Monitoring procedures during potential flood events, including regular observations of flood heights in water bodies, listening for flood alerts, and checking local water backup points at bridges, culverts and storm drains during heavy rain and thunderstorms to ensure drainage is not obstructed;



3. An action matrix addressing areas sensitive to potential impacts of flood waters and required responses to weather advisories, changes in river elevation, flood and post-flood conditions; and
4. Lists of emergency contacts and approved contractors for future mitigation and remediation.

## Coastal Land Use Regulation Program

NJDEP is also involved in a variety of hazard mitigation initiatives as part of the Coastal Zone Management Program and as part of the Department's interaction with FEMA related to the National Flood Insurance Program (NFIP). The Coastal Area Facilities Review Act (N.J.S.A. 13:19), the Waterfront Development Law (N.J.S.A. 12:5-3), and the Wetlands Act of 1970 (N.J.S.A. 13:9A) provide rules and regulations governing development in vulnerable coastal areas of New Jersey. Department staff routinely provides information to and work directly with municipal officials and property owners in the hazard identification, vulnerability analysis and mitigation planning. Through the NJDEP regulatory programs, hazard mitigation activities are often required as a condition of a permit approval.

New Jersey's coastal zone is vulnerable to various coastal hazards including chronic and episodic erosion, flooding, storm surge, tropical and extratropical storms, wind, and sea level rise. Many areas of the coast were developed before there was an informed appreciation of coastal hazards. Consequently, extensive areas of dense development exist in areas subject to coastal hazards. Moreover, recent population increase, as evidenced by the 2000 census data, has placed more people and property at risk from these hazards. With the continuing trend of sea level rise, this vulnerability will increase.

Development continues in hazardous areas along the coast, particularly reconstruction of existing residential development and the conversion of single family/duplex dwellings into multi-unit dwellings. In many cases, modest seasonal shore homes are replaced with larger year-round dwellings. As a result, the number of people and value of the property at risk is significantly increasing. On the other hand, improved hazard resistant construction techniques and hazard sensitive building standards are resulting in more storm-resistant coastal development.

Coastal hazard vulnerability, particularly along the intensely developed oceanfront areas of New Jersey, is often influenced by the management practices on the adjacent beaches, dune systems, and shorelines. Protection, management, and enhancement of these important features, is a critical component of the New Jersey Coastal Management Program. With more than 50 municipalities, numerous beach associations and hundreds of private property owners controlling beach and dune areas, management practices and the resultant degree of vulnerability vary greatly.

New Jersey's Coastal Management Program has responded to these hazards in several ways. New Jersey has adopted a number of enforceable policies that deal directly with development in hazardous areas. These standards are codified in the Coastal Zone Management rules. These standards are designed to facilitate sound management of beaches, dunes, and shorelines throughout the coast to establish and support a consistent line of protection in the form of well-maintained and protected beaches and dunes. The standards are also intended to reduce development in the most vulnerable areas and provide that any such development is located to reduce potential damage from coastal hazards, and does not adversely affect either the adjacent shorelines or structures or ecosystem.

In oceanfront and bay front areas, NJDEP rules prevent additions to or tearing down and rebuilding homes that result in place the home closer to an eroding shoreline, or in additional encroachment on dunes that is not mitigated for by enhancing the dune as a shore protection feature. These enforceable policies also prohibit much residential development in V-zones, and govern beach and dune disturbance. Further, these Coastal Zone Management rules



contain standards for beach and dune management and implementation of Best Management Practices (BMPs). These standards also maximize the benefits of the Federal/State beach nourishment program by restoring the natural and beneficial functions of the beach and dune systems.

Among the enforceable policies in riverine and bay front areas are regulations that strongly encourage the use of bioengineering as a preferred alternative to hard shoreline protection structures, particularly along the lower energy shorelines of the back-bays and rivers. By reflecting wave and current energy, bulkheads have frequently caused scour and erosion of sensitive environmental resources. NJDEP has also successfully promoted construction of sloped riprap revetments as an alternative to bulkheads. Sloped revetments have less impact on marine and estuarine resources because they tend to dissipate wave and current energy and thus reduce erosive and scour effects.

The NJDEP Coastal Management Office is the conduit for federal Coastal Zone Management grants that may be used for hazard mitigation activities such as historical shoreline change mapping projects, educational programs and coastal area planning initiatives. Under NOAA's 309 Grant Program, the Coastal Management Office has provided and will continue to provide pertinent information for local and State hazard mitigation plans. These efforts include disseminating coastal hazards information through the Coastal Management Program website; working with municipalities to provide the public with information regarding the limitations of beach nourishment; and data collection, such as beach and dune mapping and beach profile mapping to determine the degrees of vulnerability of coastal communities. Pursuant to Federal regulations at 15 CFR 930, Federal activities affecting the coastal zone are required to be consistent with approved state coastal management programs.

## Coastal Blue Acres

The Green Acres, Farmland Historic Preservation and Blue Acres Bond of 1995 contained \$15 million for the creation of a new program: Coastal Blue Acres (CBA). These funds were divided into two parts: \$6 million dollars which has been used for pre-storm acquisition of unimproved or largely unimproved storm damage prone and buffer lands. Nine million dollars has been reserved for post-storm funding to acquire properties that have suffered at least a 50% reduction in the value of improvements as a result of storm damage. These properties can be located anywhere on a coastal barrier island, within 150 feet of the mean high water line of a tidal waterway or 150 feet of the landward limit of a beach or dune.

The purpose of CBA is to provide grants and loans to county and municipal governments to acquire, for recreation and conservation purposes, lands in the coastal areas that:

- Have been damaged by storms or storm related flooding
- May be prone to incurring damage by storms or storm related flooding
- Buffer or protect other lands from storm damage

CBA acquisitions can only be made from willing sellers. The CBA legislation specifically prohibits the use of eminent domain by a local government in acquiring land using CBA funding. Municipalities must be willing participants in the program as well. Sites acquired with CBA funding will be restricted to minimal improvements for public access. The development of recreation facilities that could become a storm hazard is prohibited.

The CBA legislation also states that all lands acquired with CBA funds shall be regulated under existing Green Acres rules. This includes submission of a recreation and open space inventory and the attachment of contractual restriction to all CBA acquired lands and all other lands held by a local government for conservation and recreation purpose.



## Building Codes

The Department of Community Affairs has adopted building codes that address different hazards that affect New Jersey. The State has adopted the 2000 International Building Code (IBC) and the 2000 International Residential Code (IRC) modified to comply with State laws. These address the construction of new buildings and their relationship to weather-related and geological hazards.

**Table 3.4-1  
 Natural Hazards/Building Codes**

	Hazard	IBC Code
Geological	<b>Sinkholes and landslides</b>	The current Building Subcode provides requirements for soils investigations before a building is designed that addresses these issues.
	<b>Earthquakes</b>	The current Building Subcode provides requirements for soils investigations before a building is designed that addresses these issues.
Meteorological	<b>High Wind</b>	The Building Subcode and the One and Two Family Subcode (IBC and IRC 2000, New Jersey edition) has the latest wind maps and requires new buildings to be designed and constructed using these current values. In the years since the Uniform Construction Code was adopted, the requirements for building construction has been changed to address the current requirements concerning wind pressure requirements.
	<b>Flooding</b>	The IBC and IRC 2000, New Jersey Edition, requires new buildings to be designed and constructed to comply with the most recent requirements concerning construction in a flood hazard area (A and V zones).
	<b>Wave Action</b>	Under the IBC and IRC 2000, New Jersey requires new buildings to be designed and constructed to comply with the most recent requirements concerning construction in a flood (velocity) hazard area (coastal V zones).
	<b>Drought</b>	The Plumbing Subcode and the Energy Subcode of the Uniform Construction Code provide water conservation standards.
Manmade	<b>Conflagration (Fire)</b>	The Uniform Construction Code provides for fire safety through the Building Subcode. The requirements for combustibility/non-combustibility, suppression, ratings of exterior walls, etc. address this area. New Jersey fire departments that report to the Division of Fire Safety use a National reporting system, developed by the Federal Government, referred to as N.F.I.R.S. 5.0 (National Fire Incident Reporting System). This system captures information regarding fire department responses to emergencies in the community. The benefit of this system is that the information collected is "all-incident," not just fire related, giving a computer generated statistically accurate picture of to which hazards the fire service responds. Additionally, this system provides the SHMT the ability to address trends in urban and wildland fires. Not all fire departments in New Jersey report fires using NFIRS. About 60-70% of fire departments submit incident reports to the Division of Fire Safety.
	<b>Energy</b>	The Uniform Construction Code provides for energy conservation through the adoption of the Energy Subcode. Further, the code officials in the State of New Jersey receive continuing education for all new code requirements and all other aspects of the adopted codes.



## Hurricane Programs

The NJOEM, in conjunction with the FEMA Region II, the New Jersey Department of Environmental Protection, the National Weather Service and the U.S. Army Corps of Engineers/Philadelphia District, has completed a technical data report entitled "New Jersey Hurricane Evacuation Study 1992". This study has been reviewed by interested parties and the data is being used to increase the State's preparedness levels. This comprehensive report contains data quantifying the major factors involved in hurricane evaluation decision-making. Proper use of this study will permit each county to update and revise hurricane evacuation plans and operational procedures.

## State Transportation Improvement Plan Flood Mitigation Projects

Over recent years, approximately \$2 billion per year has been spent on transportation projects. Along with state investments, transportation programs rely substantially on capital financing provided by the federal government. The state's Transportation Trust Fund (TTF) and the federal Transportation Equity Act for the 21st Century (TEA-21) primarily provide funding for transportation projects. TEA-21 also established a nationwide pilot program to help communities reconcile land use and transportation decision-making, which includes opportunities to integrate hazard mitigation in both transportation and land use planning and projects.

The New Jersey Department of Transportation works closely with the three Metropolitan Planning Agencies (MPOs) in New Jersey. Projects using Federal funding are first approved through the State Transportation Improvement Plan (STIP) as a result of discussions between the Department and the MPO. Once federal funding is approved the project is moved into the planning phase. The Department planning process begins with the submission of a "Problem Statement", which can come from any number of sources. Highway infrastructure repetitive issues and losses are rolled into the NJDOT Drainage Management System and are dealt with through the NJDOT Capital Program or Maintenance Repair Contracts. In either case project execution is dependent on annual funding allocations. During the planning and scoping processes for each project, whether State, Interstate, Freeway, or Land Service, flooding mitigation reviews are implemented up to the 100-year storm. These mitigation efforts include but are not limited to, expanded drainage system, enlarged drainage system, retention/detention basins and vortex chambers.

An example of NJDOT mitigation efforts is the replacement of the New Jersey Route 72 bridge in Ocean County. This existing bridge is the only egress from Long Beach Island and is recognized as a vulnerable area for that reason. Working within the NJDOT, the Offices of Design and of Emergency Management are providing mitigation efforts in the planning of the new bridge with the addition of a pumping station immediately on entering the island. The project remains several years "out" in the capital budget at this time. NJDOT maintenance, Traffic Operations Centers and office buildings have historically not sustained repetitive losses due to flooding or natural hazards.

## Tidal Gauge Monitoring

As a method of pre-emptive mitigation, the USGS has put in place a series of tidal gauges recording real time information that is transmitted directly to the USGS and the Weather Service. These gauges are located along the coast of the Delaware Bay and River and are used by DOT and NJOEM to follow tidal changes before and during a



weather event. Due to budget constraints through, DOT will no longer fund the monitoring and maintenance. NJOEM has agreed to take on the funding until December 2007. Due to a coordinated effort, NJOEM was given notice of the DOT lack of funding in advance and was able to offset the closing of the program due to lack of funds. The New Jersey Association for Floodplain Management and the New Jersey League of Municipalities is presently working with the State legislature to find a secure and permanent source of funding for this program.

## State of New Jersey Water Emergency Plan

The State of New Jersey Water Emergency Plan approved in 2002 guides the necessary actions to be taken in response to a potential water shortage situation or water shortage emergency pursuant to the Water Supply Management Act and the Emergency Management Act. It describes the responsibilities of the New Jersey Department of Environmental Protection under the Water Supply Management Act with respect to the State's water supply in such an emergency and serves as a supplement to the State Emergency Operations Plan.

## NJDEP Dam Safety Program

The purpose of the Dam Safety program is to minimize the possibility of a dam failure and to mitigate the effects of dam failures that do occur. A dam failure on a sunny day can cause major floor damage and a dam failure during a general flood event can greatly increase flood damage.

The Division of Engineering and Construction, Dam Safety Program published Dam Safety Standards, N.J.A.C. 7:20. Under N.J.A.C. 7:20-1.4, General Requirements and Prohibitions, subsection (g) states: "The Department may deny any application for a dam permit, based upon its conclusion that the construction or operation of a dam will cause an unacceptable threat to or impact on natural or cultural resources or the environment".

N.J.A.C. 7:20-1.7 Application Stage, subsection (f), states: "All applicants must submit an Operation and Maintenance Manual in accordance with N.J.A.C. 7:20-1.1 and applicants for Class I and II dams (see N.J.A.C. 7:20-1.8) shall prepare and submit an Emergency Action Plan which shall at least include a Dam Breach Analysis, Inundation Maps and Emergency Notification and Evacuation Plans." The NJDEP developed Guidelines For Developing An Emergency Action Plan, on file at NJOEM, to assist dam owners in the preparation of an emergency action plan.

In 1912 the legislature of the State of New Jersey instituted laws relating to the construction, repair, and inspection of existing and proposed dams. The law was amended in 1981 and became known as the Safe Dam Act. New Jersey's Dam Safety program is administered by the Department of Environmental Protection, Division of Engineering and Construction, Bureau of Dam Safety and Flood Control, under rules and regulations promulgated in May 1985 known as the Dam Safety Standards

In New Jersey, a dam is any artificial barrier, together with appurtenant works that raise the waters of a stream more than five feet above the usual mean low water height. The Bureau of Dam Safety and Flood Control reviews plans and specifications for the construction of new dams, or for the alteration, repair or removal of existing dams and must grant approval before the owner can proceed with caution. All applicants must submit an Operation and Maintenance Manual and applicants for Class I and II dams must prepare and submit an Emergency Action Plan. The New Jersey Office of Emergency Management maintains a number of published plans and procedures to facilitate coordination in hazard preparedness, response, recovery and mitigation (see below). Many of these plans are prepared and maintained through interdepartmental efforts.



## Other State Agency Plans Guiding Mitigation Actions

1. State of New Jersey Emergency Operations Plan, March 2005, New Jersey Office of Emergency Management. This plan sets for guidance policies and procedures for State departments and agencies, counties and municipalities in their development of emergency plans and in their support of state emergency management activities.
2. Winter Storm Procedures, January 2005, NJ Office of Emergency Management. This procedure provides describes the actions necessary to properly respond to and manage a winter storm event from the state Emergency Operations Center.
3. Reverse 911 Procedures, August 2004, NJ Office of Emergency Management. This plan sets guidance policies and procedures for notification by telephone of residents of selected areas of impending or actual events that may affect life and safety
4. Hurricane Procedures, July 2004, NJ Office of Emergency Management. This procedure describes the actions necessary to properly respond to and manage a hurricane event from the state Emergency Operations Center.
5. State Warning Plan, June 2004, NJ Office of Emergency Management. The purpose of this plan is to alert the affected segments of a given population to have them take specific protective action.
6. State of New Jersey Water Emergency Plan, February 2002, NJ Office of Emergency Management and NJ Department of Environmental Protection. This plan provides guidance for the necessary actions to be taken and response to a potential water shortage situation or water shortage emergency.
7. Emergency Alert System Operational Plan, June 2001, NJ Office of Emergency Management. This plan provides direction and control for the NJ state emergency communications committee of the emergency alert system in accordance with the rules, regulations and policies of the Federal Communications Commission.

## 3.5 Integration into other FEMA Mitigation Programs and Initiatives

The NJOEM is responsible for educating, reviewing and administering many of the mitigation grant programs that FEMA offers. In this capacity, NJOEM works closely with FEMA to understand the requirements necessary for grant applications and utilizes on-line and in-person training that FEMA provides as well as establishing effective communication with FEMA Region II in support of further educating NJ communities to the grant opportunities, applications and obligations as well as obtain guidance to help facilitate grant application. In addition to NJOEM coordination with FEMA, the NJ DEP works with FEMA as the NFIP Coordinator for the State. NJOEM administers grants that FEMA awards for Severe Repetitive Loss (SRL), Repetitive Loss (RL) Pre-Disaster Mitigation (PDM), Flood Management Assistance (FMA) and Hazard Mitigation Grant Program (HMGP).

Appendix H of the 2008 plan update is a fact sheet NJOEM provides to communities that explains the various grant opportunities.

- National Flood Insurance Program (NFIP)

The NFIP is administered by the NFIP Coordinator within the NJ Department of Environmental Protection. The NFIP Coordinator works closely with NJOEM on all NFIP issues, since eligibility for pre- and post-disaster programs relies on participation in the program. The three components of the program are: flood insurance, floodplain management, and flood hazard mapping. The NFIP makes federally backed flood insurance available to homeowners, renters, and



business owners in the participating communities. Community participation in the NFIP is voluntary. Gaining municipality participation in the NFIP and encouraging property owners to purchase flood insurance significantly reduces disaster costs. Together these programs systematically reduce flood exposure to people and their property. Of the 566 municipalities in NJ, there are 546 participating in the NFIP. The NFIP Coordinator works closely with FEMA to educate or inform communities of their responsibilities

- **Flood Mitigation Assistance Program (FMA)**

Although the NFIP is administered by NJDEP, the FMA program is the responsibility of NJOEM. NJOEM works with the SHMT to identify, prioritize, and implement FMA programs. There are three types of grants available under FMA: Planning, Project, and Technical Assistance Grants. FMA Planning Grants are available to States and communities to prepare Flood Mitigation Plans. NFIP participating communities with approved Flood Mitigation Plans can apply for FMA Project Grants. FMA Project Grants are available to States and NFIP participating communities to implement measures to reduce flood losses. Ten percent of the Project Grant is made available to States as a Technical Assistance Grant. These funds may be used by the State to help administer the program. Communities receiving FMA Planning and Project Grants must be participating in the NFIP. The program requires a 75/25 cost share.

- **Hazard Mitigation Grant Program (HMGP)**

HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP, administered by FEMA, provides grants to States and local governments to implement long-term hazard mitigation measures after a federal disaster declaration. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The Program requires a 75/25 cost-share. The SHMT reviews all applications. The SHMT will review, select, and prioritize applications for potential projects.

Hazard mitigation planning is an important aspect of a successful mitigation program. A fundamental component of the DMA2K is the emphasis on planning. The State is eligible for up to 15% of the overall federal disaster expenditures if the State has an approved Standard All Hazards Mitigation Plan. Hazard mitigation planning is a collaborative process whereby hazards affecting the community are identified, vulnerability to the hazards is assessed, and consensus reached on how to minimize or eliminate the effects of these hazards.

- **Pre-Disaster Mitigation Program (Competitive) (PDM-C)**

PDM is authorized by §203 of the Robert T. Stafford Disaster Assistance and Emergency Relief Act (Stafford Act), 42 USC, as amended by §102 of DMA2K. Funding for the program is provided through the National Pre-Disaster Mitigation Fund to assist States and local governments in implementing cost-effective hazard mitigation activities that complement a comprehensive mitigation program. All applicants must be participating in the NFIP if they have been identified as having a Special Flood Hazard Area. In addition, the community must not be suspended or on probation from the NFIP. The NJOEM works directly with the FEMA Region II program coordinator to develop and submit projects and plans for funding consideration. 44 CFR Part 201, Hazard Mitigation Planning, establishes criteria for State and local hazard mitigation planning authorized by §322 of the Stafford Act, as amended by §104 of the DMA.

After November 1, 2003, local governments and Indian Tribal governments applying for PDM funds through the States need to have an approved local mitigation plan prior to the approval of local mitigation project grants. States are also required to have an approved Standard State mitigation plan in order to receive PDM funds for State or local mitigation projects after November 1, 2004. Therefore, the development of State and local multi-hazard mitigation



plans is key to maintaining eligibility for future PDM funding. NJOEM mitigation staff works with local jurisdictions to develop projects for potential PDM funding.

- Severe Repetitive Loss Grant Program (SRL)

Early in 2008 FEMA initiated the Severe Repetitive Loss Grant Program, which makes available mitigation grant funds to reduce losses to a high-risk subset of NFIP repetitive loss properties. In addition to these funds being available through a new, dedicated source, the program also offers an improved 90/10 federal/non-federal cost share when certain conditions are met. These are described in detail in Appendix G of the 2008 NJ HMP.

### 3.6 Incorporation of Local Plans

When the 2005 plan was approved, no local plans had been approved, and therefore there were none to incorporate into the State HMP. Since the April 2005 plan was approved, both Atlantic City and the City of Wayne have developed and adopted local hazard mitigation plans. The State has included in Section 5 of the updated plan an action to review these documents and incorporate germane sections into the State plan as appropriate. The State will also review these plans with the intent of further refining its approach to assisting localities and regions as they develop plans. The SHMO, NJOEM and SHMT have been working with the 21 counties and 566 municipalities to educate communities about the benefits of a plan, support any requests for assistance in planning applications, and providing review and analysis of plans in conjunction with FEMA Region II so that communities understand the requirements for plan approval.

As noted in various other places in the 2008 Plan update, the State has facilitated (and FEMA has funded) numerous grants to support development of local and regional hazard mitigation plans. The grants are shown in the two tables below.

**Table 3.6-1  
 2005 and 2006 Planning Grants in New Jersey**

<b>Government</b>	<b>Source</b>	<b>FEMA Funds</b>	<b>Other Funds</b>	<b>Total</b>
Mercer, Hunterdon, Warren and Sussex Counties	FMA	\$97,000	\$32,858	\$129,858
Burlington	FMA	\$63,700	\$21,233	\$84,933
Burlington	HMGF	\$71,899	\$23,966	\$95,865
Essex	PDM	\$1,176,187	\$392,062	\$1,568,250
Hudson	PDM	\$879,999	\$303,600	\$1,183,600
Monmouth	PDM	\$345,375	\$103,615	\$448,990
Somerset	PDM	\$199,000	\$59,700	\$258,700
<b>Total</b>		<b>\$2,833,160</b>	<b>\$937,034</b>	<b>\$3,770,196</b>



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**Table 3.6-2**  
**2007 Planning Grants in New Jersey**

2007 Mitigation Planning Grants				
Government	Funding Source	FEMA Funds	Other Funds	Total
Camden/Cumberland/Salem/Gloucester	PDM	\$463,000	\$155,000	\$618,000
Atlantic	PDM	\$165,000	\$55,000	\$220,000
Cape May	PDM	\$474,000	\$158,000	\$632,000
Middlesex	PDM	\$200,000	\$66,000	\$266,000
Morris	PDM	\$300,000	\$100,000	\$400,000
Passaic	PDM	\$225,000	\$75,000	\$300,000
Union	HMGP	\$375,000	\$125,000	\$500,000
<b>Total</b>		<b>\$2,202,000</b>	<b>\$734,000</b>	<b>\$2,936,000</b>

Section 6 (Coordination of Local Planning) includes a more detailed description of NJOEM's plan to incorporate local plans into the State document. The State intends to remain closely engaged with these local and regional entities as they develop plans, to offer technical support, and to ensure that the State and local documents are well integrated. In developing the State HMP, NJOEM has obtained and analyzed a significant amount of technical data, which will be provided to local and regional planners. Part of the technical support that the State will offer includes descriptions of specific methodologies that should be used in vulnerability assessments and loss estimations. The State will also offer to review interim versions of local and regional plans and provide feedback to planners in key subject areas. NJOEM believes this will improve the consistency of the local plans, and make them more easily integrated into the State HMP. NJOEM will also facilitate information sharing among local and regional planners as HMPs are developed over the next two years.

The present section of the State HMP will be updated periodically, as the local plans are developed and new and more detailed information is available.



## Section 4 Risk Assessment

### Contents of this Section

- 4.1 Interim Final Rule Requirements for Risk Assessments
- 4.2 Background and General Discussion of Risk Assessment
- 4.3 Methodology for Identifying Statewide Hazards of Concern
- 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 Risk Assessments

### 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 Risk Assessment

### 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.

#### Risk

In the context of hazard mitigation planning risk is defined as the expected future losses to a community, business or State from the effects of natural events. Risk is often expressed in terms of future monetary losses because this provides a common measure that can be used to compare the effects of different hazards. 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 possible future events over a specific time period. Capturing a long period of time allows repetitive events to be included in the risk calculation. In many cases data is *annualized* to express the chance of a hazard occurring each year.

#### Probability

Probability is the likelihood that a hazard will impact a particular place. 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.

#### Severity

Severity is the measure of “how bad” a hazard event is. Severity is measured in various ways, depending on the hazard. For example, floods are 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

Vulnerability is the degree to which something is damaged by a hazard. 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

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 (such as R.S. Means, which was used as the basis for the hurricane wind risk assessment), experience of local officials, the FEMA HAZUS (Hazards U.S.) software.

## Risk

Risk is the estimated (and/or calculated) dollar value of future losses. Monetary values are used as the basis of risk so that different kinds of losses can be readily compared. For example, without a common basis for comparison, it would be virtually impossible to determine if the risk of injury from potential earthquakes is greater than damage to vehicles in potential floods. When the expected losses are expressed in dollars, damages can be compared and prioritized (and used in benefit-cost analysis to determine the cost effectiveness of projects that reduce the risk). In combination with the concepts discussed above, almost any kind of hazard can be quantified, although with varying accuracy. 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, so any risk calculus has considerable uncertainty.

Risk calculations often start with an annualized (yearly) loss figure, which is then projected into the future for some pre-determined period of time (sometimes called the *planning horizon*), then *discounted* to today's value using a discount rate. Discounting is a standard economic methodology that is required by the Federal government for analyses of many of its programs, including FEMA's mitigation initiatives. It is used to account for the decreasing monetary value of events that occur far in the future, such as natural hazards. 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.



## Section 4.3 Methodology for Identifying Statewide Hazards of Concern

In accordance with the requirements of the Interim Final Rule (Appendix B) all hazards with potential to affect New Jersey are profiled in this section of the Plan. However, because this is a State-level hazard mitigation plan it is useful to identify the hazards that are of the most concern Statewide, so these can be the focus of more detailed assessment. It is important to note, however, that many hazards and risks are very site-specific, so as regional and local jurisdictions develop mitigation plans they should recognize that this process and the resulting table should be used only as a guide, and that more detailed and localized vulnerability and risk assessments are required for local mitigation plans.

**Table 4.3-1  
State of New Jersey Qualitative Hazard Ranking**

Hazard	Rationale	Sources
Flooding	Widespread impacts, long history of occurrences in the State, significant annual damages	FEMA Flood Insurance Studies, numerous other studies for nearly all major flood sources, FEMA Flood Insurance Rate Maps, US Army Corps of Engineers, and National Oceanographic and Atmospheric Administration (NOAA), studies and records.
Hurricanes (wind)	Relatively low historic probability; potential for widespread impacts.	NOAA and National Climatic Data Center (NCDC) records, various studies of hurricane strike probability
Nor'easters	Moderate probability of more extreme events, potential for moderately widespread impacts.	National Weather Service (NWS), NOAA, NCDC, New Jersey State Climatologist.
Winter storms	High annual probability, widespread impacts, but losses generally limited except in most extreme events.	National Weather Service (NWS), NOAA, NCDC, New Jersey State Climatologist.
High Winds/Tornadoes	High annual probability, widespread impacts, but but losses generally limited except in most extreme events.	National Weather Service (NWS), NOAA, NCDC, New Jersey State Climatologist., ASCE and USACE wind maps.
Earthquakes	Relatively low annual probability, but potential for significant consequences	United States Geologic Survey (USGS), New Jersey Geologic Survey (NJGS).
Drought	High annual probability, but impacts generally limited	National Weather Service (NWS), NOAA, NCDC, New Jersey State Climatologist. New Jersey Department of Agriculture.
Wildfire	High annual probability of site-specific events, but impacts generally limited	New Jersey Fire Service, New Jersey State Climatologist.
Geological Hazards	High annual probability when all hazards are included in this grouping, impacts generally limited to northern part of the State, but potential for high level of damages under some scenarios.	United States Geologic Survey (USGS), New Jersey Geologic Survey (NJGS).
Hail	High annual probability but impacts are limited in severity and area	National Weather Service (NWS), NOAA, NCDC, New Jersey State Climatologist.



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Hazard	Rationale	Sources
Extreme Temperatures	Relatively high annual probability, but impacts are limited.	National Weather Service (NWS), NOAA, NCDC, New Jersey State Climatologist.
Coastal Erosion	Relatively high annual probability, but impacts are limited to coastal areas.	NOAA, USACE

Note that for the 2008 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 Hazard Profiles

### 4.4.1 Floods

#### Nature of the Flood Hazard

Flooding is the accumulation of water within a water body (e.g., stream, river, lake, or reservoir) and the overflow of excess water onto adjacent floodplains. As illustrated in Figure 4.4-1-1, floodplains are usually lowlands adjacent to water bodies that are subject to recurring floods. Floods are natural events that are considered hazards only when people and property are affected. Nationwide, hundreds of floods occur each year, making them one of the most common hazards in the U.S. (FEMA, 1997). Floods have been and continue to be the most frequent, destructive, and costly natural hazard facing the State of New Jersey. The large majority of the State's damage reported for major disasters is associated with floods. There are a number of categories of floods in the U.S., including the following:

- Riverine flooding, including overflow from a river channel, flash, alluvial fan, ice-jam, and dam breaks
- Local drainage or high groundwater levels
- Fluctuating lake levels
- Coastal flooding, including storm surges
- Debris flows
- Subsidence

Human activity has profound impacts on flooding. The two major activities which impact flooding are land use change and the building of flood control structures. The transportation network associated with land use change also affects flooding. In addition to the impacts of impervious paved surfaces, bridges and culverts usually constrict stream channels and flood plains. This aggravates upstream flooding, especially when the constrictions become clogged with ice or debris.

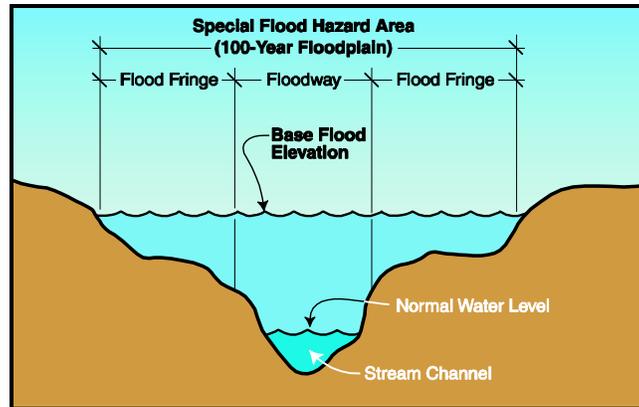
There are two major types of flooding that occur in New Jersey: Riverine flooding and coastal flooding. Riverine flooding is when the rate of rainfall or snowmelt exceeds the rate of infiltration to the ground, the excess water, called runoff, moves across the ground surface toward the lowest section of the watershed. As the surface runoff enters stream channels, stream levels increase. If the rate of runoff is high enough, water in the stream overflows the banks and flooding occurs.

#### Riverine Flooding

Riverine flooding occurs to some extent almost every year and is considered to be New Jersey's number one hazard. Flooding occurs most frequently between November and April, with a peak from February through April. Flooding occurs in both natural and developed watersheds.



**Figure 4.4-1-1**  
**Floodplain Definition (Source: FEMA, August 2001)**



Floods can happen almost anywhere in New Jersey, although they do tend to occur in and around areas near existing bodies of water, such as rivers, streams, and the Atlantic Ocean. FEMA Flood Insurance Studies and Flood Insurance As a rule, the most damaging floods affecting developed areas in New Jersey occur in the northern half of the State. This is a function of number of physiographic and physical features of the landscape. Greater geographic relief of the northern half of the State results in flowing water moving down steeper gradients, naturally or artificially channelized through valleys and gullies. Development patterns have resulted in denser development in north Jersey, and proximity to New York City boosts property values and thus damage dollar totals. Extensive development also leaves less natural surface available to absorb rainwater, forcing water directly into streams and rivers, swelling them more than when more natural surface existed. Since the Delaware, Raritan and Passaic rivers drain more than 90 percent of the northern counties in the State, these rivers and their tributaries are common locations for flooding. Source: <http://www.capitalcentury.com/1955.html>).

## Previous Flood Occurrences

### Riverine Flooding

Based on history, NFIP records, and analysis engineering data about floodplains (FEMA FIRM, DFIRM and Q3 data, primarily) it is clear that New Jersey is one of the more floodprone States in the nation. The NOAA/NCDC database reports 941 flood events just since 1996 (the data reporting truncates the list at that year because of its length). The total reported losses related to flooding are \$1.82 billion, according to NOAA. Because the definition of flooding is relatively broad, and because flooding can happen virtually anywhere, it is the most prevalent natural hazard almost everywhere in the U.S., including New Jersey. New Jersey has a significant coastline, and many rivers and streams, meaning that floods occur very frequently, although most are relatively minor.

The Delaware is one of the largest rivers on the east coast, and has flooded numerous times in the past. Just one of many examples is the Flood of August 1955 which produced record-high flows for the Delaware River at Trenton, New Jersey. This was brought on by back-to-back hurricanes, Connie and Diane. The cumulative total of rain for the two separate storms was 10 inches in 12 days (<http://www.capitalcentury.com/1955.html>). The Delaware River will continue to periodically overflow its banks for as long as it flows through the basin.



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- The Passaic River Basin is one of the most flood-prone river basins in the country. The April 1984 flood in the Passaic Basin claimed three lives, caused \$335 million in damages, and forced about 9,400 people from their homes. (USGS October, 2007)
- From 1993 until 2007 there have been 770 floods in New Jersey according to the NCDC. These floods have caused over a billion dollars in property damages and are responsible for 11 deaths and 196 injuries. Some of the most devastating floods causing over \$10 million in damages are described below.
- January 19th thru the 26th 1996. Flash flooding on the afternoon and early evening of the 19th led to larger river flooding through the 21st.
- October 19, 1996. Rain, very heavy at times around noon on the 19th caused widespread and severe flooding throughout Somerset County.
- August 20, 1997. Torrential rain fell across southeast New Jersey as a low pressure system developed over the Delmarva Peninsula and slowly moved northeast across southern New Jersey.
- September 16, 1999. Hurricane Floyd caused the most damage since the great floods.
- August 12, 2000. A nearly unprecedented thunderstorm with torrential downpour remained nearly stationary for about six hours.
- July 12, 2004. Flash Flood during the late afternoon and evening of the 12th, thunderstorms with torrential downpours kept on redeveloping along the Interstate 295 corridor in southern Burlington County and moved east.
- September 18, 2004. The remnants of Hurricane Ivan interacting with a slowly moving cold front caused widespread very heavy rain to fall during the first half of the day on the 18th in Warren County.
- March 2005. Following a major rainstorm in the last days of March 2005 and another between Friday, April 1 and Sunday, April 3, 2005, the Delaware River overflowed its banks, flooding an estimated 3,500 homes and forcing the evacuation of more than 5,500 people.
- July 17, 2005. Thunderstorms with torrential downpours caused flash flooding in the Manalapan Brook basin in southeastern Middlesex County.
- June 27, 2006. Several days of heavy rain throughout the Delaware River Basin culminated with major flooding along the Delaware River from the 28th through the 30th.

As noted in Subsection 4.5.3.3, which describes Statewide hazard vulnerabilities, flooding has been responsible for six of the most significant recent Presidentially-declared disasters in New Jersey, as shown in the table below.



**Table 4.4-1-3**  
**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

### **Coastal Flood and Storm Surge Occurrences in New Jersey**

NOAA's National Climatic Data Center database indicates that since 1996 there have been 941 floods, of which 96 were categorized as coastal. New Jersey's has 210-miles of coastline stretching from Raritan Bay in the north, along the Atlantic Coast to Delaware Bay in the south and includes the counties of Atlantic, Cape May, Ocean, and Monmouth. Though not as costly as other flood events, coastal flooding has caused beach erosion, damage to dunes and shore protection structures as well as tidal flooding impacts.

### **Tsunami-Related Flood Occurrences in New Jersey**

While the probability of a large tsunami impacting the coast of New Jersey is very small due to the position of New Jersey on the trailing edge of the North Atlantic Plate, the mid-Atlantic region has been subjected to minor tsunami action over the past 250 years and perhaps significant tsunami action over the last geologic period.

Lockridge, et al., (2002) analyzed tsunami and tsunami-like waves that have impacted the east coast of the United States and the National Geophysical Data Center of NOAA compiled a listing of all tsunamis and tsunami-like waves of the eastern United States and Canada. Forty-three potential tsunami events have been identified as possibly impacting the east coast of the United States between 1668 and 1992. Of these events, 15 are categorized as definite or probable tsunamis. Nine of the fifteen events generated either observed or possible impacts along the New Jersey. Three of the events were generated remotely and four were generated locally.



## Probability of Flood Occurrences

As noted elsewhere, the FEMA hazard mitigation planning Interim Final Rule requires that States perform vulnerability assessments and loss estimations as part of the planning process. The State vulnerability assessment is found in Subsection 4.5.

Floods are virtually certain to occur somewhere in New Jersey every year, so the Statewide probability is very high. When considering specific sites in the State, however, probability must be estimated using engineering studies or flood insurance statistics. As noted above, FEMA flood maps and flood insurance studies offer the best available information about where floods are likely to occur, and how often. There is virtually a 100 percent chance of floods occurring somewhere in New Jersey every year. Appendix I of the 2008 plan update includes Q3 and DFIRMs for every County in the State. Flood Insurance Studies can be obtained from the FEMA map service center.

## Flood Loss Estimation

The sections immediately below comprise the State loss estimation (risk assessment) for the flood hazard. Although the results of these methodologies provide reasonable loss estimates on a Statewide level, they should be used only as a way to identify areas where relative risk is higher, with the purpose of further assessment as the State or local jurisdictions develop and prioritize potential mitigation efforts.

Because flooding is clearly the most significant natural hazard risk in New Jersey – and because there is a large amount of data available about flood losses – the present hazard identification section includes a more detailed calculation of future losses (risk) than is afforded the other hazards. The following subsections estimate future losses based on several related methodologies. Note that Appendix G of this plan (Severe Repetitive Loss Mitigation Strategy) includes more detailed flood loss estimations for Repetitive Loss and Severe Repetitive Loss properties in New Jersey, based on the most current NFIP data available.

### **Flood Loss Estimation Method 1 Extrapolation of NFIP Flood Claims Data**

The most straightforward and reliable way to estimate future flood losses is to use historical data as the basis for calculating future losses. In the case of New Jersey, there is an extensive history of flood claims which indicates a total of more than 82,000 claims since the inception of the NFIP in the late 1970s. The State has one of the highest number of claims of any in the country, and is also among the highest in repetitive flood claims (as defined by FEMA/NFIP, see related discussion elsewhere in this section). Although this is clearly not a positive statistic for the State, it does mean that there is a rich data set on which to base estimations of additional losses. The most reliable methodology for doing so is to **annualize** the losses, then calculate future losses using a present value coefficient that expresses combinations of time horizons and discount rate. This is a standard statistical methodology, and is used by FEMA in its various benefit-cost analysis software programs. As noted elsewhere, the Office of Management and Budget requires most federal agencies to use a 7% discount rate in assessing benefits of their activities and programs, and that is used in the present calculation. The results of the calculations are displayed in Table 4.4-1-4.



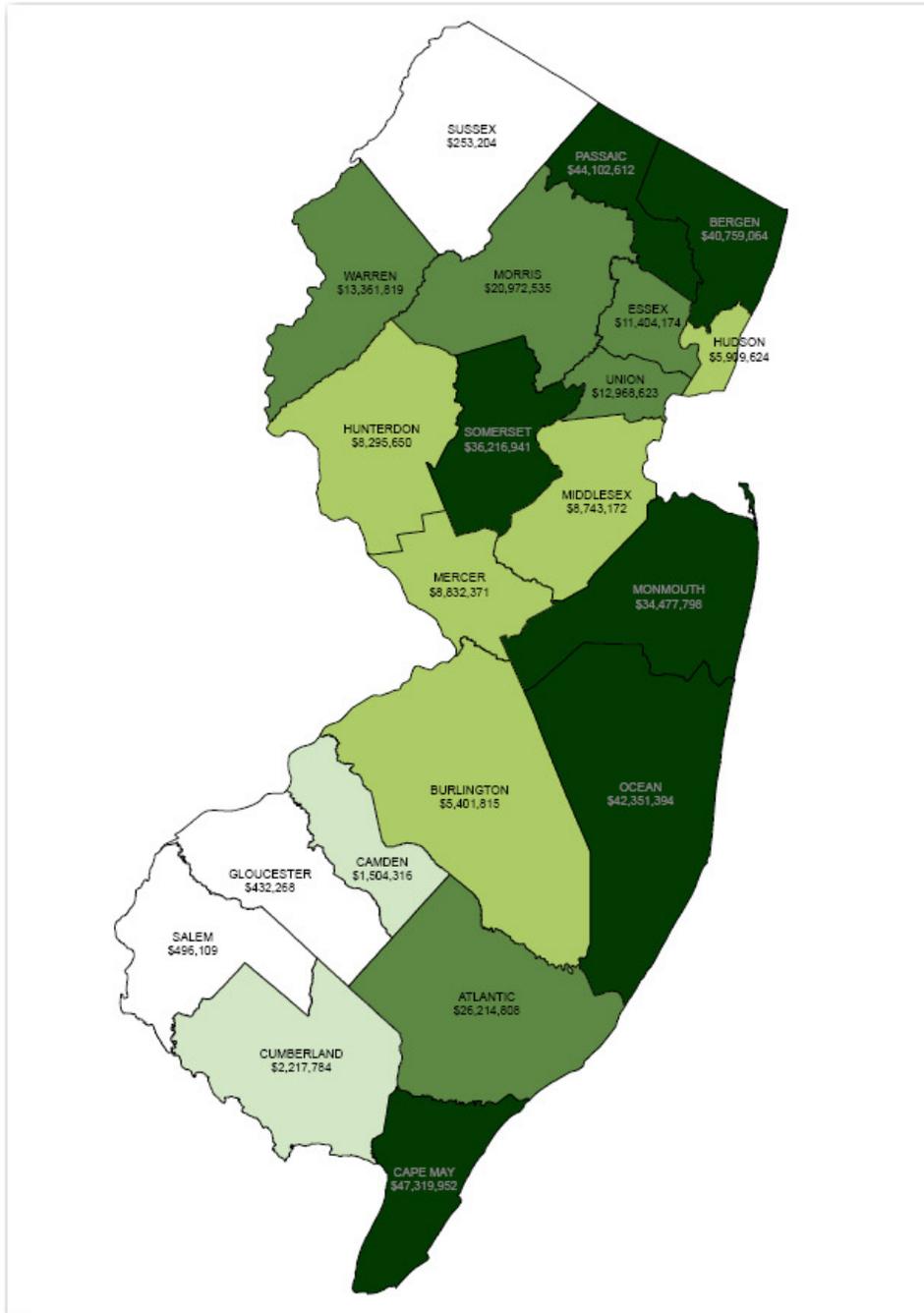
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**Table 4.4-1-4**  
**Annualized NFIP Flood Insurance Claims and Projected 50- and 100-year Losses (Risk),**  
**Ordered by Annual Claims Value**

<b>County</b>	<b>Annual NFIP Claims</b>	<b>Risk (50 year)</b>	<b>Risk (100-year)</b>
Cape May	\$3,316,044	\$45,761,411	\$47,319,952
Passaic	\$3,090,582	\$42,650,038	\$44,102,612
Ocean	\$2,967,862	\$40,956,499	\$42,351,394
Bergen	\$2,856,276	\$39,416,614	\$40,759,064
Somerset	\$2,537,978	\$35,024,092	\$36,216,941
Monmouth	\$2,416,104	\$33,342,229	\$34,477,798
Atlantic	\$1,837,057	\$25,351,391	\$26,214,808
Morris	\$1,469,694	\$20,281,779	\$20,972,535
Warren	\$936,357	\$12,921,731	\$13,361,819
Union	\$908,803	\$12,541,486	\$12,968,623
Essex	\$799,171	\$11,028,564	\$11,404,174
Mercer	\$618,947	\$8,541,466	\$8,832,371
Middlesex	\$612,696	\$8,455,205	\$8,743,172
Hunterdon	\$581,335	\$8,022,423	\$8,295,650
Hudson	\$414,129	\$5,714,983	\$5,909,624
Burlington	\$378,543	\$5,223,900	\$5,401,815
Cumberland	\$155,416	\$2,144,738	\$2,217,784
Camden	\$105,418	\$1,454,770	\$1,504,316
Salem	\$34,766	\$479,769	\$496,109
Gloucester	\$30,292	\$418,030	\$432,268
Sussex	\$17,744	\$244,865	\$253,204
<b>Total</b>	<b>\$26,085,216</b>	<b>\$359,975,982</b>	<b>\$372,236,034</b>



**Figure 4.5-1-4**  
**State of New Jersey Annualized NFIP Flood Insurance Claims**  
**and projected Losses (Risk) for 100 year Horizon**





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Table 4.4-1-5 shows various data and calculations for Severe Repetitive Loss properties in New Jersey, as provided by FEMA and the National Flood Insurance Program. The data in the “risk” columns shows the actuarial calculation of the potential maximum flood losses over 30- and 100-year planning horizons. These horizons are used because they correspond to the standard mitigation project life figures that FEMA uses in benefit-cost analysis for elevations and acquisition/demolitions, respectively.

**Table 4.4-1-5  
FEMA NFIP Actuarial Calculation of Potential Maximum Benefits  
for Mitigating SRL Properties, ordered alphabetically by New Jersey County**

County	Number of SRL Properties	Number of Claims	Total \$ Claims	% of Claims	30-year Risk/County	30-year Risk/Property	100-year Risk/County	100-year Risk/Property
Atlantic	33	234	\$3,883,453	4.16%	\$1,886,369	\$57,163	\$2,169,150	\$65,732
Bergen	27	144	\$4,518,894	4.84%	\$2,670,403	\$98,904	\$3,070,717	\$113,730
Camden	3	18	\$236,843	0.25%	\$180,069	\$60,023	\$207,063	\$69,021
Cape May	141	837	\$17,631,173	18.89%	\$9,376,381	\$66,499	\$10,781,971	\$76,468
Cumberland	1	13	\$280,261	0.30%	\$121,919	\$121,919	\$140,196	\$140,196
Essex	6	51	\$1,059,508	1.13%	\$465,346	\$77,558	\$535,105	\$89,184
Gloucester	1	13	\$102,804	0.11%	\$74,308	\$74,308	\$85,447	\$85,447
Hudson	2	8	\$153,549	0.16%	\$197,304	\$98,652	\$226,881	\$113,441
Hunterdon	10	33	\$3,050,297	3.27%	\$2,737,566	\$273,757	\$3,147,948	\$314,795
Mercer	3	16	\$284,018	0.30%	\$189,456	\$63,152	\$217,856	\$72,619
Middlesex	6	33	\$481,237	0.52%	\$309,908	\$51,651	\$356,366	\$59,394
Monmouth	11	51	\$2,010,354	2.15%	\$1,213,278	\$110,298	\$1,395,158	\$126,833
Morris	66	456	\$10,520,713	11.27%	\$4,956,735	\$75,102	\$5,699,788	\$86,360
Ocean	30	179	\$3,475,353	3.72%	\$2,268,795	\$75,626	\$2,608,904	\$86,963
Passaic	199	1,278	\$33,367,945	35.74%	\$15,920,245	\$80,001	\$18,306,811	\$91,994
Somerset	13	58	\$3,179,228	3.41%	\$1,925,061	\$148,082	\$2,213,643	\$170,280
Union	2	10	\$222,367	0.24%	\$142,397	\$71,198	\$163,743	\$81,871
Warren	40	152	\$8,898,507	9.53%	\$6,908,711	\$172,718	\$7,944,379	\$198,609
<b>Total</b>	<b>594</b>	<b>3,584</b>	<b>\$93,356,504</b>	<b>100.00%</b>	<b>\$51,544,251</b>	<b>\$86,775</b>	<b>\$59,271,126</b>	<b>\$99,783</b>



**Flood Loss Estimation Method 2  
Extrapolation of NFIP Repetitive Loss Claims Data**

This risk loss estimation methodology uses historical repetitive flood loss insurance claims data as the basis for estimating future losses. The methodology is based on annualizing losses by dividing the total losses by the number of years since the inception of the NFIP, then projecting future losses using a standard present value coefficient (which integrates the required 7% discount rate with planning horizons of 50 and 100 years, respectively). This type of analysis is reasonably accurate on a large scale such as a State, but County-level data should be reviewed carefully prior to use in local or regional planning exercises. Note that the columns entitled “50-year risk” and “100-year risk” are projections of annual losses for whole Counties. The columns at the far right of the table show projected future losses (risk) on a per-policy basis. The secondary (shaded) rows for each County show the same data for only those policies that have made four or more claims against the NFIP. The data can be used by the State and regions to identify patterns indicating where the most significant claims history has been. Note to local and regional planning entities: this data can be obtained in a spreadsheet form, and extends to the level of individual claims. Note that Appendix G of this Plan includes additional data related to Repetitive Loss and Severe Repetitive Loss properties, including the FEMA/NFIP actuarial calculation of the maximum potential benefits (risk) to SRL properties for 30- and 100-year planning horizons.

**Table 4.4-1-6  
Estimated Future Flood Losses to FEMA Repetitive Loss Properties, based on NFIP claims records,  
With 50- and 100-year Loss Projections on Countywide and Individual Policy Basis**

County	Group	Total Building Pmts	Total Contents Pmts	# Losses	Total Pmts	Average Annual Pmt	50-year risk	100-year risk	# Props/ Policies	Avg annual loss/policy	50- year risk/policy	100-year risk/policy
Atlantic	All RL	\$21,405,715	\$6,432,788	2,414	\$27,838,503	\$927,950	\$12,805,711	\$13,241,848	787	\$1,179	\$16,272	\$16,826
	4+ claims	\$9,958,362	\$3,424,743	1,062	\$13,383,105	\$446,104	\$6,156,228	\$6,365,897	197	\$2,264	\$31,250	\$32,314
Bergen	All RL	\$37,739,514	\$16,617,348	2,023	\$54,356,861	\$1,811,895	\$25,004,156	\$25,855,747	776	\$2,335	\$32,222	\$33,319
	4+ claims	\$8,380,271	\$8,935,986	542	\$17,316,257	\$577,209	\$7,965,478	\$8,236,766	94	\$6,141	\$84,739	\$87,625
Burlington	All RL	\$5,129,719	\$1,233,023	228	\$6,362,742	\$212,091	\$2,926,861	\$3,026,544	91	\$2,331	\$32,163	\$33,259
	4+ claims	\$470,977	\$107,361	53	\$578,338	\$19,278	\$266,036	\$275,096	10	\$1,928	\$26,604	\$27,510
Camden	All RL	\$862,874	\$184,812	126	\$1,047,686	\$34,923	\$481,936	\$498,349	50	\$698	\$9,639	\$9,967
	4+ claims	\$140,036	\$50,749	22	\$190,785	\$6,359	\$87,761	\$90,750	4	\$1,590	\$21,940	\$22,688
Cape May	All RL	\$48,994,017	\$20,436,970	6,192	\$69,430,988	\$2,314,366	\$31,938,254	\$33,026,006	1,904	\$1,216	\$16,774	\$17,346
	4+ claims	\$27,644,345	\$13,598,895	3,138	\$41,243,240	\$1,374,775	\$18,971,890	\$19,618,034	591	\$2,326	\$32,101	\$33,195
Cumberland	All RL	\$1,053,029	\$225,418	113	\$1,278,448	\$42,615	\$588,086	\$608,115	45	\$947	\$13,069	\$13,514
	4+ claims	\$251,974	\$100,381	24	\$352,355	\$11,745	\$162,083	\$167,604	3	\$3,915	\$54,028	\$55,868
Essex	All RL	\$7,400,252	\$5,077,233	624	\$12,477,486	\$415,916	\$5,739,643	\$5,935,124	768	\$542	\$7,473	\$7,728
	4+ claims	\$2,477,553	\$2,705,115	238	\$5,182,668	\$172,756	\$2,384,027	\$2,465,223	41	\$4,214	\$58,147	\$60,127
Gloucester	All RL	\$322,879	\$78,160	41	\$401,039	\$13,368	\$184,478	\$190,761	228	\$59	\$809	\$837
	4+ claims	\$52,483	\$22,858	7	\$75,341	\$2,511	\$34,657	\$35,837	1	\$2,511	\$34,657	\$35,837
Hudson	All RL	\$2,051,762	\$8,349,624	269	\$10,401,386	\$346,713	\$4,784,638	\$4,947,593	84	\$4,128	\$56,960	\$58,900



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County	Group	Total Building Pmts	Total Contents Pmts	# Losses	Total Pmts	Average Annual Pmt	50-year risk	100-year risk	# Props/ Policies	Avg annual loss/policy	50-year risk/policy	100-year risk/policy
	4+ claims	\$941,930	\$7,953,679	111	\$8,895,608	\$296,520	\$4,091,980	\$4,231,344	16	\$18,533	\$255,749	\$264,459
Hunterdon	All RL	\$13,383,447	\$1,154,686	493	\$14,538,133	\$484,604	\$6,687,541	\$6,915,305	184	\$2,634	\$36,345	\$37,583
	4+ claims	\$2,734,058	\$387,876	85	\$3,121,934	\$104,064	\$1,436,090	\$1,485,000	21	\$4,955	\$68,385	\$70,714
Mercer	All RL	\$8,721,701	\$7,342,029	726	\$16,063,731	\$535,458	\$7,389,316	\$7,640,981	255	\$2,100	\$28,978	\$29,965
	4+ claims	\$2,200,673	\$4,507,309	141	\$6,707,982	\$223,599	\$3,085,672	\$3,190,763	22	\$10,164	\$140,258	\$145,035
Middlesex	All RL	\$8,142,815	\$1,204,283	488	\$9,347,098	\$311,570	\$4,299,665	\$4,446,103	195	\$1,598	\$22,050	\$22,801
	4+ claims	\$1,452,794	\$297,254	69	\$1,750,048	\$58,335	\$805,022	\$832,440	14	\$4,167	\$57,502	\$59,460
Monmouth	All RL	\$23,719,726	\$6,374,456	1,553	\$30,094,182	\$1,003,139	\$13,843,324	\$14,314,799	603	\$1,664	\$22,957	\$23,739
	4+ claims	\$6,913,408	\$1,912,745	373	\$8,826,153	\$294,205	\$4,060,031	\$4,198,307	76	\$3,871	\$53,421	\$55,241
Morris	All RL	\$23,139,762	\$7,851,699	1,998	\$30,991,461	\$1,033,049	\$14,256,072	\$14,741,605	539	\$1,917	\$26,449	\$27,350
	4+ claims	\$13,999,273	\$4,825,505	1,198	\$18,824,777	\$627,493	\$8,659,398	\$8,954,319	209	\$3,002	\$41,433	\$42,844
Ocean	All RL	\$19,505,518	\$5,177,768	1,914	\$24,683,286	\$822,776	\$11,354,311	\$11,741,016	735	\$1,119	\$15,448	\$15,974
	4+ claims	\$5,313,412	\$1,780,379	543	\$7,093,792	\$236,460	\$3,263,144	\$3,374,280	111	\$2,130	\$29,398	\$30,399
Passaic	All RL	\$49,504,524	\$21,908,406	4,072	\$71,412,930	\$2,380,431	\$32,849,948	\$33,968,750	1,047	\$2,274	\$31,375	\$32,444
	4+ claims	\$28,756,766	\$13,040,087	2,521	\$41,796,853	\$1,393,228	\$19,226,552	\$19,881,370	425	\$3,278	\$45,239	\$46,780
Salem	All RL	\$228,115	\$25,033	35	\$253,148	\$8,438	\$116,448	\$120,414	13	\$649	\$8,958	\$9,263
	4+ claims	\$50,476	\$12,447	9	\$62,923	\$2,097	\$28,945	\$29,930	2	\$1,049	\$14,472	\$14,965
Somerset	All RL	\$42,536,555	\$9,072,149	1,503	\$51,608,704	\$1,720,290	\$23,740,004	\$24,548,540	607	\$2,834	\$39,110	\$40,442
	4+ claims	\$5,702,805	\$1,448,639	195	\$7,151,445	\$238,381	\$3,289,665	\$3,401,704	43	\$5,544	\$76,504	\$79,109
Sussex	All RL	\$238,087	\$4,953	11	\$243,040	\$8,101	\$111,798	\$115,606	5	\$1,620	\$22,360	\$23,121
	4+ claims	\$0	\$0	0	\$0	\$0	\$0	\$0	0	\$0	\$0	\$0
Union	All RL	\$12,496,582	\$7,939,667	1,060	\$20,436,249	\$681,208	\$9,400,675	\$9,720,843	431	\$1,581	\$21,811	\$22,554
	4+ claims	\$1,209,345	\$6,421,813	166	\$7,631,158	\$254,372	\$3,510,333	\$3,629,888	24	\$10,599	\$146,264	\$151,245
Warren	All RL	\$21,707,307	\$3,708,588	660	\$25,415,895	\$847,197	\$11,691,312	\$12,089,494	239	\$3,545	\$48,918	\$50,584
	4+ claims	\$6,774,011	\$1,601,618	179	\$8,375,629	\$279,188	\$3,852,789	\$3,984,007	43	\$6,493	\$89,600	\$92,651



**Flood Loss Estimation Method 3  
Estimated Annual Damages for 1% (100-year) Probability Floods**

This flood risk assessment methodology is completed by using the HAZUS estimates of total exposure for all land use categories, combined with the results of the GIS-based analysis of DFIRM and Q3 data. The latter were used to estimate the percentage of land area in A zones (assumed to be 100-year floodplain) for each County in the State. The fourth column (A Zone Exposure) shows the total value of assets in each County that is potentially exposed to a one percent annual chance of flooding. This methodology is constrained by the uncertainty of the value of assets that are actually in the 100-year floodplain, but nevertheless offers a perspective on the potential annual damages in each County, and Statewide. Clearly, potential damages are directly correlated to the value of assets in the Counties, but the coefficient floodplain percentage also has a significant effect on the outcome. The last column in the table displays the estimated annual damages from flooding.

**Table 4.5-1-7  
Estimated Annual Damages in New Jersey Counties for 1% Floods,  
sorted by Total Potential Damages**

<b>County</b>	<b>Total Exposure</b>	<b>% A zone</b>	<b>A Zone Exposure*</b>	<b>Potential Ann Damages</b>
Bergen	\$100,653,325,000	20.32%	\$20,454,933,398	\$204,549,334
Hudson	\$53,814,871,000	35.59%	\$19,153,803,429	\$191,538,034
Ocean	\$50,946,874,000	25.89%	\$13,187,896,960	\$131,878,970
Essex	\$79,240,485,000	15.89%	\$12,591,376,804	\$125,913,768
Middlesex	\$78,836,283,000	13.92%	\$10,977,399,938	\$109,773,999
Burlington	\$51,757,042,000	18.77%	\$9,714,949,727	\$97,149,497
Atlantic	\$27,652,015,000	32.46%	\$8,976,933,482	\$89,769,335
Morris	\$64,432,550,000	13.61%	\$8,768,564,566	\$87,685,646
Cape May	\$18,311,425,000	46.43%	\$8,501,530,083	\$85,015,301
Monmouth	\$67,233,273,000	8.52%	\$5,731,103,444	\$57,311,034
Passaic	\$45,121,076,000	12.55%	\$5,664,673,952	\$56,646,740
Mercer	\$40,721,537,000	10.65%	\$4,336,537,938	\$43,365,379
Gloucester	\$24,721,631,000	16.43%	\$4,061,302,346	\$40,613,023
Cumberland	\$12,235,912,000	31.56%	\$3,861,595,910	\$38,615,959
Somerset	\$35,656,884,000	10.26%	\$3,660,096,390	\$36,600,964
Union	\$50,021,816,000	6.76%	\$3,383,045,455	\$33,830,455
Camden	\$46,731,673,000	6.80%	\$3,177,894,007	\$31,778,940
Salem	\$6,080,176,000	33.18%	\$2,017,293,129	\$20,172,931
Sussex	\$14,692,482,000	7.38%	\$1,083,767,464	\$10,837,675
Hunterdon	\$15,132,181,000	5.19%	\$784,753,392	\$7,847,534
Warren	\$10,381,209,000	5.69%	\$590,394,133	\$5,903,941
<b>Total</b>	<b>\$894,374,720,000</b>		<b>\$150,679,845,946</b>	<b>\$1,506,798,459</b>



## 4.3-2 Hurricanes and Tropical Storms

### Nature of the Hurricane and Tropical Storm Hazards

A hurricane is a tropical storm that attains hurricane status when its wind speed reaches 74 or more miles an hour. Tropical systems may develop in the Atlantic between the Lesser Antilles and the African coast, or may develop in the warm tropical waters of the Caribbean and Gulf of Mexico. These storms may move up the Atlantic coast of the United States and impact the Eastern seaboard, or move into the U.S. through the states along the Gulf Coast, bringing wind and rain as far north as New England before moving off shore and heading east.

Because of its northern location on the Atlantic coastline, direct hits by storms of hurricane strength have a relatively low probability of impacting New Jersey, compared to the Southern coastal and Gulf States. It is possible for the entire State to be impacted by hurricanes, although wind and surge effects tend to be concentrated in coastal areas, as well as specific riverine regions that may experience storm surge backwater effects. The cooler waters off the coast of New Jersey can serve to diminish the energy of storms that have traveled up the eastern seaboard in the Gulf Stream current. However, historical data shows that a number of hurricanes/tropical storms have impacted New Jersey, often as the remnants of a large storm hitting the Gulf or Atlantic coast hundreds of miles south of New Jersey, but maintaining sufficient wind and precipitation to cause substantial damage to the State.

The following paragraphs summarize the nature of these storms as they intensify from tropical depressions into storms and Hurricanes:

- A **Tropical depression** is an organized system of clouds and thunderstorms with a defined surface circulation and maximum sustained winds of less than 33 knots or 38 miles per hour. Although a low pressure system is present, there is no eye and typically does not have the organization or spiral shape of more powerful storms. It has a low pressure system.
- A **tropical storm** is an organized system of strong thunderstorms with a defined surface circulation and maximum sustained winds between 34 and 63 knots or 39 and 73 miles per hour. At this point the distinctive cyclonic shape starts to develop, although an eye is not usually present. The National Oceanic and Atmospheric Administration assign storm names to systems that reach this level of intensity.
- A **hurricane** is a storm system with sustained winds of greater than 64 knots or 74 miles per hour. Storms of this intensity develop a central eye which is an area of relative calm and the lowest atmospheric pressure. Surrounding the eye is a circulating eye wall and the strongest thunderstorms and winds.

The impacts of Hurricanes can cross several categories:

1. **Rainfall.** Hurricanes can produce significant amounts of precipitation which can last for days and cause major inland flooding.
2. **Winds.** Strong winds related to hurricanes can cause significant damage to buildings, with strong storms creating extremely hazardous flying debris. Included in the wind hazard is the potential for the creation of tornadoes.



3. **Storm surge and wave action.** A fast rise in sea level can occur as a storm approaches a coastline. This surge in water can damage buildings and infrastructure with water inundation and high velocity waves, often reshaping the coastline through erosion.

The following table outlines the definition of the intensity of hurricanes (known as the Saffir/Simpson Hurricane Scale). The table also highlights the type of damage that typically occurs in each category of intensity.

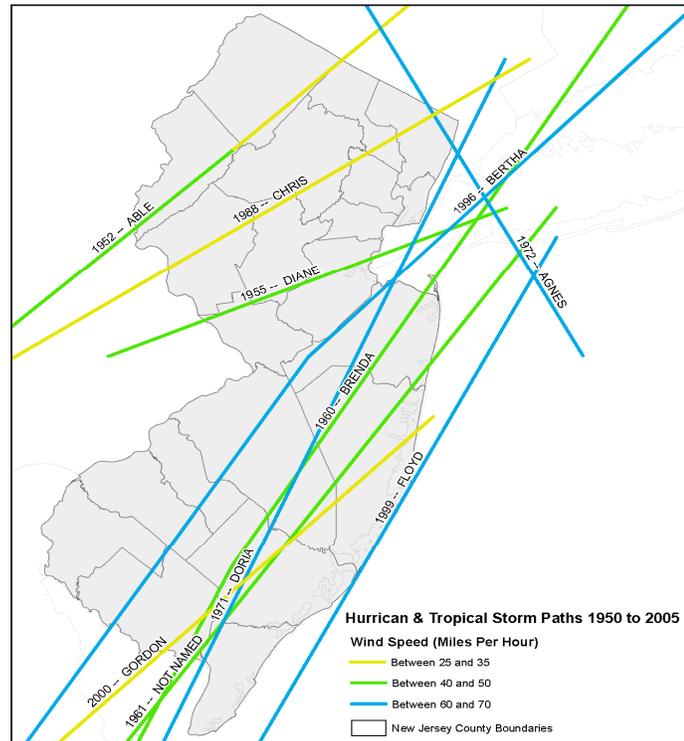
**Table 4.4-2-1  
Saffir/Simpson Hurricane Intensity Categories**

Category	Damage Level	Description	Example
1	MINIMAL	Damage primarily to shrubbery, trees, foliage, and unanchored homes. No real damage to other structures. Some damage to poorly constructed signs. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorage torn from moorings.	Hurricane Earl (1998)
2	MODERATE	Considerable damage to shrubbery and tree foliage; some trees blown down. Major damage to exposed mobile homes. Extensive damage to poorly constructed signs. Some damage to roofing materials of buildings; some window and door damage. No major damage to buildings. Coast roads and low-lying escape routes inland cut by rising water 2 to 4 hours before arrival of hurricane center. Considerable damage to piers. Marinas flooded. Small craft in unprotected anchorages torn from moorings. Evacuation of some shoreline residences and low-lying areas required.	Hurricane Georges (1998)
3	EXTENSIVE	Foliage torn from trees; large trees blown down. Practically all poorly constructed signs blown down. Some damage to roofing materials of buildings; some wind and door damage. Some structural damage to small buildings. Mobile homes destroyed. Serious flooding at coast and many smaller structures near coast destroyed; larger structures near coast damaged by battering waves and floating debris. Low-lying escape routes inland cut by rising water 3 to 5 hours before hurricane center arrives. Flat terrain 5 feet or less above sea level flooded inland 8 miles or more. Evacuation of low-lying residences within several blocks of shoreline possibly required.	Hurricane Fran (1996)
4	EXTREME	Shrubs and trees blown down; all signs down. Extensive damage to roofing materials, windows and doors. Complete failures of roofs on many small residences. Complete destruction of mobile homes. Flat terrain 10 feet or less above sea level flooded inland as far as 6 miles. Major damage to lower floors of structures near shore due to flooding and battering by waves and floating debris. Low-lying escape routes inland cut by rising water 3 to 5 hours before hurricane center arrives. Major erosion of beaches. Massive evacuation of all residences within 500 yards of shore possibly required, and of single-story residences within 2 miles of shore.	Hurricane Andrew (1992)
5	CATASTROPHIC	Shrubs and trees blown down; considerable damage to roofs of buildings; all signs down. Very severe and extensive damage to windows and doors. Complete failure of roofs on many residences and industrial buildings. Extensive shattering of glass in windows and doors. Some complete building failures. Small buildings overturned or blown away. Complete destruction of mobile homes. Major damage to lower floors of all structures less than 15 feet above sea level within 500 yards of shore. Low-lying escape routes inland cut by rising water 3 to 5 hours before hurricane center arrives. Massive evacuation of residential areas on low ground within 5 to 10 miles of shore possibly required.	Hurricane Camille (1969)

As illustrated in Figure 4.4-2-1 below, a number of major hurricanes and tropical storms have impacted New Jersey in the last half century.



**Figure 4.4-2-1**  
**Hurricanes and Tropical Storms that have Crossed New Jersey 1950-2007**



Prepared for the New Jersey Office of Emergency Management January 2007. Source: National Oceanic and Atmospheric Administration, Tropical Prediction Center/National Hurricane Center, September 2005. Original map layer distributed by the National Atlas of the United States. Contact address: NOAA Coastal Services Center, 2234 South Hobson Ave., Charleston, SC 29405-2413. Phone: 843-740-1200

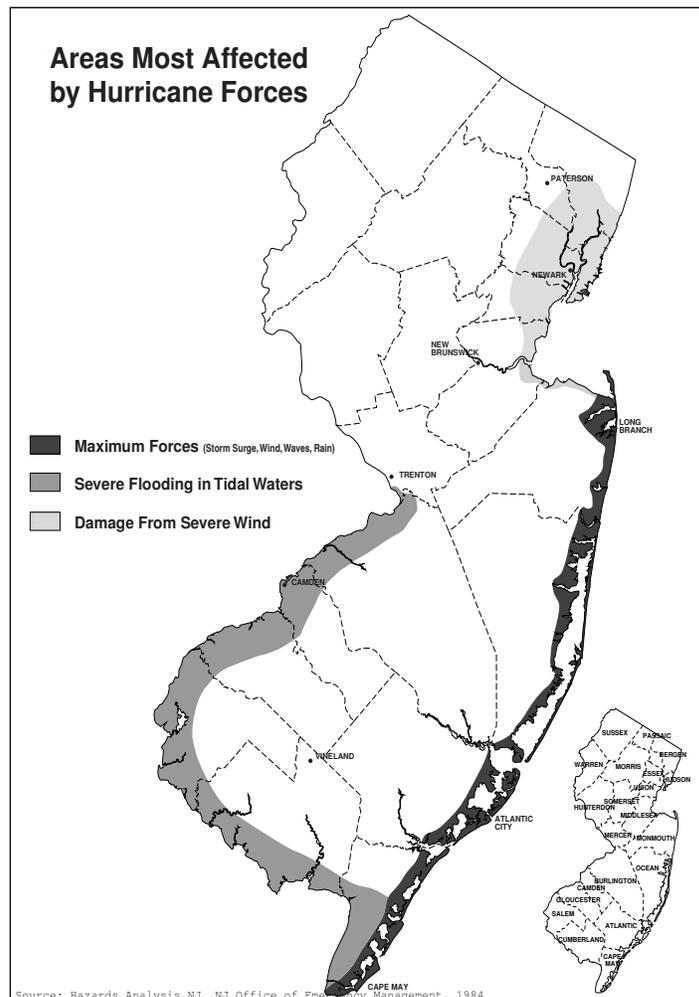
The hurricane hazard can be detailed in the following categories as the impacts relate to New Jersey:

- **Flooding.** Flooding causes severe damage in New Jersey during hurricanes. Flooding and flash floods brought by the torrential rains of a hurricane are dangerous killers. Rain delivered by tropical storm can amount to almost nothing to as much as 15 inches in two to three days. Hurricane Diane (1955) caused little damage as it moved into the continent, but long after its winds subsided, it brought floods to Pennsylvania, New York and New England which killed 200 persons and cost an estimated 700 million dollars in damage. In 1972, Agnes fused with another storm system, flooding stream, and river basins in the Northeast with more than a foot of rain in less than 12 hours, killing 117 people and causing almost three billion dollars of damage.
- **Storm Surge.** It is estimated that 90 percent of deaths and most property damage near the coast during hurricanes are caused by storm surge. Storm surge occurs when coastal waters are pushed toward shore and held above mean sea level. Depending on storm size, characteristics and distance from the shoreline, the storm can raise the sea level of along 50 or more miles of coastline by 20 or more feet. The higher sea level, along with the wind-enhanced hammering of waves, act as a giant bulldozer sweeping everything in its path. In fact, during at least two hurricanes this century, New Jersey's barrier islands Island Beach and Long Beach Island experienced a complete overwash as a result of the storm surge, with waves completely washing over the islands taking with them homes and other infrastructure.
- The damage does not end with destruction from wave action effects. Still-water damage from inundated structures and facilities is exacerbated by the harmful effects of saltwater. Structures, once salted, will remain more susceptible to moisture, leading to mildewing and corrosion of the structure and all contents that came in contact with the saltwater.



- **Wind.** High wind speeds occur in a narrow ring usually extending 20 to 30 miles from the wall of the eye of a hurricane. Minor damage begins at approximately 50 MPH and includes broken branches. Moderate damage, such as broken window and loosed shingles begins around 80 MPH, and major structural damage and destruction begins at 100 MPH. For some structures, wind force alone is sufficient to cause total destruction. Mobile homes with their lack of foundation, light weight, and minimal anchoring make them particularly vulnerable to hurricane winds. Some hurricanes spawn tornadoes that contribute to the damage delivered by hurricanes. Tornadoes are discussed in the thunderstorms & tornadoes section of this report.

**Figure 4.4-2-2**  
**Areas Most Affected by Hurricane Forces in New Jersey**





## Previous Hurricane Occurrences in New Jersey

The table below (with data provided from the National Climatic Data Center) shows that a relatively small number of Hurricane/Tropical Storm events have impacted New Jersey since 1950.

**Table 4.4-2-2  
 Hurricanes and Tropical Storms affecting New Jersey from 1950 to 2007**

**5 HURRICANE & TROPICAL STORMS** event(s) were reported in New Jersey between 01/01/1950 and 08/31/2007.

Click on *Location or County* to display Details.

**New Jersey**

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 <a href="#">NJZ013&gt;014 - 020&gt;026</a>	07/13/1996	04:00 AM	Tropical Storm	N/A	1	2	0	0
2 <a href="#">NJZ024&gt;026</a>	09/16/1999	02:00 AM	Hurricane	N/A	0	0	1.2M	0
3 <a href="#">NJZ014 - 024&gt;026</a>	09/16/1999	04:00 PM	Tropical Storm	N/A	0	0	500K	0
4 <a href="#">NJZ005&gt;006 - 011</a>	09/18/2003	04:00 PM	Tropical Storm	N/A	0	0	0	0
5 <a href="#">NJZ014 - 021 - 023&gt;026</a>	09/18/2003	04:00 PM	Tropical Storm	N/A	0	0	2.1M	0
TOTALS:					1	2	3.750M	0

Mag: Magnitude  
 Dth: Deaths  
 Inj: Injuries  
 PrD: Property Damage  
 CrD: Crop Damage

<http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>

Although NCDC records are generally reliable, Table 4.4-2-2 above somewhat disagrees with the NOAA Storm Prediction Center data that is displayed above in Figure 4.4-2-1. This is likely the result of differences in data that the agencies use, or in the nature of their reporting (i.e., the definition of “affecting”). Note that Section 5 of this Plan includes descriptions of recent Presidentially-declared disasters, including some of those shown in the table above. According to FEMA records, the following disaster declarations are the only ones made in New Jersey related to Hurricanes:

**Table 4.4-2-3  
 Hurricane-related Presidential Disaster Declarations in New Jersey**

Date	Name	FEMA Disaster Number
August 1955	Diane	41
October 1985	Gloria	749
September 1999	Floyd	1295

The following table provides a more in-depth analysis of Hurricane and tropical storm events that have impacted New Jersey, including the nature of the impact of these events.



**Table 4.4-2-4  
Hurricanes and Tropical Storms affecting New Jersey from 1950 to 2007**

<b>Date</b>	<b>Name</b>	<b>Description</b>
June 17, 2001	Tropical Storm Allison	Passed just east of the state as a subtropical depression, causing gusty winds and up to 4.86 inches (12.34 cm) of rain.
<u>September 13, 2003</u>	<u>Tropical Storm Henri</u>	Caused up to 3 inches (8 cm) of rain across the state.
<u>September 19, 2003</u>	<u>Hurricane Isabel</u>	Passed well to the southwest of the state, though because of the hurricane's large windfield, Isabel caused strong storm surges of up to 10.6 feet (3.2 m) in <u>Burlington</u> . Persistent strong waves severely erode beaches along the coast.
<u>August 31, 2004</u>	<u>Tropical Storm Gaston</u>	Passed to the east of the state, causing up to 3 inches (8 cm) of rainfall across the state.
<u>September 8, 2004</u>	<u>Hurricane Frances</u>	<u>Extratropical storm dropped around 3 inches (8 cm) of rain in North Jersey.</u>
<u>September 17, 2004:</u>	<u>Hurricane Ivan</u>	Dropped 5.5 inches (14.0 cm) of rain in <u>Maplewood</u> .
<u>September 28, 2004:</u>	<u>Hurricane Jeanne</u>	Passed to the south of the state as an extratropical storm, causing up to 5 inches (13 cm) of rainfall across New Jersey.
<u>August 11-August 16, 2005:</u>	<u>Hurricane Irene</u>	Passed to the southeast of the state, causing rip currents and strong waves. In <u>Point Pleasant Beach, New Jersey</u> , lifeguards made 150 rescues in a three day period. Many beaches banned swimming due to the threat.
<u>September 7-September 8, 2005:</u>	<u>Hurricane Maria and Hurricane Nate</u>	Rip currents from storms killed one and seriously injured another.
<u>September 3, 2006:</u>	<u>Tropical Storm Ernesto</u>	The interaction between the remnants of the storm and a strong high pressure system produced intense wind gusts of up to 81 mph in <u>Strathmere</u> . The storm also dropped heavy rainfall, totaling to a maximum of 4.92 inches in <u>Margate</u> . The winds and rain down trees and power lines, resulting in power outages.

#### Probability of Hurricanes and Tropical Storms

Because they are relatively infrequent in the Northeastern U.S., it is impossible to assign accurate probabilities to hurricanes and tropical storms in the region, except on a very long-term basis. As noted, such storms that do impact the region are often remnants of hurricanes rather than named events, so their effects often appear as floods or (to a lesser extent) as windstorms, rather than hurricanes or tropical storms. Because the reporting period is relatively long, it is reasonable to assume that the probabilities of these events will remain about the same in the



future, with the region experiencing the effects of a hurricane every 15 or 20 years, and tropical storms perhaps every five years.

## Hurricane Wind Loss Estimation

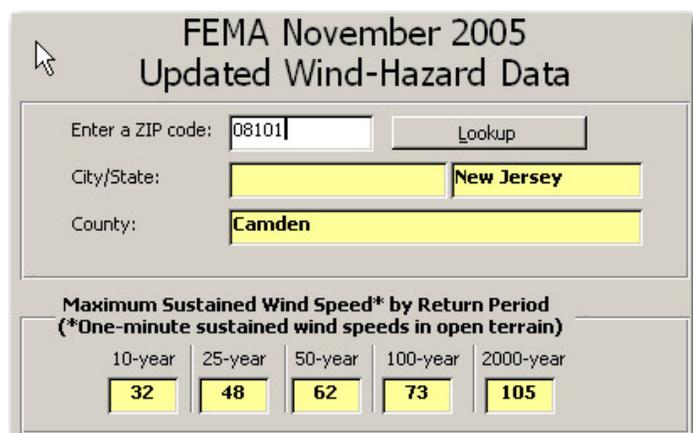
This subsection includes a detailed calculation of hurricane wind risk in New Jersey. The present analysis uses information extracted from the FEMA HAZUS software (estimated square footages of various land uses, including residential, industrial, commercial, agricultural, educational, and religious) in combination with FEMA software and methodologies to estimate future wind losses. The methodology is based on the following steps.

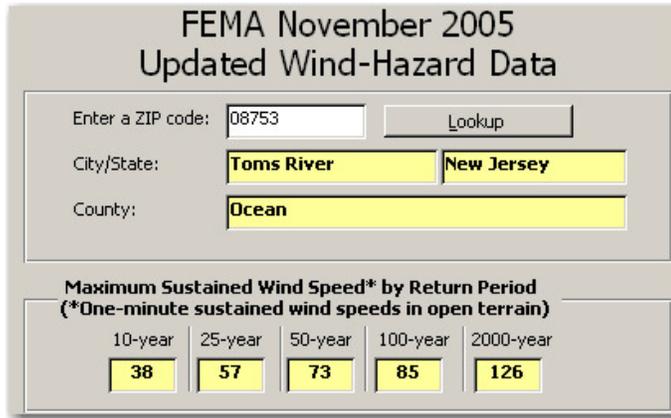
1. Compile data about land uses by County, including estimated square footage of each use category.
2. Assign specific typical building types to each category, using the R.S. Means standard list (see note).
3. Determine replacement values for all building types using the R.S. Means on-line calculator (see note).
4. Estimate contents values using USACE contents-to-structure value ratios and other methods.
5. Divide Counties into three groups based on proximity to the coast.
6. Assign a ZIP code to each group of Counties.
7. Determine damage functions using FEMA Wind Damage Function software.
8. Determine wind hazard profiles using FEMA Wind Damage Function software.
9. Perform risk calculations using FEMA Full-Data Hurricane Wind benefit-cost analysis software.

Note: R.S. Means is a national-standard reference guide that is used by engineers, architects and planners to estimate the cost to construct a range of different types of buildings, based on size, type and location.

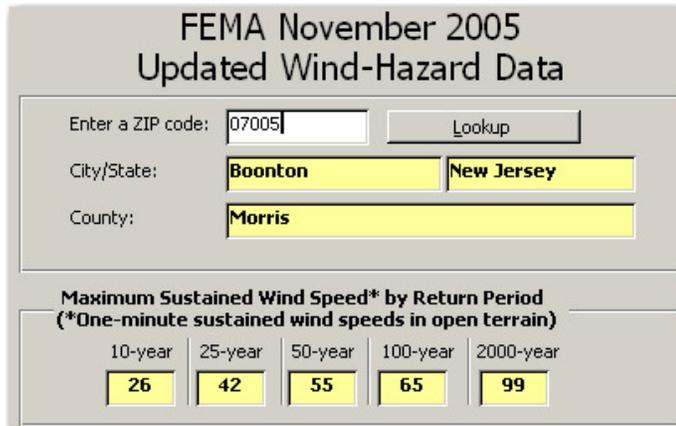
The 21 Counties in the State were divided into three groups, based on proximity to the Atlantic Coast, and a central ZIP code was assigned to each group. Then the FEMA Wind Damage Function database was queried to determine the general wind speed profiles for the Counties in each sample. The series of three figures below shows the wind profiles for selected areas of New Jersey. Note the differences in the wind profiles, particularly for the higher category events, between the inland areas and Counties near the Atlantic Coast.

**Figure 4.4-2-3**  
**Wind Hazard Profile for Northern**  
**Inland New Jersey Counties**





**Figure 4.4-2-4  
Wind Hazard Profile for  
Coastal New Jersey Counties**



**Figure 4.4-2-5  
Wind Hazard Profile for Southern Inland  
New Jersey Counties**

The results of the risk calculation are displayed in the series of tables below. The dollar figures in the tables represent the expected future losses (risk) over a 100-year planning horizon. This assessment should be used for comparative purposes only – in order to accurately characterize risk to individual structures or operations it is necessary to gather much more detailed information. However, the results of this assessment can be used to show relative risk across the State from hurricane winds.



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**Table 4.4-2-5  
Hurricane Wind Risk for Coastal New Jersey Counties (ZIP 08752)**

County	Residential	Commercial	Industrial	Agriculture	Education	Government	Religious	Total
Atlantic	\$336,385,398	\$3,163,510	\$483,219	\$674	\$57,594	\$14,461	\$12,964	\$340,117,818
Cape May	\$344,322,734	\$2,237,484	\$640,448	\$422	\$18,055	\$5,217	\$12,173	\$347,236,533
Middlesex	\$828,319,087	\$11,181,596	\$3,709,021	\$2,159	\$82,840	\$11,509	\$29,620	\$843,335,832
Monmouth	\$761,583,109	\$7,567,886	\$1,419,557	\$3,305	\$61,892	\$18,744	\$24,268	\$770,678,760
Ocean	\$748,459,178	\$4,548,184	\$849,393	\$937	\$31,733	\$6,721	\$20,024	\$753,916,171
<b>Total</b>	<b>\$3,019,069,506</b>	<b>\$28,698,660</b>	<b>\$7,101,638</b>	<b>\$7,497</b>	<b>\$252,114</b>	<b>\$56,652</b>	<b>\$99,049</b>	<b>\$3,055,285,115</b>

**Table 4.4-2-6  
Hurricane Wind Risk for Northern Inland New Jersey Counties (ZIP 08101)**

County	Residential	Commercial	Industrial	Agriculture	Education	Government	Religious	Total
Bergen	\$253,038,075	\$4,877,740	\$1,881,658	\$251	\$52,880	\$7,655	\$14,288	\$259,872,547
Essex	\$195,648,649	\$3,411,984	\$1,330,693	\$101	\$59,529	\$8,193	\$18,230	\$200,477,379
Hudson	\$138,318,264	\$3,468,319	\$701,324	\$27	\$27,046	\$1,734	\$10,967	\$142,527,681
Hunterdon	\$37,798,125	\$549,028	\$256,781	\$176	\$7,703	\$1,167	\$2,986	\$38,615,967
Morris	\$139,780,278	\$2,662,741	\$1,143,951	\$294	\$26,101	\$3,058	\$10,274	\$143,626,697
Passaic	\$120,517,938	\$1,990,821	\$960,440	\$98	\$14,915	\$4,631	\$9,036	\$123,497,878
Somerset	\$89,061,719	\$1,450,685	\$513,989	\$135	\$20,454	\$2,505	\$5,328	\$91,054,817
Sussex	\$43,945,406	\$441,127	\$130,703	\$80	\$8,157	\$496	\$2,451	\$44,528,420
Union	\$139,119,111	\$2,259,025	\$950,829	\$159	\$13,745	\$2,727	\$9,877	\$142,355,472
Warren	\$30,249,943	\$352,945	\$114,963	\$82	\$7,829	\$502	\$1,779	\$30,728,043
<b>Total</b>	<b>\$1,187,477,508</b>	<b>\$21,464,416</b>	<b>\$7,985,330</b>	<b>\$1,403</b>	<b>\$238,360</b>	<b>\$32,668</b>	<b>\$85,216</b>	<b>\$1,217,284,902</b>

**Table 4.4-2-7  
Hurricane Wind Risk for Northern Inland New Jersey Counties (ZIP 07005)**

County	Residential	Commercial	Industrial	Agriculture	Education	Government	Religious	Total
Burlington	\$79,910,340	\$2,719,713	\$215,751	\$9,730	\$22,109	\$12,720	\$3,486	\$82,893,850
Camden	\$92,936,981	\$1,235,328	\$209,883	\$403	\$37,000	\$12,180	\$4,352	\$94,436,126
Cumberland	\$11,783,231	\$97,672	\$13,895	\$344	\$2,637	\$3,149	\$761	\$11,901,691
Gloucester	\$46,553,313	\$562,937	\$234,676	\$692	\$17,409	\$6,381	\$2,231	\$47,377,639
Mercer	\$66,001,998	\$984,346	\$141,234	\$431	\$172,365	\$48,715	\$4,661	\$67,353,749
Salem	\$12,247,401	\$133,435	\$30,829	\$241	\$4,328	\$3,029	\$1,038	\$12,420,301
<b>Total</b>	<b>\$309,433,264</b>	<b>\$5,733,430</b>	<b>\$846,270</b>	<b>\$11,841</b>	<b>\$255,848</b>	<b>\$86,174</b>	<b>\$16,529</b>	<b>\$316,383,356</b>



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Section 4.4 Statewide Hazard Profiles

Table 4.4-2-8 shows the Statewide wind risk calculation ordered by County total wind risk. The calculation uses a 100-year planning horizon.

**Table 4.4-2-8  
100-year New Jersey Wind Risk, Ordered by County**

<b>County</b>	<b>100-year Wind Risk</b>	<b>% of State Risk</b>
Middlesex	\$843,335,832	18.38%
Monmouth	\$770,678,760	16.79%
Ocean	\$753,916,171	16.43%
Cape May	\$347,236,533	7.57%
Atlantic	\$340,117,818	7.41%
Bergen	\$259,872,547	5.66%
Essex	\$200,477,379	4.37%
Morris	\$143,626,697	3.13%
Hudson	\$142,527,681	3.11%
Union	\$142,355,472	3.10%
Passaic	\$123,497,878	2.69%
Camden	\$94,436,126	2.06%
Somerset	\$91,054,817	1.98%
Burlington	\$82,893,850	1.81%
Mercer	\$67,353,749	1.47%
Gloucester	\$47,377,639	1.03%
Sussex	\$44,528,420	0.97%
Hunterdon	\$38,615,967	0.84%
Warren	\$30,728,043	0.67%
Salem	\$12,420,301	0.27%
Cumberland	\$11,901,691	0.26%
<b>Total</b>	<b>\$4,588,953,373</b>	<b>100.00%</b>

As noted earlier, the wind risk calculation has several components that influence the outcome of the assessment. These include proximity to the coast, building types in the sample area, and the gross square footage of assets in the sample area.



### 4.4.3 Nor'easters

#### Nature of the Nor'easter Hazard

A nor'easter is a macro-scale storm whose winds come from the northeast, especially in the coastal areas of the Northeastern United States and Atlantic Canada. More specifically, it describes a low pressure area whose center of rotation is just off the coast and whose leading winds in the left forward quadrant rotate onto land from the northeast. The precipitation pattern is similar to other extra-tropical storms. They also can cause coastal flooding, coastal erosion and gale force winds. As with hurricanes, coastal areas of the State tend to be affected most by Nor'easters because of their proximity to the ocean, but all parts of New Jersey have some exposure to the hazard, and past effects have been widespread.

Nor'easters are usually formed by an area of vorticity associated with an upper level disturbance or from a kink in a frontal surface that causes a surface low pressure area to develop. Such storms often move slowly in their latter, frequently intense, mature stage. Until the nor'easter passes, thick dark clouds often block out the sun. During a single storm, the precipitation can range from a torrential downpour to a fine mist. Low temperatures and wind gusts of up to 90 miles per hour are also associated with nor'easters. On very rare occasions, such as the North American blizzard of 2006, and a nor'easter in 1979, the center of the storm can even take on the circular shape more typical of a hurricane and have a small eye.

**Figure 4.4-3-1  
 The Dolan-Davis Nor'easter Intensity Scale**

Storm Class	Beach Erosion	Dune Erosion	Overwash	Property Damage
1 (Weak)	Minor Changes	None	No	No
2 (Moderate)	Modest; mostly to lower beach	Minor	No	Modest
3 (Significant)	Erosion extends across the beach	Can be significant	No	Loss of many structures at local level
4 (Severe)	Severe beach erosion and recession	Severe dune erosion or destruction	On low beaches	Loss of structures at community level
5 (Extreme)	Extreme beach erosion	Dunes destroyed over extensive areas	Massive in sheets and channels	Extensive at regional-scale; millions of dollars

The Atlantic coast, from northern Georgia northward up the coast, can suffer high winds, pounding surf and extremely heavy rains during these storms. Nor'easters cause a significant amount of severe beach erosion in these areas, as well as flooding in low-lying areas. Beach residents in these areas may actually fear the repeated depredations of nor'easters over those of hurricanes, because they happen more frequently, and cause substantial damage to beach-front property and their dunes. The northeastern United States, from New Jersey to the New England coast, Quebec and Atlantic Canada see nor'easters each year, most often in the winter and early spring, but also sometimes during the autumn. These storms can leave inches of rain or several feet of snow on the region, and sometimes last for several days.



## Previous Nor'easter Occurrences

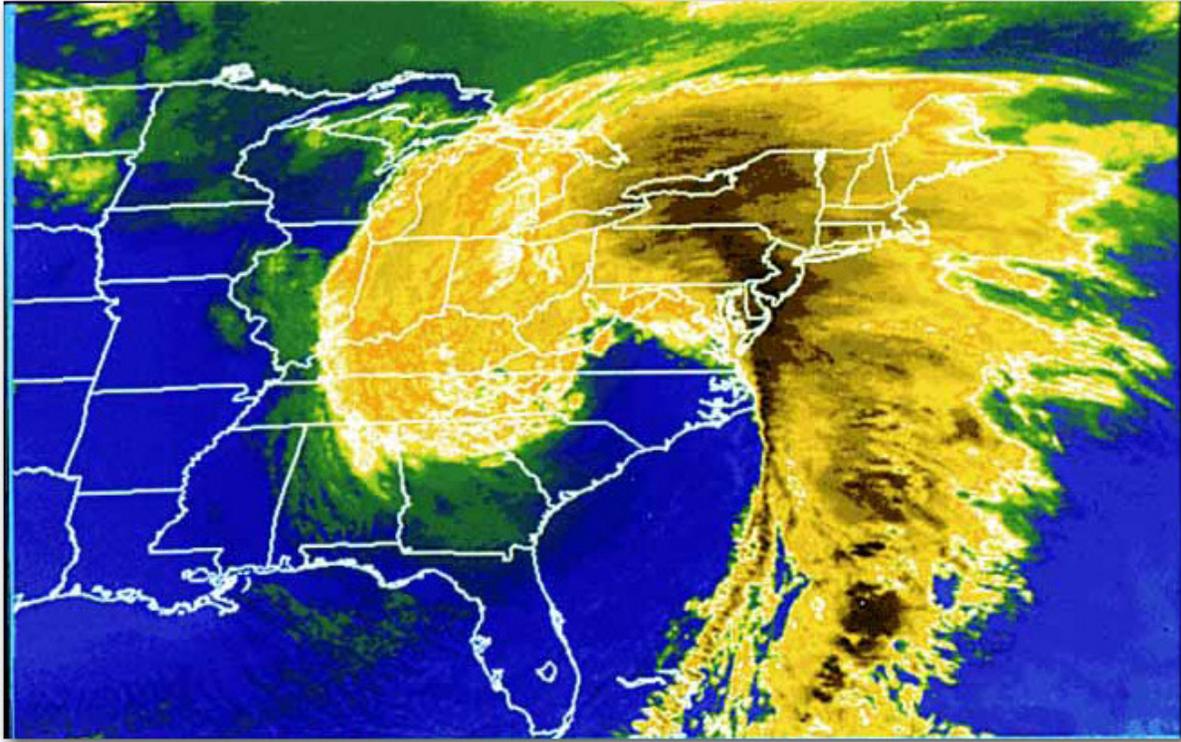
Nor'easter storms can wreak significant damage for New Jersey. Four of the past six nor'easters have been severe enough to result in Presidential disaster declarations. Table 4.4-3-1 describes these events.

**Table 4.4-3-1  
 New Jersey Presidential Disaster Declarations for Nor'easter Storms**

Date(s)	Description
March 6-8, 1962	FEMA Disaster # 124: The most damaging northeast storm since the 1888 Blizzard struck New Jersey. Although this storm did not produce record surge levels, it inflicted substantially greater overall damages and loss of life than any other storm. This was primarily due to the prolonged duration of the storm that caused damaging overwash and flooding through five successive high tides. Increased development along the coast since the 1944 hurricane also accounted for increased damages. This storm was also responsible for the loss of 22 lives, completely destroyed 1,853 homes and caused major damage to approximately 2,000 additional homes. The total damage caused by this storm to public and private property was about \$85 million (1962 dollars).
December 18, 1992	FEMA Disaster #973: This storm impacted Ocean, Monmouth, Atlantic, Cape May, Cumberland, Bergen, Salem, Middlesex, Somerset, Union, Essex, Hudson counties. Public Assistance, Individual Assistance, Hazard Mitigation Programs were granted with the total eligible amount of \$51.0 million Public Assistance (25% state share \$12.5 million) \$10.5 million Individual Assistance (25% state share \$1.32 million) \$ 2.2 million Hazard Mitigation (50/50 share). In addition 238 municipalities were eligible for Public Assistance.
March 3, 1998	FEMA Disaster # 1206: A severe Nor'easter in February impacted Atlantic, Cape May, and Ocean counties. Various programs were activated for Public Assistance, Individual Assistance, and Hazard Mitigation. The dollar amounts awarded were: Public Assistance \$2.2 million (12.5% state share, 12.5% local share) Disaster Housing Program \$1.1 million Individual/Family Grant Program \$88,184 million (\$28,000 state share) Hazard Mitigation \$477,000.
April 26, 2007	FEMA Disaster # 1694: This was on of the worst Nor'easter storms to hit New Jersey in several decades. While filing for federal disaster relief, acting Governor Codey of New Jersey indicated that the storm caused \$180 million in property damage in New Jersey, making it the second-worst rain storm in its history, after <u>Hurricane Floyd</u> . Individual and Public Assistance programs were issued for Bergen, Burlington, Essex, Passaic, Somerset, Camden, Mercer, and Union Counties. Public Assistance was issued for Atlantic, Hudson, Middlesex, Sussex and Warren Counties. Gloucester County for Individual Assistance.



**Figure 4.4-3-2**  
**The “Perfect Storm” of March, 1993 (NOAA)**



Two other significant storms caused severe damage to parts of the State in 1994 and 1996, but were not declared Presidential disasters. A storm occurred on December 22, 1994 and dissipated on December 26<sup>th</sup>. This storm caused \$17 million in damages. The long duration of north winds pushed New Jersey tides 2.5 feet above normal, leading to significant coastal erosion and flooding.

Another storm moved into New Jersey on October 18<sup>th</sup>, 1996 and due to climactic conditions became stationary, raining on New Jersey through October 23<sup>rd</sup>. Record rainfall, flooding, and high winds affected New Jersey from Morris County to Middlesex County to Hunterdon County. Hundred-year floods were reached on various streams in Morris, Somerset, and Union Counties. Thousands of electrical customers lost power.

### Probability of Nor'easters

As with any weather phenomenon, it is nearly impossible to assign probabilities to Nor'easters, except over the long-term. New Jersey experiences one or two storms every year that could potentially be classified as Nor'easters, but not all of these are severe enough to cause significant damages or result in disaster declarations.



## 4.4-4 Winter Storms

### Nature of the Winter Storm Hazard

Heavy snowfall and extreme cold can immobilize an entire region. Even areas that normally experience mild winters can be hit with a major snowstorm or extreme cold. Winter storms can result in flooding, storm surge, closed highways, blocked roads, downed power lines and hypothermia. The following descriptions provide the commonly used definitions of winter storms:

- **Winter storm.** A storm with significant snowfall, ice, and/or freezing rain; the quantity of precipitation varies by elevation.
  - Non-mountainous areas - heavy snowfall is 4 inches or more in a 12-hour period, or 6 or more inches in a 24-hour period
  - Mountainous areas - 12 inches or more in a 12-hour period or 18 inches or more in a 24-hour period
- **Blizzard.** A storm with considerable falling and/or blowing snow combined with sustained winds or frequent gusts of 35 mph or greater that frequently reduces visibility to less than one-quarter mile.

These storms derive their energy from the clash of two air masses of substantially different temperatures and moisture levels. An air mass is a large region above the Earth, usually about 1,000-5,000 km in diameter, with a fairly uniform temperature and moisture level. In North America, winter storms usually form when an air mass of cold, dry, Canadian air moves south and interacts with a warm, moist air mass moving north from the Gulf of Mexico. The point where these two air masses meet is called a front. If cold air advances and pushes away the warm air, it forms a cold front. When warm air advances, it rides up over the denser, cold air mass to form a warm front. If neither air mass advances, it forms a stationary front. ([http://teacher.scholastic.com/activities/wwatch/winter\\_storms/](http://teacher.scholastic.com/activities/wwatch/winter_storms/)).

Winter storms affect the entire State of New Jersey about equally, and are responsible for many deaths each year. Of reported deaths, more than 33 percent were attributed to automobile and other accidents; about 30 percent to overexertion, exhaustion, and consequent heart attack; about 13 percent to exposure and freezing; and the rest to combustion heater fires, carbon monoxide poisoning in stalled cars, falls on slippery walks, electrocution from downed wires, and building collapse. Communications systems and medical care delivery can be disrupted during winter hazard conditions, exacerbating hazards already part of the winter experience. Some of these deaths may be eliminated through the application of better forecasting and mitigation measures.

Older people are particularly sensitive to overexposure because of their economic and physical condition. Often senior citizens do not feel they have the income to heat their homes properly and they leave their homes far less heated than they should. In addition, senior citizen's changing sensitivities to heat and cold often result in their not realizing the temperatures they are experiencing are dangerously low. This leads to increased stresses on the body, especially when exerting themselves outside.



## Snow

Heavy snow accumulations can immobilize a region and paralyze a city, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Ice storms can be accompanied by high winds, and they have similar impacts, especially to trees, power lines, and residential utility services. New Jersey, because of its unique location at a climactic crossroads and distinctive geography, experiences the full effect of all four seasons, and winter is no exception. Snowstorms are the most obvious manifestation of intense winter weather.

The most common conditions for snowstorm formation begin with the formation of a storm-system somewhere in a crescent-shaped zone running from Texas through the northern Gulf of Mexico to the Atlantic Ocean waters off Georgia and the Carolinas. Storm centers moving northeast pass near Cape Hatteras and continue over the Ocean toward Cape Cod and Nantucket. If this mass of air meets a northeast already cooled by cold arctic air, a snowstorm can form. Snow begins in cooling clouds as water droplets freezing around an ice-covered particle of matter. Once the ice crystal grows large enough to leave the cloud, it falls as a snowflake. If the air into which the snow is falling through has not cooled sufficiently, the snow will ultimately fall as rain.

The trajectory of the storm center, whether it passes close to the New Jersey coast or at a distance, largely determines both the intensity and the duration of the snowfall over the State.

The zone of heaviest snowfall across New Jersey usually occurs in the southwest-to-northeast strip about 150 miles wide, approximately parallel to the path of the storm center, and about 125 and 175 miles northwest of it. (Figure 4.4-4-1 Average Yearly Snowfall) If the center passes well offshore, only South Jersey receives substantial snowfall. When the track passes close to shore, warm air from the Ocean is drawn into the surface circulation, resulting in rain falling over South Jersey and snow over the rest of the State. Often, a passing storm center brings rain to the South, mixed precipitation to central sections and snow to the north.

Seasonal snowfall in New Jersey varies from an average of about 15 inches at Atlantic City to about 50 inches in Sussex County. There is, however, great variability from year to year. In addition, February is the month when maximum accumulations on the ground are usually reached. After three major snows in February 1961, total accumulations reached 30 to 50 inches from Trenton to the Highlands.



Figure 4.4-4-1  
Average Annual Snowfall  
in New Jersey

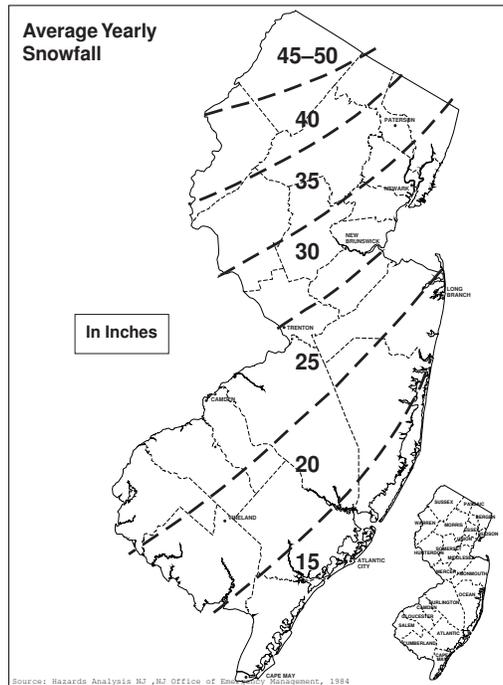
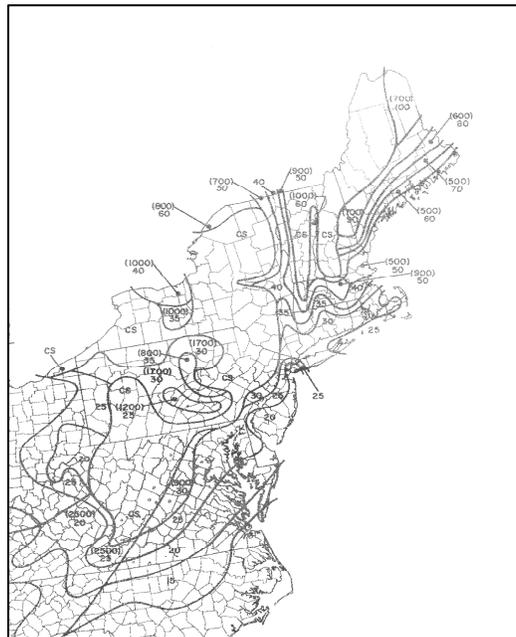


Figure 4.4-4-2  
Ground Snow Loads (pounds per square foot)  
for the Northeastern United States



Source: Ground snow loads in pounds per square foot with a 2% probability of being exceeded. Based on American Society of Engineers Standards ASCE 7-98, Minimum Design Loads for Buildings and Other Structure, and referenced in FEMA 55CD, Coastal Construction Manual, 3<sup>rd</sup> Edition.



Most extreme snowfall events occur as the result of strong low pressure systems moving to the north, northeast off of the coast of New Jersey from early winter through mid-spring. If the conditions are right, these coastal lows transport Atlantic moisture over a cold layer of air over New Jersey resulting in extremely high snowfall rates and occasionally blizzard conditions. Between 1926 –2001 significant snowfalls have occurred in 1933, 1947, 1958, 1978, 1996, and 2001 with the greatest single day snowfall of 28.4 inches occurring along the coast in Long Branch, NJ on December 26, 1947 (NOAA/NCDC; [www.ncdc.noaa.gov/servlets/SCoptions?state=1111&short=28](http://www.ncdc.noaa.gov/servlets/SCoptions?state=1111&short=28)).

Beyond disruption to transportation, the main hazard associated with snow is the weight of the frozen liquid on buildings and utilities. The ground snow load in pounds per square foot varies with the amount of water content in the ice crystals that make up the snow. Large snowfalls with low water content can generate the same snow load as a light snowfall with a high water content. Ground snow loads in pounds per square foot with a 2% probability of being exceeded have been tabulated by the American Society of Engineers Standard ASCE 7-98, Minimum Design Loads for Buildings and Other Structures. Snow loads with a 1 in 50 chance of occurring over 100 years range from 20 lb/sq. ft. south of the Atlantic City Expressway and along the Atlantic Ocean coast to over 35 lb/sq.ft. in Northwester New Jersey. Extreme variations in snow loads within the Highlands section of New Jersey require the use of specific engineering case studies to determine appropriate ground snow loads.

## Ice Storms

Although snow is the weather phenomenon most commonly associated with winter, ice storms are a much greater winter menace. The freezing rain that coats all objects in a sheath of ice can cause power outages, structural damage, damaging tree falls. Ice storms occur when rain droplets fall through freezing air and but do not freeze until they touch objects such as trees, roads, or structures. A clear icy sheath, known as a glaze, forms around branches, structures and wires and has been known to bring down high-tension utility, radio, and television transmission towers.

All regions of New Jersey have been and continue to be subject to ice storms. Besides temperature, their occurrence depends on the regional distribution of the pressure systems, as well as local weather conditions. The distribution of ice storms often coincides with general distribution of snow within several zones in the State. A cold rain may be falling over the southern portion of the State, freezing rain over the central region, and snow over the northern counties as a coastal storm moves northeastward offshore. A locality's distance to the passing storm center is often the crucial factor in determining the temperature and type of precipitation during a winter storm.

Normally experiencing lower temperatures on most winter days, the north has a greater chance of all types of winter storms occurring. Elevation can play a role in lowering the temperature to cause ice and snow to form on hilltops while valley locations remain above freezing, receiving only rain or freezing rain. Often a difference of only one or two hundred feet can make a difference between liquid rain, adhering ice, and snow. Essex County's Orange Mountains, with an elevation of only two hundred feet above the valley, have on occasion been locked in an icy sheath while valley residents have experienced only rain. Conversely, ice storms may occur in valleys and not on hilltops if cold air gets trapped in the valleys of regions with greater relief.

## Cold Waves and Wind Chill

Two dangers of winter do not even involve precipitation. A cold wave is classified as a rapid drop of 20 degrees, to below between 28 and 10 degrees, depending on the time of year and whether the drop occurs in the southern or northern half of the State, within a 24-hour period. When this occurs, outdoor industrial, commercial, agricultural and social activity must be curtailed or additional precautions taken.



The extreme northwest corner of New Jersey can expect temperatures as low as zero degrees almost every year, and the State's entire northwest quarter about once every two years. In this section of New Jersey, the combined effects of latitude, topography, and elevation create favorable radiational cooling conditions at night, with low temperatures resulting. A second area of lower temperatures is found in the Pine Barrens, where the flat terrain and strong radiational quality of the sandy soil produce low temperatures. The central part of Burlington County, the center of the Pine Barrens, can expect a zero reading once every two years.

The central and south coasts are the least susceptible to zero temperatures, with a zero reading occurring less than once every ten years. Urban complexes, such as Newark and Trenton, can expect a zero reading only once or twice in ten years, because of the heat-island effect resulting from the retention of heat by buildings and pavements, the reduction of nocturnal radiation by pollution-laden atmosphere, input of heat into the atmosphere from fossil fuel combustion, and emanation of waste heat from heated and cooled buildings.

Wind chills can make winter a more dangerous. Very strong winds combined with temperatures slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees F lower in a calm atmosphere. Arctic explorers and military experts have developed what is called the "wind-chill factor", which calculates an equivalent calm-air temperature for the combined effects of wind and temperature. In effect, the index describes the cooling power of air on exposed flesh and to a lesser extent a clothed person. Wind-chill temperatures throughout New Jersey annually fall below zero a number of times each winter, with wind chills in Northwestern New Jersey occasionally reaching 30 degrees F below zero.

## Winter Storm Occurrences

### Snowfall

New Jersey's middle latitude location results in snow falling in all portions of the state each winter. There have been several unusual winters in the past century when measurable snow (greater than or equal to 0.1") has failed to fall or been almost absent over southern portions of the state, but these are rare exceptions. On average, seasonal snowfall totals 10"-20" in the southern third of the state, 20"-30" in the central third and 30"-40" in the lower elevations of the northern third. The higher northern locations receive 40"-60". These averages are not particularly meaningful, as inter-annual variations may be on the order of feet. Two winters within the past decade exemplify the variability. Statewide, the winter of 1997/98 was one of the least snowy on record (1972-73 had the least snow). Less than 5" fell in most of southern and central NJ, with only the northwest corner of the state having close to half of their annual average. Conversely, the winter of 1995/96 was the snowiest on record in NJ. As much as 110" fell at High Point, with record breaking amounts, as much as 20" over former records, in northeast and central NJ. Less snow fell to the south, however totals still were commonly twice or more the annual average.

New Jersey has had its share of wintry weather. Since 1950 there have been 363 winter weather events (snow, ice, and freezing rain) recorded for the State of New Jersey. These events caused \$67.9 million in property damages and are responsible for five deaths and 39 related injuries. Table 4.4-1 below summarizes significant winter storm events by county.



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**Table 4.4-1**  
**New Jersey Snow and Ice Storm Events by County, 1950-2007**  
(Source: NOAA National Climatic Data Center)

Location or County	Number of Events	Deaths	Injuries	Property Damage
Atlantic	78	1	2	30.1M
Bergen	37	0	0	0
Burlington	88	0	27	27.7M
Camden	85	0	2	27.7M
Cape May	55	1	2	13.9M
Cumberland	70	1	2	30.1M
Essex	38	0	0	0
Gloucester	85	0	2	27.7M
Hudson	31	0	0	0
Hunterdon	102	1	33	8M
Mercer	90	1	33	19M
Middlesex	79	1	33	19M
Monmouth	79	1	8	19M
Morris	129	1	33	19M
Ocean	76	0	2	27.7M
Passaic	48	0	0	0
Salem	80	0	2	27.7
Somerset	98	1	33	19M
Sussex	175	1	37	19M
Union	31	0	0	0
Warren	128	1	33	19M

New Jersey's middle latitude location results in snow falling in all portions of the State each winter. There have been several unusual winters in the past century when measurable snow (greater than or equal to 0.1") has failed to fall or been almost absent over southern portions of the state, but these are rare exceptions. On average, seasonal snowfall totals 10"-20" in the southern third of the state, 20"-30" in the central third and 30"-40" in the lower elevations of the northern third. The higher northern locations receive 40"-60". These averages are not particularly meaningful, as inter-annual variations may be on the order of feet. Two winters within the past decade exemplify the variability. Statewide, the winter of 1997/98 was one of the least snowy on record (1972-73 had the least snow). Less than 5" fell in most of southern and central NJ, with only the northwest corner of the state having close to half of their annual average. Conversely, the winter of 1995/96 was the snowiest on record in NJ. As much as 110" fell at High Point, with record breaking amounts, as much as 20" over former records, in northeast and central NJ. Less snow fell to the south, however totals still were commonly twice or more the annual average.



**Table 4.4-4-2  
Summary of Notable Winter Storm Events in New Jersey**

Date(s)	Storm Type	Description
February 7, 1978	Blizzard	This blizzard caused an estimated \$24 million in damage, primarily to dunes, beaches, and public facilities along the beachfront.
January 7, 1996	Blizzard	A State of Emergency was declared for the blizzard that hit the State. Snowfall amounts ranged from 30 inches in southern interior sections to 14 inches in coastal areas. Road conditions were dangerous due to the high winds and drifts. Because of these road conditions, a non-essential travel ban was issued and mass transit operations were suspended. Both government and contract snow plowing operations were running at a maximum. Local roads were impassable. This blizzard also brought on coastal flooding with the high tides of Sunday evening and Monday morning, and there were reports of damage to dunes and beaches from the heavy wave activity. Evacuations were instituted in Cape May, Ocean and Monmouth counties. A total of nine Red Cross Shelters were opened, and provided equipment for two community shelters. More than 400 National Guard personnel were activated for transport assistance, primarily for medic missions.
February 16, 2003	Snow Storm	The combination of the very cold temperatures and the approach of a strong storm system caused widespread snow to break out, starting before sunrise on Sunday, February 16th. Snow continued during the day Sunday, heavy at times, and continued into Sunday night before mixing with and changing to sleet and rain in the southeastern part of the state later Sunday night. Precipitation continued on Monday, before finally coming to an end on Tuesday. When all was said and done, a significant snowfall occurred across the entire state of New Jersey. Total snowfall across New Jersey ranged from 12 to 24 inches. The President's Day snowstorm tied or set records in all 21 New Jersey counties, and all municipalities were involved in states of emergency. New Jersey requested and was granted a Snow Emergency Declaration.

## Probability of Winter Storms

As shown above in Table 4.4-4-2, the NCDC reports 365 ice and snow events in New Jersey between 1950 and 2007. This translates to 6.4 events per year (note that only those reported to NCDC are included in the total and average). The period of time over which this data is provided suggests that probability of winter storms will be about the same in the future, with year-to-year variations.



## 4.4-5 Tornadoes and High Winds

### Nature of the Tornado and High Wind Hazard

The State of New Jersey is susceptible to high winds from several sources – most notably thunderstorms and hurricanes/tropical storms, which can all spawn tornadoes and straight line winds. High straight-line winds related to thunderstorms affect nearly all areas of the State equally, although tornadoes are relatively uncommon in the northeast part of the U.S. compared to the central and south-central States. The potential for a tornado strike is about equal across New Jersey, except in the northern parts of the State, which generally have steeper terrain, are less likely to experience tornadoes.

**Tornadoes** are nature’s most violent storms and can cause fatalities and devastate a neighborhood in seconds. A tornado appears as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with whirling winds that can reach 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long. Before a tornado hits, the wind may die down and the air may become very still. A cloud of debris can mark the location of a tornado even if a funnel is not visible. Tornadoes generally occur near the trailing edge of a thunderstorm. It is not uncommon to see clear, sunlit skies behind a tornado. Tornadoes are typically developed from either a severe thunderstorm or hurricane as cool air rapidly overrides a layer of warm air. This causes the warm air to rise rapidly as a funnel shaped cloud.

The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. The severity of tornadoes is measured by the Fujita Scale and illustrated in Table 4.4-5-1 below. This table provides the level of destruction which may occur with each level of intensity.

**Table 4.4-5-1**  
**Fujita Tornado Intensity Scale**  
 (Source: National Weather Service)

Scale	Wind Speed	Typical Destruction
F-0	40-72 mph	Chimney damage, tree branches broken
F-1	73-112 mph	Manufactured homes pushed off foundation or overturned
F-2	113-157 mph	Manufactured homes demolished, trees uprooted
F-3	158-206 mph	Roofs and walls torn down, trains overturned, cars thrown
F-4	207-260 mph	Well constructed walls leveled
F-5	261-318 mph	Homes lifted off foundation, autos thrown as far as 100 meters

Tornado season in New Jersey is generally March through August, though tornadoes can occur at any time of year. Over 80 percent of all tornadoes strike between noon and midnight. Approximately five tornadoes occur each year within the State, and in general, they tend to be weak. Figure 4.4-1 is from ASCE 7-98, and depicts design wind speeds for the United States. New Jersey is in Zone II, but the entire State is also in a hurricane-susceptible region. See Subsection 4.4-2 (hurricane hazard profile) for more information about the potential for hurricane winds to impact the State.



Figure 4.4-5-1  
 United States Wind Zones (ASCE 7-98, 3-second gust, 3 meters above grade)





**Thunderstorms** can bring other hazard along with high winds to include lightning and flash flooding. In the United States, an average of 300 people is injured and 80 people are killed each year by lightning. Dry thunderstorms that do not produce rain that reaches the ground are most prevalent in the western United States. Falling raindrops evaporate, but lightning can still reach the ground and can start wildfires. Thunderstorms affect relatively small areas when compared with hurricanes and winter storms. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Despite their small size, thunderstorms are dangerous. Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe. (FEMA.gov)

During the warm season, **thunderstorms** are responsible for most of the rainfall. Cyclones and frontal passages are less frequent during this time. Thunderstorms spawned in Pennsylvania and New York State often move into Northern New Jersey, where they often reach maximum development in the evening. This region has about twice as many thunderstorms as the coastal zone, where the nearby ocean helps stabilize the atmosphere. ([http://climate.rutgers.edu/stateclim\\_v1/njclimoverview.html](http://climate.rutgers.edu/stateclim_v1/njclimoverview.html)). The conditions most favorable to thunderstorm development occur between June and August, with July being the peak month for all weather stations in New Jersey.

Straight line winds and microbursts, though not contained in tornadoes, can still reach very high speeds and are in fact for a much greater volume of injuries and damage. Quite often, straight-line winds are associated with thunderstorms and their intense downbursts; however, any frontal passage, storm, or significant gradient between high and low pressure zones in the region can be result in damaging winds. These winds have been known to cause tornado like damage and even be mistaken for tornadoes to the untrained observer. Straight-line winds occur more often in areas with large expanses unbroken by buildings or geographic relief and as with tornadoes are associated with thunderstorms. They often cause extensive crop damage

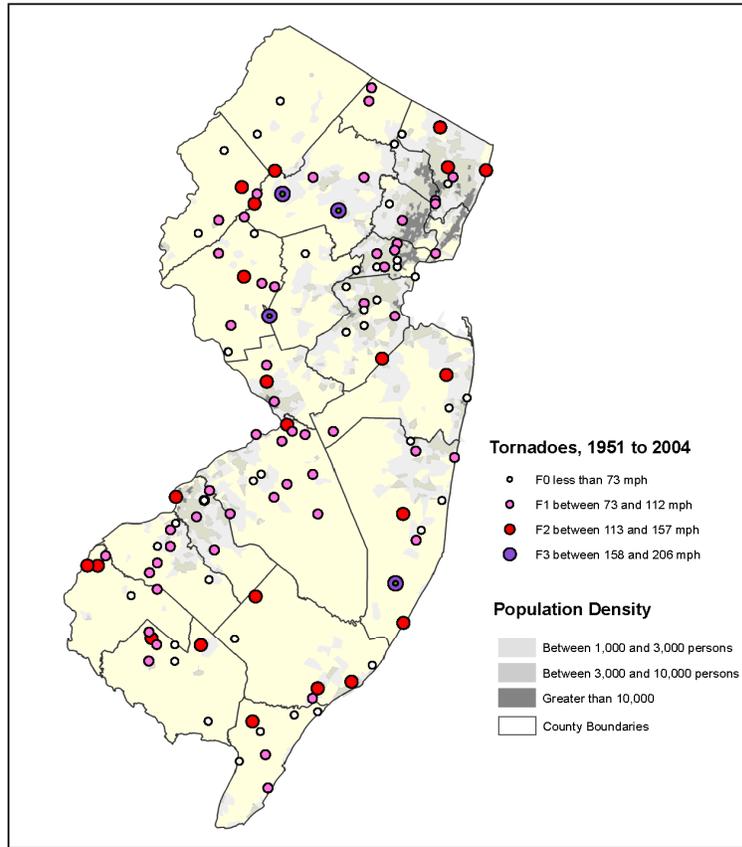
## Previous Tornado and High Wind Occurrences

In an analysis of tornado occurrence per square mile, New Jersey ranks number 20 in the United States for the frequency of tornadoes, number 30 for injuries per area, and number 23 for costs per area. When New Jersey is compared to the nation however, New Jersey ranks number 37 for frequency of tornadoes, 39 for injuries and 33 for cost of damages.

The next figure shows the historic distribution of tornadoes in the State, including an indicator of intensity.



**Figure 4.4-5-2**  
 Historic Tornado Distribution and Intensity in the State of New Jersey



Map prepared by New Jersey Office of Emergency Management January 2007. Source: Population density statistics originated from the United States Bureau of Census 2000. Tornado touchdown points and wind speeds originated from the National Weather Service, Storm Prediction Center, September 2005. Contact address: NOAA Storm Prediction Center, SPC Warning Coordination Meteorologist, 1313 Halley Circle, Norman, OK 73069.

Table 4.4-5-2 summarizes the number of tornadoes that have impacted New Jersey during the 55 year period between 1951 and 2006.

**Table 4.4-5-2**  
**Tornadoes affecting New Jersey from 1950 to 2006**  
 (Source NOAA, National Climatic Data Center)

Tornado Magnitude	Total Occurrences Within New Jersey 1951 to 2006
F-0	47
F-1	55
F-2	22
F-3	4



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- The most costly tornado in New Jersey history occurred on July 13, 1975 and caused \$25,000 in property damage.
- The most recent tornado occurred on June 2, 2006. A fast moving thunderstorm tracked northward during the evening of June 2nd across southern New Jersey, then merged with additional thunderstorms arriving from the west as it entered Gloucester County. The merging thunderstorm produced an F0 tornado in East Greenwich Township, New Jersey. The National Weather Service Office in Mount Holly, New Jersey conducted a storm survey and confirmed that a weak tornado with 65 mph winds touched down. The path length of the tornado was three-quarters of a mile and the path width was mostly around 100 yards, but at its maximum it reached 250 yards. Numerous trees were knocked down and snapped in a six block area. Three homes sustained major damage from downed trees, and another twenty homes had minor damage. Roofing material from a house on County Lane Road was found a quarter of a mile away near the Mount Royal firehouse. Total property damage from this event was \$100,000.

**Table 4.4-5-3  
 Annual Tornado Summary, State of New Jersey**

Year	Tornadoes	Deaths	Injuries	Total Damages
1951	1	0	2	\$ 25,000
1952	4	0	0	\$ 78,000
1955	1	0	0	\$0
1956	4	0	8	\$ 50,000
1957	1	0	0	\$ 250,000
1958	4	0	1	\$ 528,000
1960	6	0	6	\$ 303,000
1962	3	0	1	\$ 500,000
1964	6	0	10	\$ 1,275,000
1967	1	0	0	\$ 25,000
1970	2	0	0	\$ 275,000
1971	3	0	0	\$ 750,000
1973	8	0	12	\$ 536,000
1974	2	0	0	\$ 0
1975	3	0	0	\$ 25,275,000
1976	1	0	0	\$ 250,000
1977	2	0	1	\$ 250,000
1979	2	0	1	\$ 253,000
1980	1	0	0	\$25,000
1981	3	0	0	\$ 250,000
1982	1	0	0	\$ 2,500,000
1983	1	0	0	\$ 2,500,000
1985	3	0	8	\$ 0
1986	1	0	0	\$ 250,000
1987	9	0	3	\$ 259,000



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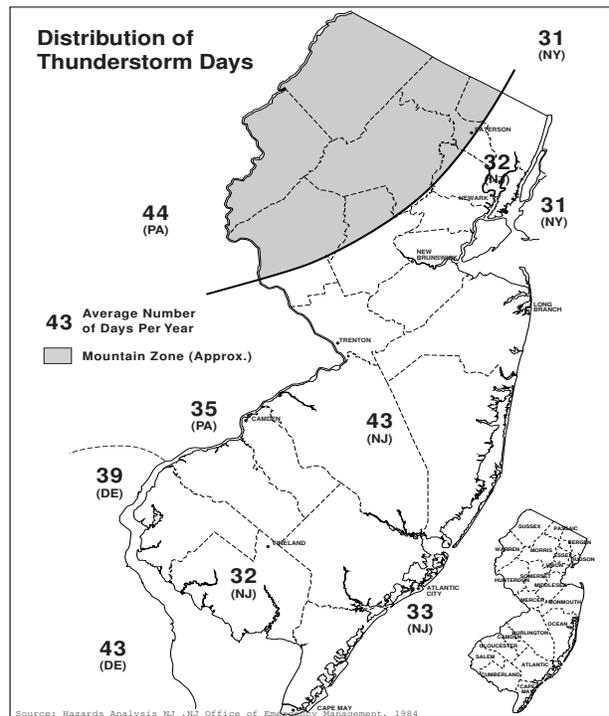
<b>Year</b>	<b>Tornadoes</b>	<b>Deaths</b>	<b>Injuries</b>	<b>Total Damages</b>
1988	6	0	1	\$ 3,253,000
1989	17	0	2	\$ 8,828,000
1990	8	0	11	\$ 6,000,000
1991	1	0	0	\$ 3,000
1992	4	0	0	\$ 500,000
1993	2	0	0	\$ 503,000
1994	7	0	0	\$ 10,575,000
1995	5	0	0	\$ 0
1996	2	0	0	\$ 10,000
1997	2	0	0	\$ 103,000
1998	3	0	0	\$ 3,050,000
1999	2	0	1	\$ 4300,000
2001	2	0	0	\$ 1,015,000
2003	7	1	0	\$ 2,100,000
2004	2	0	2	\$ 600,000
2006	1	0	0	\$ 100,000
<b>Total</b>	<b>144</b>	<b>1</b>	<b>70</b>	<b>\$ 77,347,000</b>
<b>Average</b>	<b>2.6</b>	<b>.02</b>	<b>1.27</b>	<b>\$1,406,309</b>

Source: National Climatic Data Center

For the State, an average of thirty thunderstorms a year occurs for each locality, with more storms occurring in the northwestern portion of the state than the eastern portion (Figure 10-2 Distribution of Thunderstorm Days). This is because the passage of air masses most commonly associated with storms and other weather phenomenon, known as frontal passages, is in a generally west to east direction. Thus, thunderstorms created in New York State and Pennsylvania are carried into New Jersey. Geologic relief in Pennsylvania, New York and northern New Jersey enhance the intensity and frequency of thunderstorm development, which is why there are more thunderstorms in the northern portion of the State. As a result, Sussex County experiences twice as many thunderstorms as Cape May County.



**Figure 4.4-5-3  
Distribution of Thunderstorm  
Days in New Jersey**



## Probability of Future Occurrences

Tornado distribution throughout the State, as shown in Figure 4.4-4 is uncertain and does not exhibit readily identifiable patterns. Therefore, the areas selected for the vulnerability analysis at highest risk are those of highest urbanization. Recent advances in technology and prediction methodologies have enabled the Storm Prediction Center of the National Weather Service to provide the public with up to a 15-minute warning of an approaching tornado compared to only three minutes in 1978. This advance warning will definitely reduce deaths and injuries associated with tornadoes, and may also reduce property damage, at least at the fringes of the path, by allowing loose objects to be better sheltered or secured.

Although exact tornado probability is impossible to determine, given the relatively long reporting period, it is reasonable to assume that the average annual statewide figure cited in Table 4.4-3 (2.6 per year) will remain relatively constant in the future. Note however, the numbers of deaths, injuries, and dollar amount of damages can fluctuate drastically depending on the severity of the tornados and the locations that they impact.

Thunderstorms and associated high winds are a fairly regular occurrence in the State, and it is reasonable to expect that the frequency of such events will remain about the same as it has been in the past.



## 4.4-6 Earthquakes

### Nature of the Earthquake Hazard

In the popular press, earthquakes are often described by their Richter Magnitude (M). Magnitude is a measure of the total energy released by an earthquake. In addition to Richter magnitude, there are several other measures of earthquake magnitude used by seismologists, but such technical details are beyond the scope of this discussion. It is important to recognize that the Richter scale is not linear, but rather logarithmic. A Magnitude (M) 8 earthquake is not twice as powerful as an M4, but rather thousands of times more powerful. An M7 earthquake releases about 30 times more energy than an M6, while an M8 releases about 30 times more energy than an M7, and so on. Thus, great M8 earthquakes may release hundreds or thousands of times as much energy as do moderate earthquakes in the M5 or M6 range.

It is often assumed that the larger the magnitude of an earthquake the “worse” the earthquake. Thus, the “big one” is the M8 earthquake and smaller earthquakes (M6 or M7) are not the “big one”. However, this is true only in very general terms. Larger magnitude earthquakes affect larger geographic areas, with much more widespread damage than smaller magnitude earthquakes. However, for a given site, the magnitude of an earthquake is not a good measure of the severity of the earthquake at that site. Rather, the intensity of ground shaking at the site depends on the magnitude of the earthquake and on the distance from the site to the earthquake.

An earthquake is located by its epicenter - the location on the earth’s surface directly above the point of origin of the earthquake. Earthquake ground shaking diminishes (attenuates) with distance from the epicenter. Thus, any given earthquake will produce the strongest ground motions near the earthquake with the intensity of ground motions diminishing with increasing distance from the epicenter. Thus, for a given site, a moderate earthquake (such as an M5.5 or M6.0) which is very close to the site could cause greater damage than a much larger earthquake (such as an M7.0 or M8.0) which is quite far away from the particular site. However, earthquakes at or below M5 are not likely to cause significant damage, even locally very near the epicenter. Earthquakes between about M5 and M6 are will cause damage near the epicenter. Earthquakes of about M6.5 or greater will cause major damage, with larger earthquakes resulting in greater damage over increasingly large areas.

The intensity of ground shaking from an earthquake, and the resulting damage, varies not only as a function of M and distance, but also depends on soil types. Soft soils may amplify ground motions and increase the level of damage. Thus, for any given earthquake there will be contours of varying intensity of ground shaking. The intensity will generally decrease with distance from the earthquake, but often in an irregular pattern, reflecting soil conditions (amplification) and possible directionality in the dispersion of earthquake energy.

There are many measures of the severity or intensity of earthquake ground motions. A very old scale, but still commonly used, is the Modified Mercalli Intensity scale (MMI), which is a descriptive scale that relates severity to the types of damage experienced. MMIs range from I to XII. For reference, the MMI intensity scale is shown below. However, it is important to note that these descriptions are not particularly applicable to modern buildings and that for any level of ground shaking, damage patterns for specific buildings or infrastructure will vary markedly depending on the specific vulnerabilities of each facility.



**Table 4.4-6-1  
 Modified Mercalli Intensity Scale**

MMI	Effects
<b>I</b>	Not felt except for a very few under especially favorable circumstances.
<b>II</b>	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended object may swing.
<b>III</b>	Felt quite noticeably indoors, especially on upper floors of buildings but many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibration like passing of truck. Duration estimated.
<b>IV</b>	During the day, felt indoors by many, outdoors by a few. At night, some awakened. Dishes, windows, doors disturbed; walls make creaking sound. Sensation like heavy truck striking building. Standing motorcars rocked noticeably.
<b>V</b>	Felt by nearly everyone, many awakened. Some dishes, windows etc. broken; a few instances of cracked plaster, unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
<b>VI</b>	Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
<b>VII</b>	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motorcars.
<b>VIII</b>	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motorcars disturbed.
<b>IX</b>	Damage considerable in specially built structures; well designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
<b>X</b>	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (sloshed) over banks.
<b>XI</b>	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
<b>XII</b>	Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upwards into air.

Source: Wood and Neumann (1931), Bulletin of Seismological Society of America, Volume 21.



More useful, modern intensity scales use terms that can be physically measured with seismometers, such as the acceleration, velocity, or displacement (movement) of the ground. The most common physical measure, and the one used in this mitigation plan, is Peak Ground Acceleration, or PGA. PGA is a measure of the intensity of shaking, relative to the acceleration of gravity (g). For example, 1.0 G PGA in an earthquake (an extremely strong ground motion) means that objects accelerate sideways at the same rate as if they had been dropped from the ceiling. 10% G PGA means that the ground acceleration is 10% that of gravity, and so forth.

Damage levels experienced in an earthquake vary with the intensity of ground shaking and with the seismic capacity of structures. Ground motions of only 1 or 2% G are widely felt by people; hanging plants and lamps swing strongly, but damage levels, if any, are usually very low. Ground motions below about 10% G usually cause only slight damage, except in unusually vulnerable facilities. Ground motions between about 10% G and 20% G may cause minor to moderate damage in well-designed buildings, with higher levels of damage in poorly designed buildings. At this level of ground shaking, only unusually poor buildings would be subject to potential collapse. Ground motions above about 20% G may cause significant damage in some modern buildings and very high levels of damage (including collapse) in poorly designed buildings. Ground motions above about 50% G may cause high levels of damage in many buildings, even those designed to resist seismic forces.

The level of seismic hazard – the frequency and severity of earthquakes – is substantially lower in New Jersey than in more seismically active States such as California or Alaska. However, the level of seismic risk – the threat to buildings, infrastructure, and people – is significant in New Jersey, especially in the northern part of the State. However, the level of seismic *risk* (i.e. potential damages) in New Jersey is higher than might be expected because the probability of damaging earthquakes is not negligible and because the vast majority of the buildings and infrastructure in New Jersey have been built with minimal or no consideration of earthquakes. Thus, the inventory of buildings and infrastructure in New Jersey is much more vulnerable to earthquake damage than the buildings and infrastructure in more seismically active States where much of the inventory has been built with consideration of earthquakes.

In New Jersey, earthquakes are most likely to occur in the northern parts of the State, where significant faults are concentrated. However, low-magnitude events can and do occur in many areas of the State. The New Jersey Geologic Survey and the U.S. Geologic Survey have compiled considerable bodies of information about earthquake hazards across the State, as discussed below. It is important to recognize that earthquake risk (the potential for damage) is determined by factors other than proximity to faults. As discussed in this section, the nature of soils and the vulnerability of the built environment are also significant determinants of risk.

For New Jersey, major damaging earthquakes are low probability events. However, when they do occur they may have very high consequences because of the nature of the built environment in the State, much of which (particularly older structures) was not designed to withstand the stresses induced by shaking forces. Generally speaking, the effects of high-severity (and hence relatively lower probability) hazards are more difficult and expensive to mitigate than are hazards with higher probabilities and lower consequences.

## Previous Earthquake Occurrences in New Jersey

The New Jersey Geological Survey has compiled records of over 150 earthquakes in New Jersey, with most of these in the northern part of the State. However, nearly every County in New Jersey has experienced at least one earthquake. Most of these earthquakes have been too small to cause damage. Figure 4.4-6-1 shows the locations of these earthquakes, along with their magnitudes.

Historically, there have been at least four earthquakes that caused damage in the State:

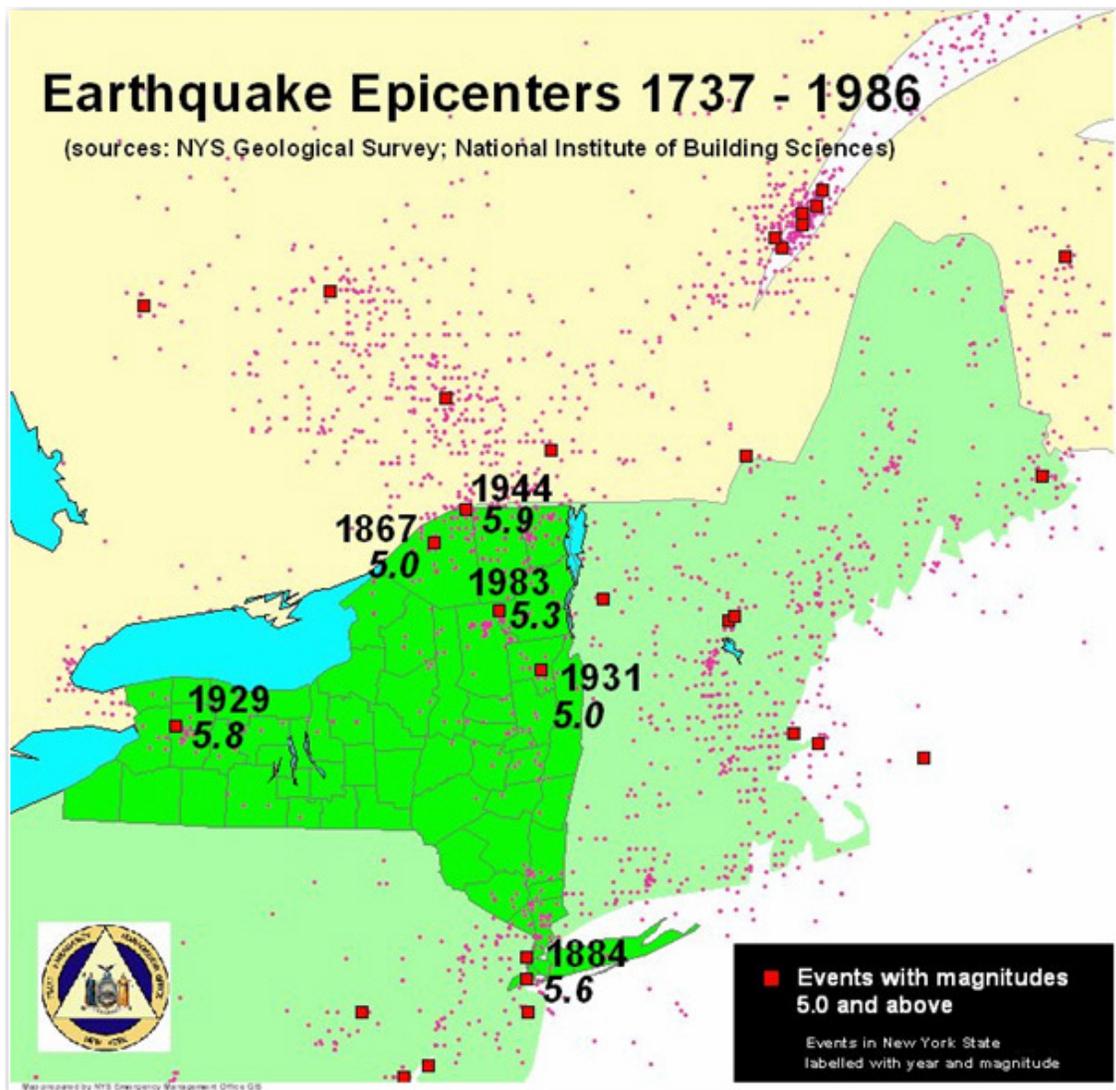


1. New York City, 1737
2. West of New York City, 1783
3. New York City, 1884
4. New Jersey Coast near Asbury, 1927

The magnitudes of these earthquakes, based on reported damage patterns, were probably approximately M5.0 to M5.5 (Richter). Damage in New Jersey from these earthquakes was relatively minor, and included building damage such as chimney collapse and objects falling from shelves.

Historically New Jersey also felt several large earthquakes which caused major damage near their epicenters: Cape Ann, Massachusetts in 1755, Charleston, South Carolina in 1886, and three large earthquakes near New Madrid, Missouri in 1811 and 1812.

**Figure 4.4-6-1**  
**Epicenters of Earthquakes in the northeastern United States, 1737 to 1986**

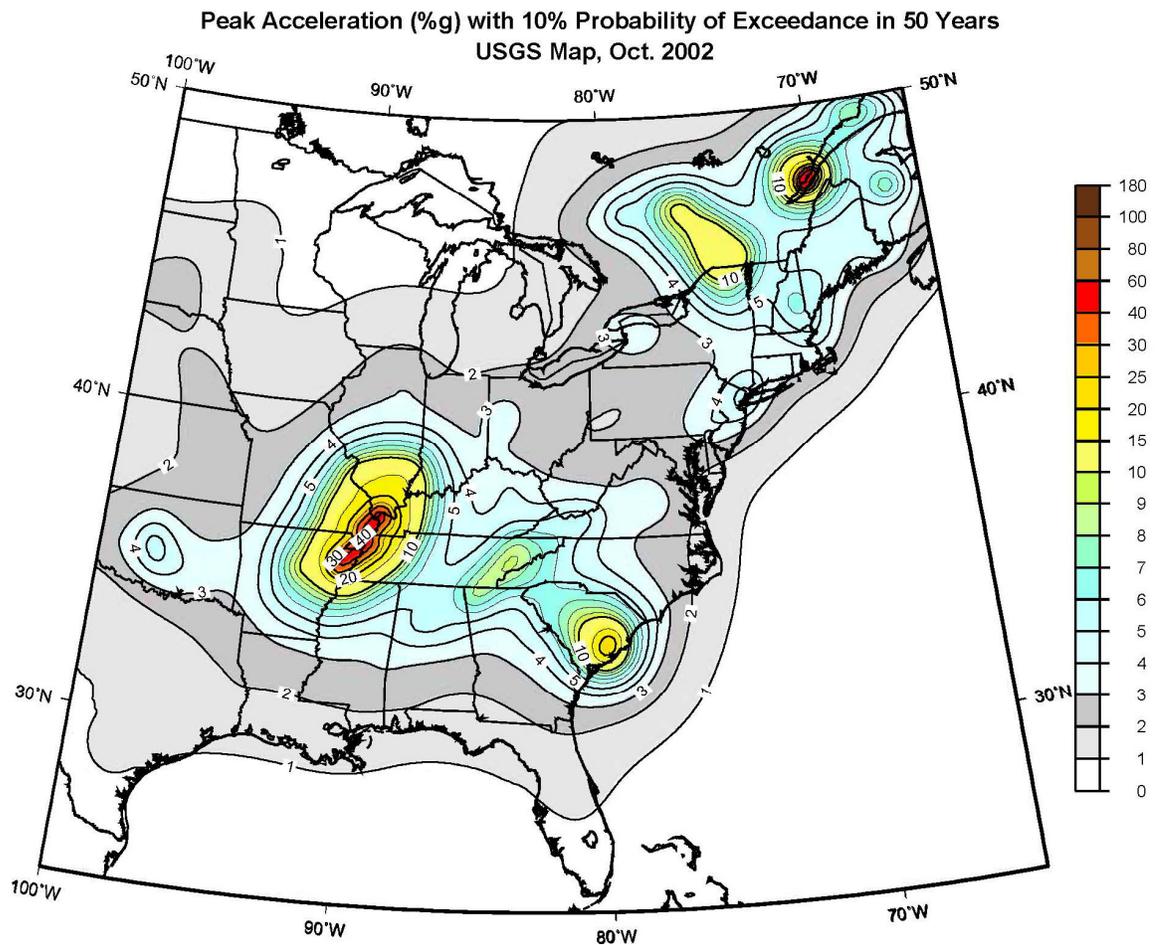




The level of seismic hazard in New Jersey – the probability and severity of earthquakes – varies markedly with location with the State. It is not possible to predict exactly when and where future earthquakes will occur. Thus, seismic hazard is expressed in probabilistic terms. The following figures show the levels of ground shaking (PGA, peak ground acceleration, in percent of G, the acceleration of gravity) with 10% and 2% probabilities of being exceeded in any 50-year time period. These maps are national consensus, United States Geological Survey estimates, which are used in building codes (along with other maps showing spectral acceleration values) and for seismic risk assessments.

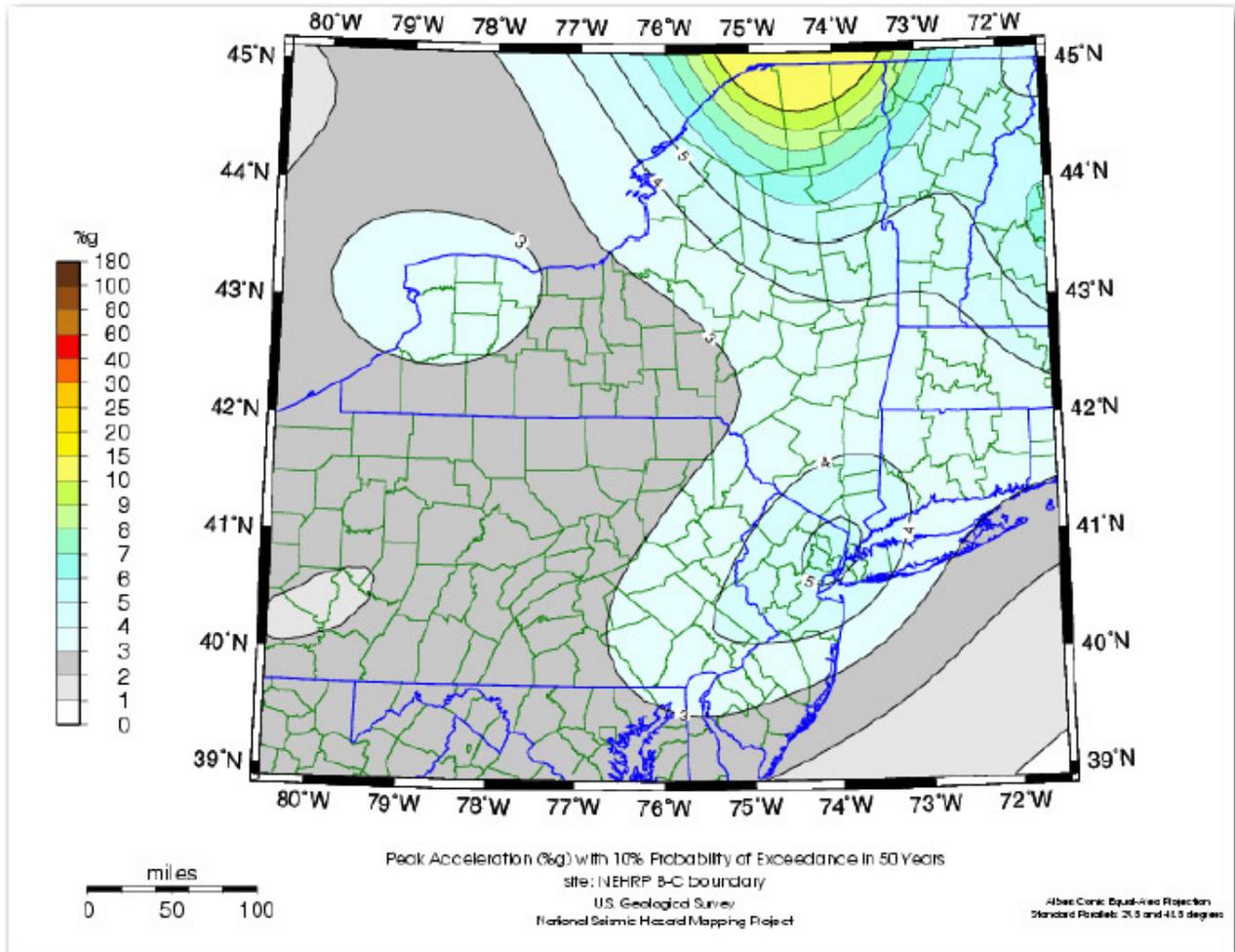
Figure 4.4-6-2 shows the 10% in 50-year earthquake ground motion contours for the central and eastern United States. This map shows several areas of significant seismicity, with one of the areas being the northeastern United States, including New Jersey.

**Figure 4.4-6-2**  
**USGS 10% in 50-Year Earthquake Ground Motions (PGA)**





**Figure 4.4-6-3**  
**USGS 10% in 50-Year Earthquake Ground Motions for Northeast U.S. (PGA)**



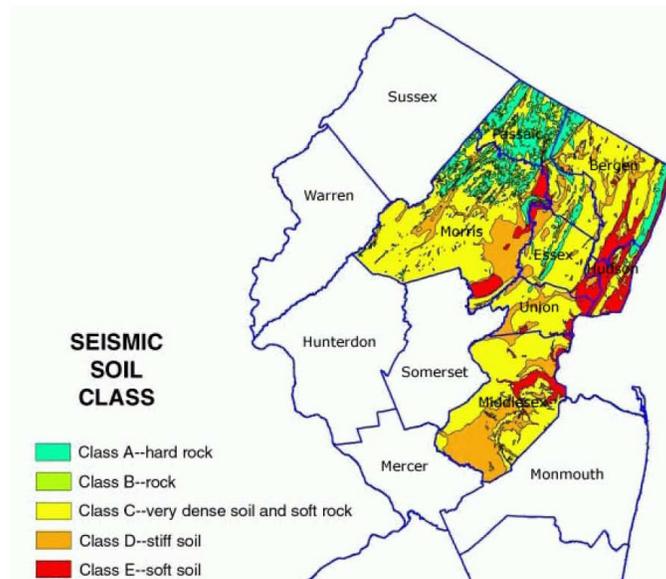
The 10% in 50-year and 2% in 50-year contour maps shown above represent probabilistic ground motions that are expected to occur, on average, about once every 500 years and about once every 2500 years, respectively. However, earthquakes with these levels of ground motions could occur anytime. For example, over the next 10 years, there is about a 2% chance of experiencing the 10% in 50-year ground motions and about a 0.4% chance of experiencing the 2% in 50-year ground motions at any location in New Jersey.

As shown by the seismic hazard maps above, the level of seismic hazard is highest in northern New Jersey, especially in the northeast corner of the State. Within this area, the level of seismic hazard is especially high in locations underlain by soft soils because soft soil sites amplify earthquake ground motions resulting in much higher levels of shaking (and damage) than on nearby firm soil or rock sites. The following geologic map for the seven



counties in northeastern New Jersey with the highest level of seismic hazard shows areas of soft soils where the level of seismic hazard and risk is especially high.

**Figure 4.4-6-4**  
**Rock-Soil Class Map for Northeastern New Jersey**



Source: New Jersey Geological Survey, Earthquake Loss Estimation Study for New Jersey ([www.State.nj.us/dep/njgs](http://www.State.nj.us/dep/njgs))

## Probability of Earthquakes

In any given year, the probability of damaging earthquakes affecting New Jersey is low. Nevertheless, current understanding of the seismicity in the northeastern United States, as reflected in the USGS seismic hazard maps shown above is conclusive: there is a definite threat of major earthquakes which could cause widespread damages and casualties in New Jersey. Major damaging earthquakes are infrequent in New Jersey and may occur only once every few hundred years or longer, but the consequences of major earthquakes would be very high.

As shown in the figures above, the 10% in 50-year ground motions are about 6% g shaking in northeastern New Jersey, 4% to 6% in much of northern New Jersey and below 4% in southern New Jersey. At these levels of shaking, the potential for damage to buildings or infrastructure is very low, with only very minimal damage expected, even for rather vulnerable facilities.

As shown in Figure 4.4-6-4, the 2% in 50-year ground motions are much higher than the 10% in 50-year ground motions. The ground motions are above 20% G in northeastern New Jersey, above 16% G for all of northern New Jersey, and 8% to 16% G for southern New Jersey. At these levels of shaking, there would be substantial damages to vulnerable buildings and infrastructure, especially in northern New Jersey.



However, a very important aspect of seismic hazards in New Jersey is that the expected levels of ground shaking from future earthquakes depends on only on location within the State, but also on soil conditions at specific locations. The levels of ground shaking shown on the figures above are for rock sites. Locations underlain by firm soils, and especially locations underlain by soft soils, will experience significantly higher levels of ground shaking than nearby locations on rock sites. For firm soil sites, ground motions are likely to be as much as 40% to 60% higher than shown above. For very soft soil locations, ground motions are likely to be from 70% to as much as 250% higher than shown above.

For the 10% in 50-year ground motions, the levels of shaking, for firm soil sites are expected to be below 10% G. At such levels of shaking, the potential for damage to buildings and infrastructure is generally low, with low levels of damage for most structures, even vulnerable structures, with only extremely vulnerable structures perhaps experiencing major damage. However, for the 10% in 50-year ground motions, the levels of shaking for soft soil sites in northern New Jersey would be in the 10% to 15% G range. At this level of shaking, many vulnerable structures may have low to moderate levels of damage, with highly vulnerable structures experiencing major damage.

For the 2% in 50-year ground motions, levels of shaking on firm soil sites would be in the 15% to 25% G range for much of the State. At such levels of shaking, widespread damage to vulnerable structures is expected. For soft soil sites, levels of shaking would be above 20% G for much of the State and above 30% G in northeastern New Jersey. At such levels of shaking there very widespread damage is expected, with heavy damage to many vulnerable structures, and possible collapse of some highly vulnerable structures.

A very important characteristic of earthquake risk is that it is not uniform. Rather, earthquake damage is always concentrated in the most vulnerable buildings and infrastructure. The building types most vulnerable to earthquake damage include: unreinforced masonry, pre-cast concrete buildings, tilt-up buildings, and some concrete frame buildings. Buildings of the above structural systems may be especially vulnerable if they have soft first stories and very irregular configurations.

Most wood frame buildings perform relatively well in earthquakes, with two exceptions. Buildings with cripple wall foundations and buildings with sill plates not bolted to the foundation are very vulnerable to earthquake damage. Cripple wall foundations are short stud walls which raise the first floor two or three feet above grade; these walls are subject to collapse in earthquakes if not adequately braced.

Infrastructure that may be especially vulnerable includes some types of older bridges, especially multispan bridges, and high voltage (220 kV or higher) electric substations with unanchored transformers and non-seismically rated equipment.

The level of risk – the threat to buildings, infrastructure and people – from earthquakes in New Jersey is addressed in the following section, which includes quantitative earthquake loss estimates.

## HAZUS Earthquake Loss Estimates for Seven Northeastern New Jersey Counties

The New Jersey Geological Survey used FEMA's HAZUS Loss Estimation software to make quantitative loss estimates for several scenario earthquakes in the seven counties in northeastern New Jersey: Bergen, Essex, Hudson, Middlesex, Morris, Passaic, and Union. Summary results are given in Table 4.4-6-2 below.



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For each County, five scenario earthquakes were considered: M5.0, M5.5, M6.0, M6.5, and M7.0 with an epicenter at the centroid of the County and a depth of 10 kilometers. Two sets of geologic rock/soil data were evaluated: a) the default rock-soil data in HAZUS and b) updated New Jersey-specific rock/soil data compiled by the New Jersey Geological Survey. The New Jersey-specific data are more accurate. Thus, the results summarized below all reflect the HAZUS runs using the New Jersey-specific rock/soil data. The New Jersey-specific rock/soil resulted in somewhat lower damage estimates than the default HAZUS results in areas of rock or very firm dense soils and higher damage estimates in areas of soft, liquefiable soils.

**Table 4.4-6-2**  
**HAZUS Scenario Earthquake Loss Estimates for Seven New Jersey Counties**  
(conducted by the New Jersey Geological Survey)

**M5.0 Scenario: Upgraded Geology**

County	Damage or Loss Estimate (\$millions)									Max PGA (g)
	Damaged Buildings <sup>1</sup>	Heavily Damaged Buildings <sup>2</sup>	Property Damage \$millions	Business Interruption Loss \$millions	Injuries <sup>3</sup>	Injuries <sup>4</sup>	Deaths <sup>5</sup>	Displaced Households	People Needing Shelter	
Bergen	12,800	400	\$1,080	\$80	80	11	1	240	150	0.37
Essex	8,800	200	\$1,410	\$90	92	11	1	270	230	0.36
Hudson	5,786	298	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Middlesex <sup>6</sup>	12,500	500	\$1,160	\$50	245	30	<20	320	190	0.37
Morris <sup>6</sup>	9,000	1,000	\$1,350	\$50	325	75	<20	1,300	315	n/a
Passaic <sup>6</sup>	5,000	500	\$550	\$50	315	100	30	1,300	315	n/a
Union <sup>6</sup>	11,000	<1000	\$1,200	\$50	190	30	<20	370	250	0.38

**M6.0 Scenario: Upgraded Geology**

County	Damage or Loss Estimate (\$millions)									Max PGA (g)
	Damaged Buildings <sup>1</sup>	Damaged Buildings <sup>2</sup>	Property Damage \$millions	Business Interruption Loss \$millions	Injuries <sup>3</sup>	Injuries <sup>4</sup>	Deaths <sup>5</sup>	Displaced Households	People Needing Shelter	
Bergen	99,900	12,000	\$5,670	\$1,610	1,902	367	36	9,900	1,610	0.68
Essex	71,700	9,800	\$6,970	\$1,890	2,742	506	48	19,270	16,310	0.69
Hudson	27,445	5,546	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Middlesex <sup>6</sup>	110,000	12,500	\$5,950	\$1,250	4,300	1,075	250	12,000	7,500	0.68
Morris <sup>6</sup>	85,000	18,500	\$6,350	\$800	3,150	895	185	15,500	3,150	1.00
Passaic <sup>6</sup>	55,000	10,500	\$3,700	\$50	2,500	800	190	5,500	1,300	1.00
Union <sup>6</sup>	85,000	11,500	\$5,650	\$1,200	3,750	1,025	250	12,500	9,000	0.69

**M7.0 Scenario: Upgraded Geology**

County	Damage or Loss Estimate (\$millions)									Max PGA (g)
	Damaged Buildings <sup>1</sup>	Damaged Buildings <sup>2</sup>	Property Damage \$millions	Business Interruption Loss \$millions	Injuries <sup>3</sup>	Injuries <sup>4</sup>	Deaths <sup>5</sup>	Displaced Households	People Needing Shelter	
Bergen	133,000	47,500	\$15,160	\$5,530	8,980	2,156	223	38,690	22,710	1.19
Essex	79,300	36,900	\$66,180	\$6,110	11,054	2,553	273	66,180	55,700	1.21
Hudson	25,293	22,363	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Middlesex <sup>6</sup>	130,000	50,000	\$15,500	\$3,650	17,500	5,750	1,300	42,500	27,000	1.20
Morris <sup>6</sup>	105,000	55,000	\$17,900	\$2,150	10,000	2,815	315	42,500	8,500	2.00
Passaic <sup>6</sup>	75,000	37,500	\$10,450	\$1,500	9,000	2,880	750	47,500	12,500	2.00
Union <sup>6</sup>	80,000	5,500	\$16,650	\$4,300	23,500	8,150	1,950	60,500	42,000	1.21

<sup>1</sup> Damaged buildings with slight or moderate damage.

<sup>2</sup> Damaged buildings with extensive or complete damage

<sup>3</sup> Injuries requiring medical treatment, but not hospitalization

<sup>4</sup> Injuries requiring hospitalization

<sup>5</sup> Death estimates in HAZUS are given for daytime and for nighttime earthquakes. Nighttime casualties are typically much lower than daytime casualties because most people are in wood frame residential buildings which are less vulnerable to collapse than commercial masonry or concrete buildings. Time of day is unspecified for the estimates shown above, per the published New Jersey HAZUS summaries.

<sup>6</sup> Values shown are midpoints of ranges given in the HAZUS Summary



## Limitations of the HAZUS Results

The results displayed in the table above should be interpreted cautiously because they are more like worst-case scenarios than typical earthquakes for New Jersey. First, each scenario earthquake is assumed to be located at the centroid of a County. A much more likely scenario is that a given County will experience damage from an earthquake outside the County. As shown by the hazard contours in the USGS seismic hazard Maps, much of the seismic hazard for northern New Jersey (and the rest of the state) arises from high probabilities of significant earthquakes in New York, northeast of the northeast corner of New Jersey. This observation is the reason why the contours of ground motion in New Jersey are highest at the extreme northeast corner of the state and systematically decrease to the west and south.

Second, for earthquakes within New Jersey or nearby, the most likely significant earthquakes are in the M5 to M5.5 magnitude range, with earthquakes of larger magnitude being possible but very unlikely. An M7.0 earthquake is probably the largest magnitude earthquake possible anywhere in the northeastern United States and adjacent parts of Canada. While such an earthquake is possible, it is very unlikely to occur in or very near New Jersey.

In combination, the above two factors mean that the return periods for the scenario earthquakes modeled in the HAZUS runs are very long – somewhat above 2,500 years for the smaller M5.0 or M5.5 scenarios and well above 2,500 years for the M6.0 or larger scenarios. Thus, the levels of ground shaking and the corresponding levels of damage expected for more likely earthquakes affecting New Jersey will be substantially lower than any of the scenarios summarized below and drastically lower than the M7.0 scenario results.

A further caveat on the scenario results presented below is that each earthquake scenario was evaluated only for damages within a single County. More realistically, these scenarios would also result in significant damages and casualties in adjacent and nearby counties. Thus, for example, building damages for the M7.0 scenario in Bergen County are shown as about \$15 billion. For New Jersey overall, building damages could be several times the Bergen County estimate, with most of the damage in adjacent counties.

In interpreting the loss estimates below, it is important to remember that all of these results are much more like worst case scenarios and not representative of the major damaging earthquakes most likely to affect New Jersey. The most likely damaging earthquakes for New Jersey would be moderate size earthquakes, roughly M5.0 to M5.5. Earthquakes on these faults would affect the counties nearest the epicenter most strongly, but would have effects in all of the northern New Jersey counties, with minor effects perhaps extending to mid- or southern New Jersey as well.

The above caveats notwithstanding, the scenario results for M5.0 and M5.5 earthquakes are reasonably representative of the damage expected from New Jersey earthquakes with these magnitudes, although the damages will not be limited to a single County. For earthquakes of similar magnitudes in New York, damage levels in New Jersey will be less, depending on the distance to the epicenter.

## Statewide Earthquake Loss Estimates for New Jersey

As discussed above the most likely earthquakes affecting New Jersey are M5.0 or M5.5 earthquakes in northeastern New Jersey or adjacent New York. Loss estimates for individual counties for earthquakes representative of such earthquakes were shown above for the seven northeastern counties. Each of these scenario earthquakes was postulated to be at the centroid of a given County.



For such earthquakes, the Statewide impacts can be estimated approximately. For such small to moderate earthquakes most of the damage will be near the epicenter, within the County in which the earthquake occurs. For a M5.0 earthquake in any of these seven counties, the Statewide loss estimates are likely to be approximately 50% to 100% more than the single County estimate shown in Table 4.4-6-1, with total property damage in the \$2 billion range, with perhaps several hundred injuries and possibly a few deaths. Such an event would be roughly a once in 2500-year event.

It is important to note that Statewide estimates or seven-County estimates cannot be made simply by summing the results because each County loss estimate represents a different earthquake (at the centroid of each County). Thus, for example, the seven M5.0 loss estimates represent seven different earthquakes.

For larger earthquakes, such as M6.0 or M7.0, the most likely epicenters would also be in these seven northeastern Counties. For such larger earthquakes, damaging effects occur over wider geographic areas and thus the ratio of Statewide losses to the losses in the County where the earthquake occurred would be higher than for the M5.0 scenarios discussed above. For an M6.0 earthquake, statewide losses would likely be 2 or 3 times the single County losses. Total property damage might be in the \$10 billion to \$15 billion range, with perhaps 5,000 or 10,000 injuries and a few dozen to possibly a few hundred deaths. Such damage would be highly concentrated in the nearest County to the epicenter and in adjacent counties, with very limited damage in more distant counties.

For an M7.0 earthquake, which would represent the worst case scenario for New Jersey, with return periods in the many thousands of years, the Statewide losses would likely be 5 to 10 times higher than the single County estimates, with total property damages roughly in the \$50 billion to \$100 billion range, with tens of thousands of injuries and perhaps over 1,000 deaths. These damages would be concentrated in the nearest County to the epicenter and in adjacent counties, with some damage in further away counties. However, even a very large M7.0 earthquake in northeastern New Jersey would have only minor effects in central New Jersey and nearly negligible effects in southern New Jersey.

## Extrapolation of HAZUS Loss Estimates to All Counties in New Jersey

As an alternative to the general estimates described in the paragraphs above, the HAZUS Total Economic Loss (TEL) figures for an M5.5 earthquake (for the seven Counties for which such estimates have been calculated) are used to extrapolate potential loss figures for the other Counties in the State. As estimated by HAZUS, TEL values for the seven studied Counties average 2.9% of the total exposure (i.e. total value of assets). For this table, a simple extrapolation as 2.9% of total exposure was used for all Counties in the State. This data should be regarded as useful for planning purposes only, as it does not account for variations in the numerous factors that influence earthquake losses.

**Table 4.4-6-2  
Potential Earthquake Losses to New Jersey Counties,  
as extrapolated from M5.5 HAZUS scenario Loss Calculation**

<b>County</b>	<b>\$ Exposure [1000s]</b>	<b>Earthquake [1000s]</b>
Atlantic	\$27,652,015	\$801,908
Bergen	\$100,653,325	\$2,918,946
Burlington	\$50,946,874	\$1,477,459
Camden	\$50,021,816	\$1,450,633



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<b>County</b>	<b>\$ Exposure [1000s]</b>	<b>Earthquake [1000s]</b>
Cape May	\$18,311,425	\$531,031
Cumberland	\$12,235,912	\$354,841
Essex	\$78,836,283	\$2,286,252
Gloucester	\$24,721,631	\$716,927
Hudson	\$53,814,871	\$1,560,631
Hunterdon	\$14,692,482	\$426,082
Mercer	\$40,721,537	\$1,180,925
Middlesex	\$79,240,485	\$2,297,974
Monmouth	\$64,432,550	\$1,868,544
Morris	\$67,233,273	\$1,949,765
Ocean	\$46,731,673	\$1,355,219
Passaic	\$45,121,076	\$1,308,511
Salem	\$6,080,176	\$176,325
Somerset	\$35,656,884	\$1,034,050
Sussex	\$15,132,181	\$438,833
Union	\$51,757,042	\$1,500,954
Warren	\$10,381,209	\$301,055
<b>Total</b>		<b>\$4,588,953</b>



## 4.4-7 Drought

### Nature of the Drought Hazard in New Jersey

Drought is a period of drier-than-normal conditions that results in community water issues. Low precipitation may also dry out soils and threaten agriculture. When precipitation is less than normal for long enough, stream flows decrease. Water levels in lakes and reservoirs fall and the depth to reach well water increases. Although below-normal rainfall does not automatically result in drought conditions, persistent dry weather and water-supply issues may evolve into a drought emergency. Because droughts are generally the results of meteorological patterns, the entire State of New Jersey is about equally subject to their effects. As shown in Figure 4.4-7-1, nearly every County in the State has experienced at least one drought in the past ten years. As noted below, droughts are partly a function of antecedent conditions, so areas that are already experiencing dry conditions are likely to experience more problems when meteorological droughts occur.

The first evidence of drought is usually recorded with below normal rainfall while the impact of a drought on streams, river flows, and reservoir levels may not be evident for weeks or months. The water level in deep wells may take a year or more before showing drought impacts whereas shallow wells may be affected as quickly as streams are.

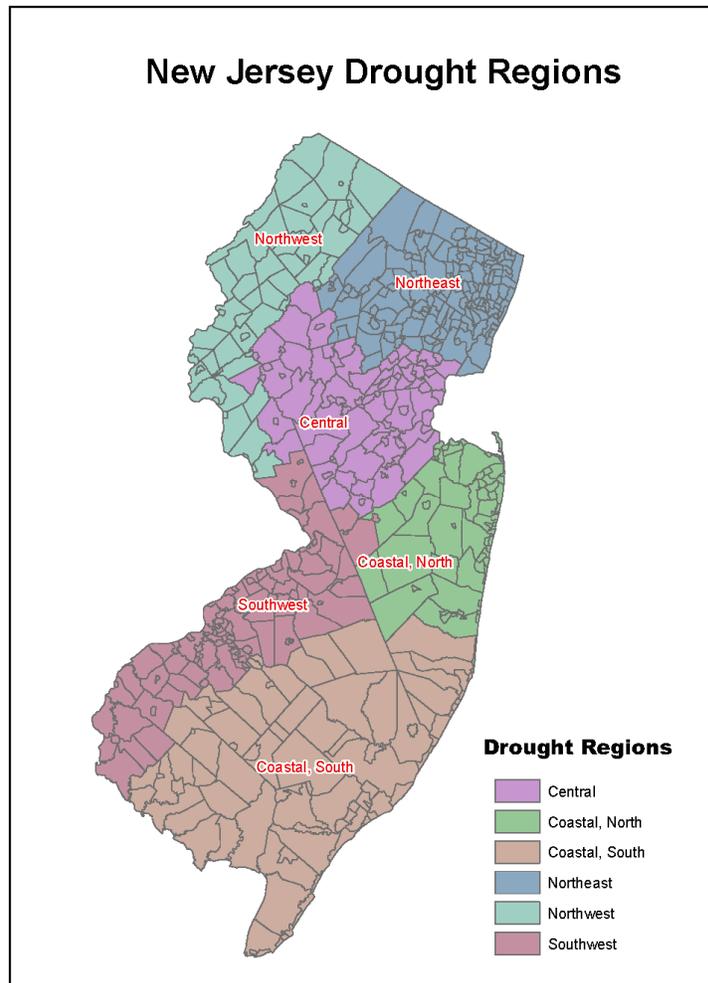
There are numerous nationally-used indices that measure average precipitation levels. Although none of the major indices are inherently superior in all circumstances, some indices are better suited than others for certain uses. The Palmer Index has been widely used by the U.S. Department of Agriculture to determine when to grant emergency drought assistance to states and municipalities. Although the Palmer is better best suited for large areas of uniform topography it does not generally work well with areas that encompass differing regional environments. Palmer values generated typically lag emerging droughts by several months. Additionally, when conditions change from dry to normal or wet, the index indicates the drought termination without taking into account stream-flow, lake and reservoir levels and other longer term hydrologic impacts. The Palmer Index also neglects to measure the human impact on water balance such as irrigation.

During the New Jersey droughts that occurred during 1998 and 1999 the New Jersey Department of Environmental Protection had difficulty comparing the severity of drought throughout the state. To improve monitoring and measurement of drought severity from region to region, the New Jersey Department of Environmental Protection devised a unique set of indices specifically designed for the unique characteristics and needs of the state. These were implemented in January 2001. This new set of state-wide indicators supplements the Palmer Index with the measurement of regional precipitation, stream-flow, reservoir levels, and ground-water levels. New Jersey currently measures the status of each indicator as: near or above normal; moderately dry; severely dry; and extremely dry. The status is based on a statistical analysis of historical values with generally the driest 10% being classified as extremely dry, from 10%-30% as severely dry, and 30%-50% as moderately dry

New Jersey is divided into six drought regions. The goal is to allow the State to respond to changing conditions without imposing restrictions on areas not experiencing water-supply shortages. As indicated in Figure 4.4-7-1 the regions are: Northeast, Central, Northwest, Southwest, Coastal North, and Coastal South. Each region is based on regional similarities in water-supply sources and rainfall patterns that correspond closely to natural watershed boundaries and municipal boundaries. These regions were developed based upon hydrogeologic conditions, watershed boundaries, municipal boundaries, and water-supply characteristics. Drought region boundaries are contiguous with municipal boundaries because during a water emergency the primary enforcement mechanism for restrictions is municipal police forces.



**Figure 4.4-7-1  
New Jersey Drought Regions**



New Jersey currently measures the status of each indicator as: near or above normal; moderately dry; severely dry; and extremely dry. As explained in the text that follows, when publicly monitoring and declaring the status of drought conditions, the State of New Jersey uses four condition levels: Drought Watch, Drought Warning, Water Emergency, and Drought Emergency Levels I through IV.

- **Drought Watch:** Indicates the New Jersey Department of Environmental Protection is closely monitoring drought indicators, including precipitation, stream flows, and reservoir and ground water levels and water demands. Under a drought watch, the public should begin voluntarily cutting back on water usage. The Commissioner of DEP is responsible for exercising non-emergency powers during a Drought Watch. Such non-emergency powers are used to develop alternative water supplies where necessary, rehabilitate and activate interconnections between water systems, and transfers water between different water systems.



- **Drought Warning:** A drought warning condition may be designated by the Commissioner of DEP as a non-emergency response to managing available water supplies. Under a designated drought warning, the DEP may order water purveyors to develop alternative sources of water and to transfer water around the State from areas with relatively more water those with less. The aim of this stage of a response to drought conditions is to avert a more serious water shortage that would necessitate declaration of a water emergency and the imposition of mandatory water use restrictions.
  
- **Water Emergency:** When actions taken under a Drought Warning prove unsuccessful in averting a water or Drought Emergency, the Governor may declare a water emergency and the Commissioner (depending upon the severity) shall impose restrictions. Phase I restricts water use for of non-commercial plants, cars, streets, hydrant flushing, etc. Phase II, and Phase III restrictions are enforced when there is substantial threat to public health and welfare. Water usage is allocated and rationed. Phase IV is considered a disaster stage where public water service is interrupted. Pubic health and safety cannot be guaranteed and selective business and industrial closings are enforced.
  
- **Drought Emergency:** A water supply emergency can only be declared by the Governor. During a water emergency that is imposed due to drought conditions, a phased approach to restricting water consumption may be initiated. Phase I of water use restrictions typically targets non-essential, outdoor residential water use. And while some indirect economic impacts may occur, the first phases of water use restrictions seek to avoid curtailment of water use by the agriculture and business sectors. Those who are uniquely impacted by the restrictions can apply for a hardship exemption. While drought warning actions focus on improving the supply of water, drought emergency actions focus on reducing water demands. Phases II through IV restrictions may be instituted as drought conditions worsen and the need for more drastic measures become essential to preserve public health and safety.

The New Jersey Department of Environmental Protection Commissioner has the authority to declare drought watches and warnings while only the State Governor declares or lifts drought and water emergencies.

## Previous Drought Occurrences in New Jersey

**Table 4.4-7-1  
 New Jersey Drought History and Location, 1995 to 2006 Source**

Month of Drought Conditions	Counties of Impact	Brief Overview of Impact
March 1995	Camden, Cumberland, Atlantic, Cape May, Monmouth, Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Burlington, Salem, Somerset	Precipitation 50% to 67% normal in northwest and southern NJ and as low as 40% normal in Cape May, Cumberland and Ocean Counties.



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Month of Drought Conditions	Counties of Impact	Brief Overview of Impact
October 1997	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	New York City Reservoir fell below 40% below capacity. Salt line in Delaware River was located near Bridgeport, Gloucester County four miles farther north than normal.
December 1998	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	State forestry service extinguished 42 small wildfires the weekend of Dec. 5th and 6th. Grain farmers suffered serious losses of corn and late season crops. Reservoir levels fell. Saltwater line of Delaware River was at River Mile 85. This was 11 miles farther upstream than normal and increased corrosion control costs of industries.
January 1999	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	On January 5th, the Delaware River Basin Commission (DRBC) issued a conditional drought emergency. Heavy precipitation on the 3rd gave the area a temporary reprieve from going straight into a drought emergency.
July 1999	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	Through 13th there were 44 forest fires in the state. Many shallow wells in northwest ran dry. Rivers and streams had 25 percent of normal flow. In an effort to maintain a flow of Delaware River, the Delaware River Basin Commission increased releases from the upstate New York reservoirs as well as Beltzville and Blue Marsh Lakes in Pennsylvania. Plant corrosion issues resulted from brackish water. Salt line along Delaware River was 12 miles farther north than usual. Livestock feed crops were at a near-total loss.



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Month of Drought Conditions	Counties of Impact	Brief Overview of Impact
August/September 1999	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	Crops were decimated, especially grain and forage crops in the northern part of the state. Crop losses were estimated at \$80 million dollars. Older wells failed in the northwest particularly Hunterdon and Sussex Counties. Field corn losses in the northern part of the state averaged between 75% to 10%. Many farms were close to total disaster. Livestock dealers auctioned off animals because they did not have enough food to feed them. The upstream advancing salt front along the lower Delaware River stressed fish and wildlife. Some groundwater supplies were also contaminated with the saltier water and had to be treated.
November 2001	Bergen, Eastern Passaic, Essex, Hudson, Union, Western Passaic	The combined storage in the 13 major water supply reservoirs serving northeast New Jersey was 35.3 billion gallons, which was 43.9% capacity. This storage was 4.7 billion gallons less than 1 month ago and 23.4 billion gallons less than 1 year ago.
November 2001	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	Sussex and Atlantic County shallow wells were drying up while permits for deeper wells were increasing. Twenty-five residents in Wawayanda (Sussex County) ran out of water. Winter crops such as rye and grasses were struggling. On a county weighted average, monthly precipitation totals ranged from 0.7 inches in Cape May County to 1.2 inches in Sussex and Warren Counties. All were less than 31% normal.
December 2001	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	Rainfall was below average for the last six consecutive months, which yielded an average deficit of 10.36 inches. The combined storage in the 13 major water supply reservoirs serving northeast New Jersey was 47.4% capacity, which was 30% below normal. Current levels stopped declining, comparable to the 1998-1999 drought levels. Capacities in the individual systems at the end of the month were: Newark Reservoirs 44.2% (percent capacity) Jersey City Reservoirs 53.1% North Jersey District 44.5% United Water of New Jersey 53.6%.



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Month of Drought Conditions	Counties of Impact	Brief Overview of Impact
January 2002	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	Northern New Jersey reservoirs were at 42.9% of capacity rather than typical 80% capacity. Issues of salt water intrusion and corrosion became an issue for industries. Water treatment costs for municipalities that depend on the river for their water supply became an issue.
January 2002	Bergen, Eastern Passaic, Essex, Hudson, Union, Western Passaic	Precipitation was 50% of normal. The combined storage of 3 major reservoirs serving northeast New Jersey was 44% capacity, or 36% below normal.
February 2002	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	Continued dry weather, the drop in stream flow and groundwater levels reduced levels in the New York State reservoirs. This forced the New Jersey DEP to continue the drought warning for all New Jersey except Union, Middlesex and Somerset Counties. Unseasonably dry weather in February exacerbated the drought and forced several individual counties to declare water emergencies, especially in the northeast. Four northern New Jersey reservoirs remained 43% capacity or half normal level.
March/April/ May/June/July 2002	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	Northern reservoirs were at 40% capacity. Most surface streams were 25% normal. 500 wells throughout state needed replacement. Between Oct. and March the Forest Service responded to 1,116 wildfires. Many streams and ponds used to fight fires were dry. Incidences of salt water infiltrating wells occurred. Consequently many wells became brackish and unusable. The Governor estimated the drought cost farmers approximately \$125 million. Crop revenue in some areas was reduced more than 50%.
August 2002	Bergen, Eastern Passaic, Essex, Hudson, Union, Western Passaic	The majority of the streams monitored had stream-flows in the 10 to 24 percentile, which was well below normal. The combined storage in the 13 major reservoirs serving Northeast New Jersey was 67.7% capacity, which was 10% to 15% below normal.



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Month of Drought Conditions	Counties of Impact	Brief Overview of Impact
September 2002	Camden, Cumberland, Eastern Atlantic, Eastern Cape May, Eastern Monmouth, Eastern Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Northwestern Burlington, Salem, Somerset, Southeastern Burlington, Sussex, Warren, Western Atlantic, Western Cape May, Western Monmouth, Western Ocean	Capacities of reservoirs on September 30th were: Newark Reservoirs 55.0% (percent capacity) Jersey City Reservoirs 62.5% North Jersey District 67.6% United Water of New Jersey 61.8%
October 2002	Bergen, Camden, Cumberland, Atlantic, Cape May, Monmouth, Ocean, Passaic, Essex, Hudson, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Burlington, Salem, Somerset, Sussex, Union, Warren,	Many New Jersey farmers suffered losses of 50% or more, notably in commodities such as corn and soybean. Combined farming losses approximately \$125 million.
September 2005	Camden, Cumberland, Atlantic, Cape May, Monmouth, Ocean, Gloucester, Hunterdon, Mercer, Middlesex, Morris, Burlington, Salem, Somerset, Southeastern Burlington, Sussex, Warren, Western Atlantic	Lack of rain permitted rain to build on power lines. When rain occurred at end of month, 9,000 homes and businesses mainly in Atlantic and Cape May lost power. The heat scorched and damaged many agricultural plants.

### Probability of Drought

As shown in the table above, droughts of at least moderate severity occur at least every few years in New Jersey, and this pattern can reasonably be expected to continue going forward. This may be particularly true depending on the effects of global warming on the region.



## 4.4.8 Wildfires

### Nature of the Wildfire Hazard in New Jersey

Wildland fires in New Jersey are predominately caused by humans. Such fires result in the uncontrolled destruction of forests, brush, field crops, grasslands, and real and personal property. Because New Jersey is so densely populated, nearly all ignitions become urban interface wildfires where homes or structures are endangered. Because of this increased risk of wildfire, the State Legislature created the NJ Forest Fire Service over 100 years ago with the sole authority and mission to prevent, mitigate, and suppress wildfire throughout the State.

New Jersey's high population density has created land use pressures in which more people are moving from urban areas to build homes in rural wildland areas. With more people living in, and enjoying the state's wildlands for various forms of recreation, the number of fires started and the seriousness of their consequences increases. A potentially explosive combination is created when the factors of hazardous wildland fuels, interface home development, and an increased risk of human caused ignition come together under extreme fire weather conditions. Although many plants in the Pine Barrens ecosystem rely on fire for a part of their reproductive cycle, the homes and property of the people who live there do not. Although Pinelands fires generally do not cause casualties, property loss can amount to thousands of dollars for each fire.

Although wildfires can occur during all months of the year, spring is the period when the most devastating incidents typically happen. With the coming of longer days, drying conditions, stronger winds, the weather provides excellent conditions for the rapid spread of fire. A second "season" develops in the northern part of the State during the fall when the abundance of freshly fallen leaves provide a bed of fuel for wildfire to race rapidly up the slopes. As shown in Figures 4.4-8-1 and 4.4-8-3, wildfire locations in the State tend to be in the less developed areas because they are more likely to have sources of fuel for fires, and because detection and suppression are somewhat less likely because there is lower population.

In years when drought was prevalent, wildfires are a major concern. Fire services have employed isolation and pre-burn techniques to limit the total acreage affected. This has had excellent results, and now that we are climbing out of drought conditions and groundwater tables are returning to better levels, our forests have rebounded well. Fire coordinators continue these programs throughout the dry season.

One of the most consistent and serious impacts of drought is the contribution to conditions conducive to forest fires. This applies particularly to the Pine Barrens, where drying conditions favor the combustion of forest fuels. Generally, a relative humidity of less than 40 percent, winds greater than 13 miles and hour, and precipitation of less than 0.01 inches during a month are ideal conditions for forest fires in the Pine Barrens. Given the proper conditions, stray cigarette butts, improperly extinguished campfires, and intentional matches can all start fires in the Pine Barrens. The season of greatest fire threat runs from March through May, though extensive fires have occurred in the summer and autumn months.

The New Jersey Pine Barrens is widely recognized as one of the most hazardous fuel types in the country. The Pinelands National Reserve is located in the south-central part of New Jersey and has similar wildfire behavior as the chaparral of California. Recognized for its globally unique fire-dependent ecosystem, the many threatened and endangered plant and animal communities located in the Pine Barrens are protected through the Pinelands Commission, an authority that regulates development within the Reserve. Within relatively vast areas of this hazardous fuels co-exist many homes in isolated urban developments that were developed prior to the Pinelands Commission, surrounded by nearly solid development on the perimeter of the Reserve. This development continues to challenge efforts to reduce the risk of devastating wildfires in New Jersey.



## Previous Wildfire Occurrences in New Jersey

The frequency and severity of wildfires is dependent on weather and human activity. Nearly all wildfires in New Jersey are human-caused (99%) with arson, children and careless debris burning being the major causes of wildfires. When not promptly controlled, wildfires may grow into catastrophic events. Fire has been a major factor in New Jersey's environment since prehistoric times. Natural fires and Native American burning played a major role in shaping the land and providing the vast expanses of forestland that greeted early settlers. These settlers soon realized that the Pinelands of New Jersey is one of the most hazardous fuel types in the nation.

There are a number of early accounts and newspaper stories of fires burning thousands of acres of New Jersey woodlands, causing extensive damage to improved property and untold loss of life. One such account from 1755 reported a fire 30 miles long between Barnegat and Little Egg Harbor. In 1895, John Gifford reported to the state geologist that 49 fires burned 60,000 acres in Burlington, Atlantic and Ocean counties. Other early surveys, including those of 1872 and 1885, indicate that as many as 100,000 to 130,000 acres burned annually in the Pine Barrens region alone. Table 4.4-8-1 summarizes historic fires in the State.

**Table 4.4-8-1  
Major Historic Wildfires in New Jersey**

Year	Acres Affected	Description
1930	267,547	The worst year for forest fires on record in New Jersey. A huge fire in May of that year destroyed the town of Forked River.
1936	58,000	Five Civilian Conservation Corps fire fighters were killed fighting a forest fire near Bass River.
1941	Not listed	Huge fires destroyed 400 structures in the Lakewood and Lakehurst area.
1954	20,000	A fire starting in Moore's Meadows threatened the town of Chatsworth.
1955	Not listed	Section Firewarden George Herbert was killed during an Easter Sunday fire in Ocean County when his power wagon was burned over by the fire.
1963	193,000	A series of 37 major fires burned on April 20-22. In the process, 186 homes and 197 outbuildings were burned, seven people were killed and \$8.5 million in property damage was caused. One fire burned 76,000 acres, traveling 21 miles from New Lisbon to the Garden State Parkway.
1971	21,000	The Manahawkin Fire burned 21,000 acres in 7 hours and 13 minutes.
1977	15,000	A 15,000-acre fire on March 31 burned six homes and caused extensive damage in Burlington, Ocean and Atlantic counties. On July 22, a 2,300-acre fire in Bass River State Forest killed four firefighters from Eagleswood Volunteer Fire Department and forced the evacuation of the Bass River Recreation Area.
1992	14,000	A series of four major fires burned 14,000 acres on May 3. A 4,800-acre fire in Lacey Township, Ocean County, threatened and closed down the Oyster Creek Nuclear Power Plant. A 2,900-acre fire in Woodland Township, Burlington County, destroyed one home and threatened 100 others. On June 13, a 5,400-acre fire burned through Lacey Township.
1995	19,225	On April 4, a wind-driven 19,225-acre fire burned through Manchester, Lacey and Ocean townships in Ocean County, threatening the Wynnewood and Bamber Lake communities.



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Year	Acres Affected	Description
1997	2,700	On July 19, the 800-acre Wrangle Brook wildfire damaged 52 homes and threatened over 300 additional Ocean County homes. Later that month, on July 29, the 1,900 Rockwood II wildfire threatened the Batsto Historic Site and 80 Atlantic County homes.
1999	11,975	On April 30, the Bass River fire burned 11,975 acres and threatened Bass River State Forest.
2002	1,200	On June 20, the Jakes Branch Fire destroyed one home with additional property damage exceeding one million dollars.
2007	12,800	May 15, a wildfire destroyed 5 homes in two senior citizen housing developments in Barnegat and 13 homes along the border between Ocean and Burlington counties were damaged.
2007	3,500	June, a wildfire in the Wharton State Forest near Atsion burned for several days and forced the closing of State Route 206.

[http://www.state.nj.us/dep/parksandforests/fire/fire\\_history.htm](http://www.state.nj.us/dep/parksandforests/fire/fire_history.htm)

The New Jersey Pinelands is a fire adapted forest community that takes advantage of wildfire to reproduce. The Pinelands are classified as Fuel Model B of the National Fire Danger Rating System with California chaparral and a number of other high hazard types. Fuel loadings exceed twenty tons per acre in some locales. This has been equated to having an inch of gasoline covering all of south and central New Jersey. Pinelands fires burn extremely hot and spread rapidly. Crown fires are fairly common, spreading from treetop to treetop, as is long range spotting where flying embers start new fires in advance of the main fire.

Each year an average of 1,500 wildfires damage or destroy 7,000 acres of New Jersey's forests. Since 99% of all forest fires are caused by people, either through carelessness or intentional acts, education is the primary mitigation ([http://www.state.nj.us/dep/newsrel/2005/05\\_0016.htm](http://www.state.nj.us/dep/newsrel/2005/05_0016.htm)). Defining the potential losses by wildfires in New Jersey is difficult. Weather, the main influence on how a wildfire burns, is a variable that can only be predicted on a short-term basis. A ten-year average of three major fires (greater than 100 acres) occurs per year, and nearly 1,600 other wildfires burn annually. Actual dollar loss, therefore, will be specific to each wildfire and each year.

**Table 4.4-8-2 New Jersey Wildfires of more than 10 acres 1996-2006**

County	Occurrences	Deaths	Injuries	Property Damage
Atlantic	22	0	0	0
Bergen	7	0	0	0
Burlington	27	1	2	0
Camden	26	0	0	\$400
Cape May	7	0	1	0
Cumberland	23	0	1	\$85,575
Essex	2	0	0	0
Gloucester	12	0	0	0
Hudson	2	0	0	0
Hunterdon	6	0	0	50K
Mercer	1	0	0	0
Middlesex	25	0	0	\$3,900
Monmouth	3	0	0	\$18,000



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County	Occurrences	Deaths	Injuries	Property Damage
Morris	8	0	0	0
Ocean	32	0	1	\$510,800
Passaic	7	0	0	0
Salem	6	0	0	0
Somerset	2	0	0	0
Sussex	11	0	2	0
Union	0	0	0	0
Warren	9	0	0	0
<b>Statewide Totals</b>	<b>238</b>	<b>0</b>	<b>7</b>	<b>\$618,675</b>

<http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

Tables 4.4-8-3 and 4.4-8-4 below provide the most recent available data for the number of fire incidents per year and the number of acres burned, for the period 1996 to 2006. The data is depicted graphically on the page following the tables, in Figures 4.4-8-1 and 4.4-8-2.

**Table 4.4-8-3 Number of Fire Incidents per Year by New Jersey County: 1996 to 2006**

County	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Totals	Annual Average
Atlantic	126	214	224	206	155	232	250	163	127	149	251	2,097	190.6
Bergen	1	7	8	8	6	13	4	5	5	5	10	72	6.5
Burlington	99	121	133	140	88	128	109	64	56	71	102	1,111	101.0
Camden	55	138	126	145	124	143	103	45	62	76	110	1,127	102.5
Cape May	59	86	71	84	50	92	80	40	62	52	55	731	66.5
Cumberland	93	151	206	173	100	140	102	58	88	111	117	1,339	121.7
Essex	0	0	0	0	0	0	0	0	1	0	2	3	0.3
Gloucester	34	67	53	72	36	73	78	23	28	68	67	599	54.5
Hudson	0	0	0	0	0	0	0	0	0	1	0	1	0.1
Hunterdon	21	37	28	69	44	66	41	26	14	30	48	424	38.5
Mercer	0	0	0	5	0	4	26	8	1	5	5	54	4.9
Middlesex	18	54	50	87	62	106	106	41	35	75	87	721	65.5
Monmouth	30	30	34	50	35	75	54	42	32	51	69	502	45.6
Morris	62	113	99	139	58	65	87	63	48	53	86	873	79.4
Ocean	196	347	304	412	265	374	287	227	213	228	325	3,178	288.9
Passaic	17	37	50	71	29	61	39	21	13	22	43	403	36.6
Salem	22	36	47	24	10	38	37	15	14	16	20	279	25.4
Somerset	6	50	17	65	15	50	86	41	20	60	59	469	42.6
Sussex	38	137	109	176	85	162	129	102	49	47	101	1,135	103.2
Union	0	0	0	0	0	0	0	0	2	2	4	8	0.7
Warren	33	56	94	129	75	90	144	55	37	107	71	891	81.0
<b>Total</b>	<b>910</b>	<b>1,681</b>	<b>1,653</b>	<b>2,055</b>	<b>1,237</b>	<b>1,912</b>	<b>1,762</b>	<b>1,039</b>	<b>907</b>	<b>1,229</b>	<b>1,632</b>	<b>16,017</b>	<b>1,456.1</b>



State of New Jersey  
2007 State Hazard Mitigation Plan  
Section 4.4 Hazard Identification and Profiles

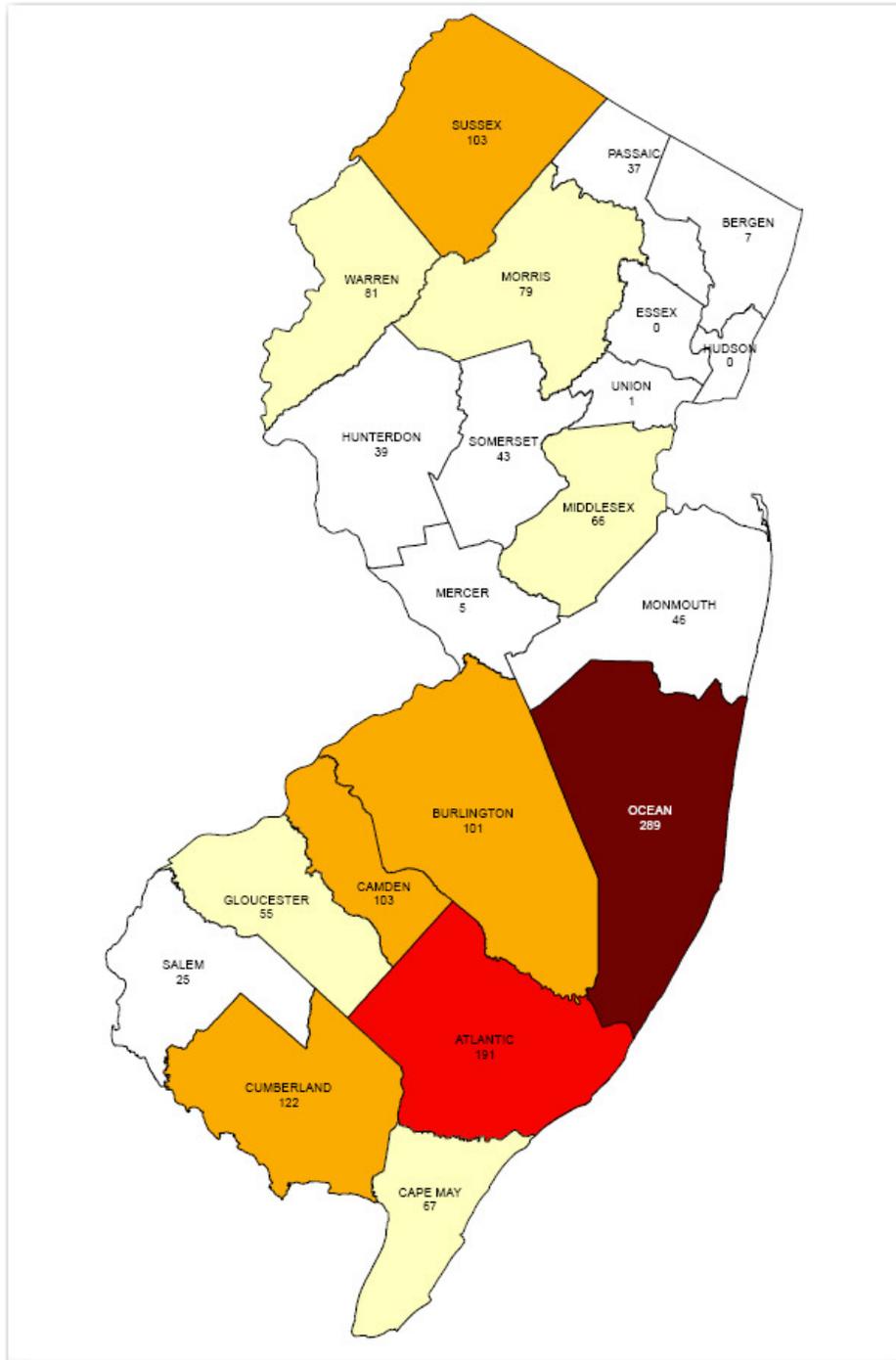
**Table 4.4-8-4 State of New Jersey Annual Number of Acres Burned\* by Wildfires County: 1996 – 2006**

<b>County</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>Totals</b>	<b>Annual Average</b>
Atlantic	130	2,150	136	188	189	166	206	88	51	55	138	<b>3,497</b>	<b>318</b>
Bergen	0.25	49	42	103	8	98	10	2	13	5	12	<b>342</b>	<b>31</b>
Burlington	130	282	121	12,857	340	215	57	26	22	26	225	<b>14,301</b>	<b>1,300</b>
Camden	61	265	220	171	283	279	806	382	34	404	106	<b>3,011</b>	<b>274</b>
Cape May	33	69	30	54	178	60	32	26	23	51	57	<b>613</b>	<b>56</b>
Cumberland	149	138	222	290	514	994	78	50	52	119	182	<b>2,788</b>	<b>253</b>
Essex	0	0	0	0	0	0	0	0	0.25	0	21	<b>2,125</b>	<b>2</b>
Gloucester	44	134	117	173	36	110	111	12	8	359	114	<b>1218</b>	<b>111</b>
Hudson	0	0	0	0	0	0	0	0	0	25	0	<b>25</b>	<b>2</b>
Hunterdon	7	38	44	108	12	30	21	7	14	10	68	<b>359</b>	<b>33</b>
Mercer	0	0	0	4	0	60	19	1	0.25	2	2	<b>8,825</b>	<b>8</b>
Middlesex	26	99	145	196	78	279	118	124	38	117	796	<b>2,016</b>	<b>183</b>
Monmouth	81	22	30	33	20	30	24	18	35	26	35	<b>354</b>	<b>32</b>
Morris	58	422	37	102	25	52	63	42	25	56	64	<b>946</b>	<b>86</b>
Ocean	136	1,023	138	712	123	1,806	4,089	109	141	95	240	<b>8,612</b>	<b>783</b>
Passaic	32	18	35	77	16	24	16	32	3	14	106	<b>373</b>	<b>34</b>
Salem	58	74	62	37	40	19	30	6	17	13	486	<b>842</b>	<b>77</b>
Somerset	2	30	6	164	5	43	32	9	9	26	19	<b>345</b>	<b>31</b>
Sussex	17	69	62	84	99	165	112	28	15	45	106	<b>802</b>	<b>73</b>
Union	0	0	0	0	0	0	0	0	.5	0.75	1	<b>2</b>	<b>0</b>
Warren	51	23	20	1,058	98	32	43	6	19	66	28	<b>1,444</b>	<b>131</b>
<b>Total</b>	<b>885</b>	<b>2,755</b>	<b>1,331</b>	<b>16,223</b>	<b>1,875</b>	<b>4,296</b>	<b>5,661</b>	<b>880</b>	<b>469</b>	<b>1,460</b>	<b>2,668</b>	<b>42,000</b>	<b>3,818</b>

\*The number of incidents includes only those wildfires to which the NJ Forest Fire Service responded to in its designated response area. Numbers are rounded for clarity.

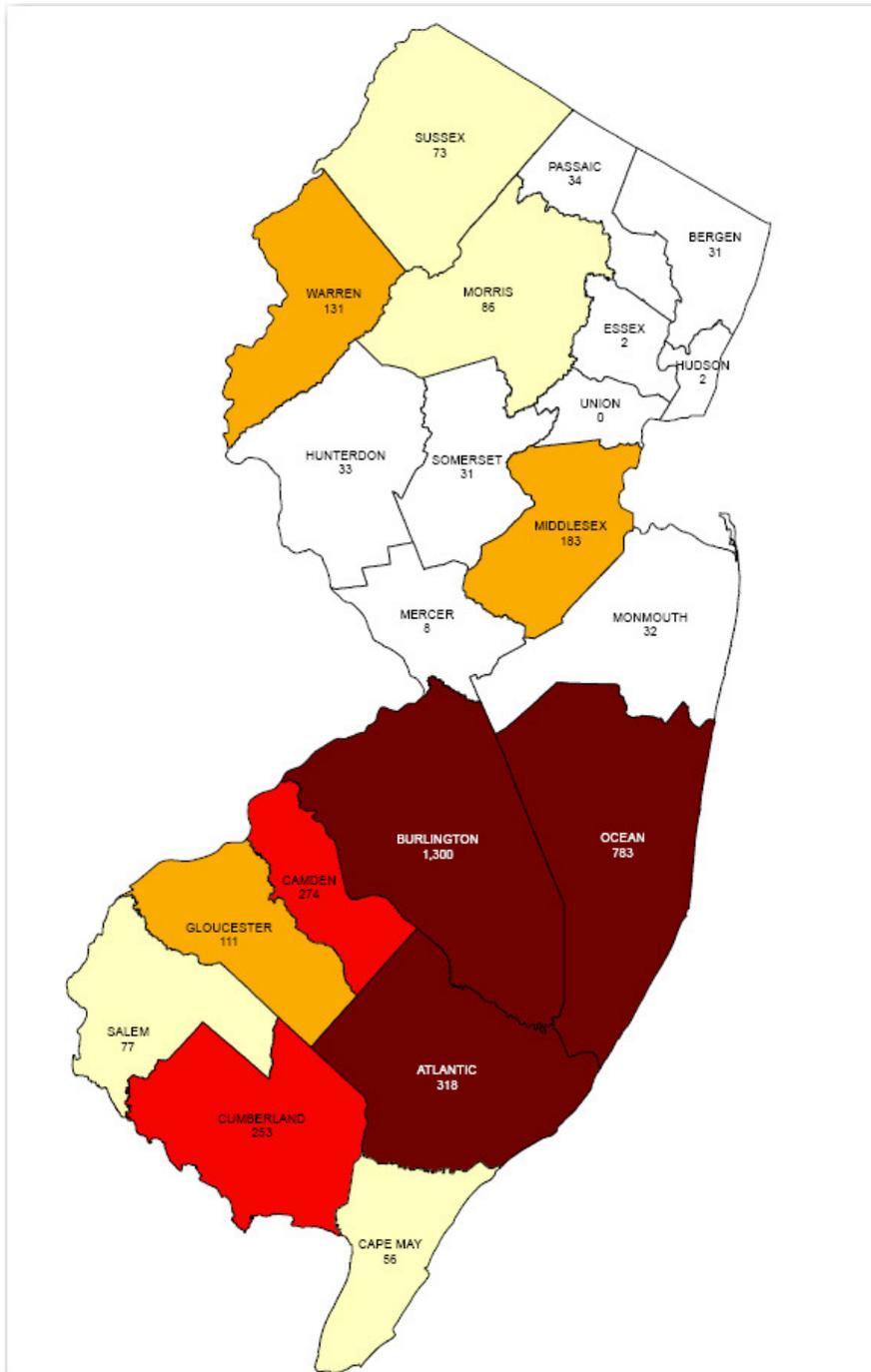


**Figure 4.4-8-1**  
**Wildfire Incidents in New Jersey, 1996 – 2006**





**Figure 4.4-8-2**  
**Acres Burned in Wildfires in New Jersey,**  
**1996 – 2006**





## Probability of Wildfires

The probability exists that New Jersey will continue to face an average of three fires greater than 100- acres each year. A complete forest fire hazards analysis for all State-owned lands is being updated in a document published by the New Jersey Bureau of Forest Fire Management, of the Division of Parks and Forestry of the Department of Environmental Protection entitled the *New Jersey Forest Fire Management Plan*.



## 4.4-9 Landslides, Subsidence and Sinkholes

### Nature of the Landslide, Subsidence and Sinkhole Hazards

#### Landslide

A landslide is a natural geologic process involving the movement of earth materials down a slope, including rock, earth, debris, or a combination of these, under the influence of gravity. However, there are a variety of triggers for landslides such as: a heavy rainfall event, earthquakes, or human activity. The rate of landslide movement ranges from rapid to very slow. A landslide can involve large or small volumes of material. Material can move in nearly intact blocks or be greatly deformed and rearranged. The slope may be nearly vertical or fairly gentle (Delano and Wilshusen, 2001).

Landslides are usually associated with mountainous areas but can also occur in areas of generally low relief. In low-relief areas, landslides occur due to steepening of slopes: as cut and fill failures (roadway and building excavations), river bluff failures, collapse of mine waste piles, and a wide variety of slope failures associated with quarries and open-pit mines (USGS, Landslide Types and Process, 2004). The locations of landslides is highly site-specific, although Figures 4.4-9-2 and 4.4-9-5 show the general location of the hazard, based on historical events and technical analysis.

**Figure 4.4-9-1**  
**Small landslide in a**  
**residential area in**  
**New Jersey**





## Subsidence and Sinkholes

Subsidence is the sinking of the top layer of ground resulting from the disappearance of material below the ground surface. Subsidence can occur as a result of natural geologic phenomenon or as a result of man's alteration of surface and underground hydrology. Natural subsidence in the form of sinkholes occurs in areas where the bedrock consists of limestone, dolomite, or marble which is collectively referred to as carbonate rock. Man-made subsidence resulting from underground mining or from excessive pumping of groundwater can cause otherwise stable ground to become unstable. Sinkhole formation typically begins when rainwater infiltrates to a layer of bedrock composed primarily of calcium carbonate or a combination of calcium-magnesium carbonate and some impurities. Man-made subsidence resulting from underground mining or from excessive pumping of groundwater can cause otherwise stable ground to become unstable and collapse leaving depressions similar to natural sinkholes. Like landslides, the subsidence hazard is location-specific because it is the result of specific conditions such as karst geology, excessive groundwater extraction, or abandoned mines.

A sinkhole is a depression in the surface of the ground that results from collapse of the "roof" of a "cave" in carbonate rocks, or from subsidence of surface material into subsurface openings produced by water solution of the carbonate bedrock. The first type is extremely rare in New Jersey, however. A true sinkhole is a closed, usually circular depression in an area underlain by soluble rock which drains internally to the subsurface. Sinkholes generally form along linear trends aligned with fractures and joints in the underlying bedrock. The fractures occur generally parallel to faults and fold axes within the bedrock. Sinkholes in New Jersey are generally concentrated on the northern end of the State, as shown in Figures 4.4-9-6 and 4.4-9-7.

Naturally occurring subsidence and sinkholes in New Jersey persist within bands of carbonate rock. Types of carbonate geology that may potentially develop sinkholes include limestone, dolomite, and marble. In New Jersey there are more than 225 square miles that are underlain by limestone, dolomite, and marble. In some localities, no sinkholes have appeared, while in others, sinkholes are more common.

These bedrock constituents, of which limestone and dolomite are two of the most common and which are collectively known as carbonate rocks, are soluble in acid. Rainwater, which is slightly acidic from picking up carbon dioxide (CO<sub>2</sub>) from the atmosphere, can become more acidic where decaying vegetation is available in the soil through which water passes on its way down to the bedrock.

When subsidence develops slowly, it may first be seen in misaligned curbs, cracked foundations and walls, or jammed windows and doors. More often a sinkhole or collapse feature occurs rapidly in a few hours or days. If it is in a field or woods away from structures and utilities, it may serve only as an annoyance, perhaps causing turbidity for a time in nearby wells or tripping up grazing livestock. If a subsidence occurs in a developed area costly damage may result. Buried utilities sag; foundation walls can crack or rupture. Cinderblock walls lose support and crack. And as a building subsides, inside plaster cracks and falls. Eventually, floors buckle, facing material falls away, and as the situation worsens, total collapse may occur.

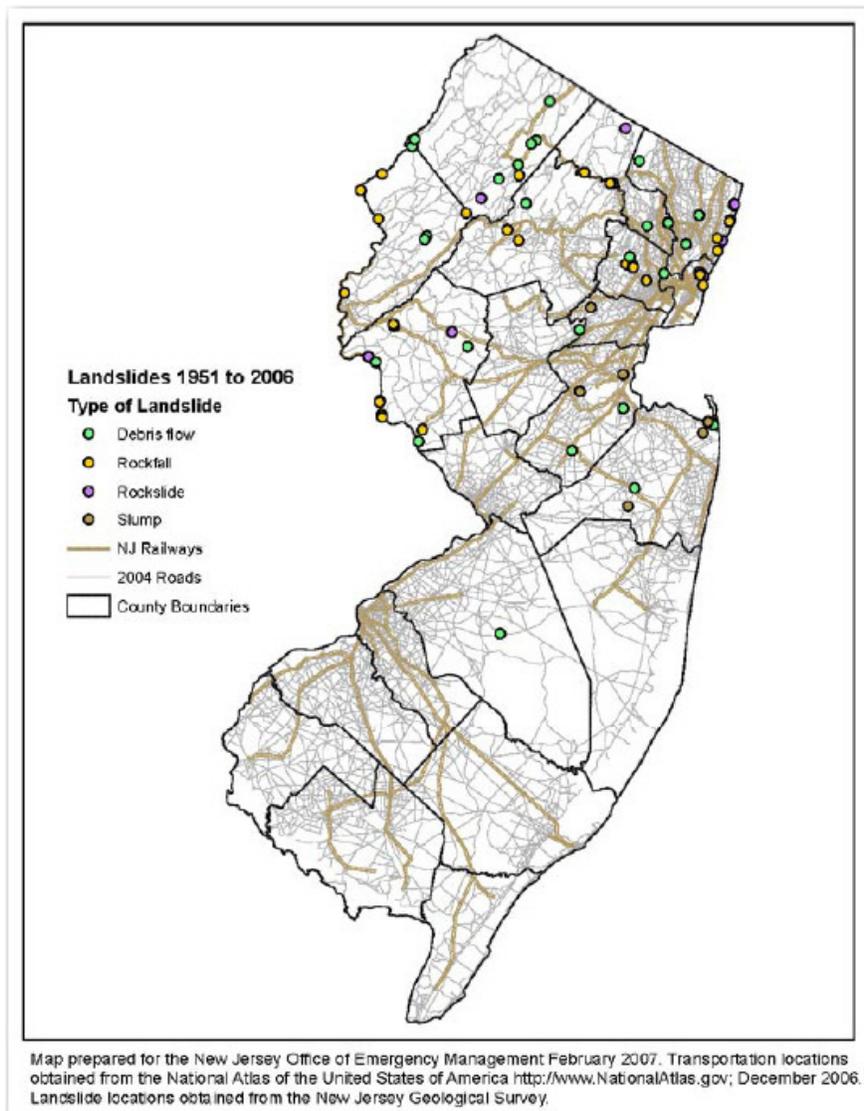


## Previous Landslide, Sinkhole and Subsidence Occurrences

### Landslide Occurrences

As shown in Figure 4.4-9-2, landslides are not particularly common in New Jersey, and tend to occur in the northern Counties.

**Figure 4.4-9-2**  
**Landslides in New Jersey, 1951 to 2006 (NJGS)**





## Sinkholes and Subsidence

In New Jersey, sinkhole and subsidence activity has been primarily limited to the Counties of Warren, Sussex, Passaic, Morris, Somerset and Hunterdon, which are located along northern and northeastern part of the State. One of the largest documented sinkholes to occur within the State of New Jersey occurred in 1983 in Phillipsburg, Warren County. This hole was large enough to cause a two-story house to rotate on its foundation until the front part of the house had sunk to the second story and the back was ten or more feet off its foundation. A second hole over twenty feet wide opened between the house and the street. All this occurred in a few hours as a result of a broken water main in the street. In 2006, a large sinkhole opened near the New Jersey State Department of Human Resources in Trenton (Figure 4.4-9-3).

**Figure 4.4-9-3**  
**Sinkhole in front of the New Jersey State Department**  
**of Human Services in Trenton**



Subsidence incidents also have occurred near areas of abandoned mines. The most significant such event that recently occurred in northern New Jersey was in Ringwood Boro, Passaic County. This large collapse appeared in 2006 near Sheehan Drive, formerly called Cable House Road. Prior mining operations throughout the Upper Ringwood area have left a number of areas susceptible to subsidence and collapse. Historical records at Ringwood indicate that mine pit and shafts were blasted closed and filled with mine tailings and other materials after mining operations ended decades ago. Over the intervening years, soil and rock material may have settled or washed into subsurface causing the voids to migrate closer to the surface and eventually collapse.

Because the Upper Ringwood area is underlain by many of these former mine pits and shafts, collapse features have been a historical, and recurring, problem in the area. For example, a large collapse developed in 1976 around the foundation of one of the then-new homes on Van Dunk Lane. The house was

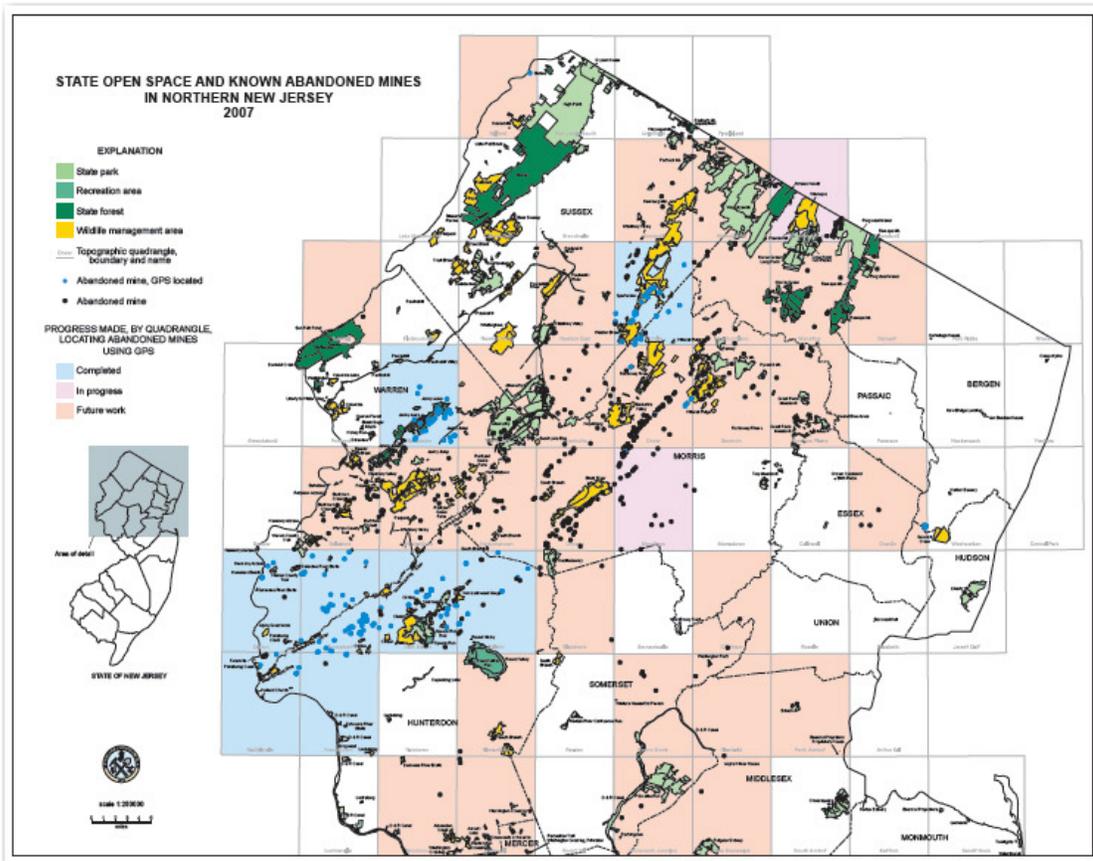


subsequently torn down. The State of New Jersey Department of Labor and Industry investigated that situation and concluded that the settling was a direct result of past iron mining activities of the Little Blue Mine. A 2006 collapse related to the White Meadow Mine destroyed the front porch and living room of a home on East Lakeshore Drive, Rockaway Township. This mine has had several other recent collapses including one at the location of a school bus stop.

The State of New Jersey Department of Labor and Industry, which investigated historic, abandoned mines and collapse development after the series of collapse occurrences in the Ringwood, Warren County, area has concluded that the Ringwood area should expect additional subsidence features. The map that follows shows the sites of 588 abandoned mines.

Figure 4.4-9-4

State Open Space and known Abandoned Mines in Northern New Jersey, 2007



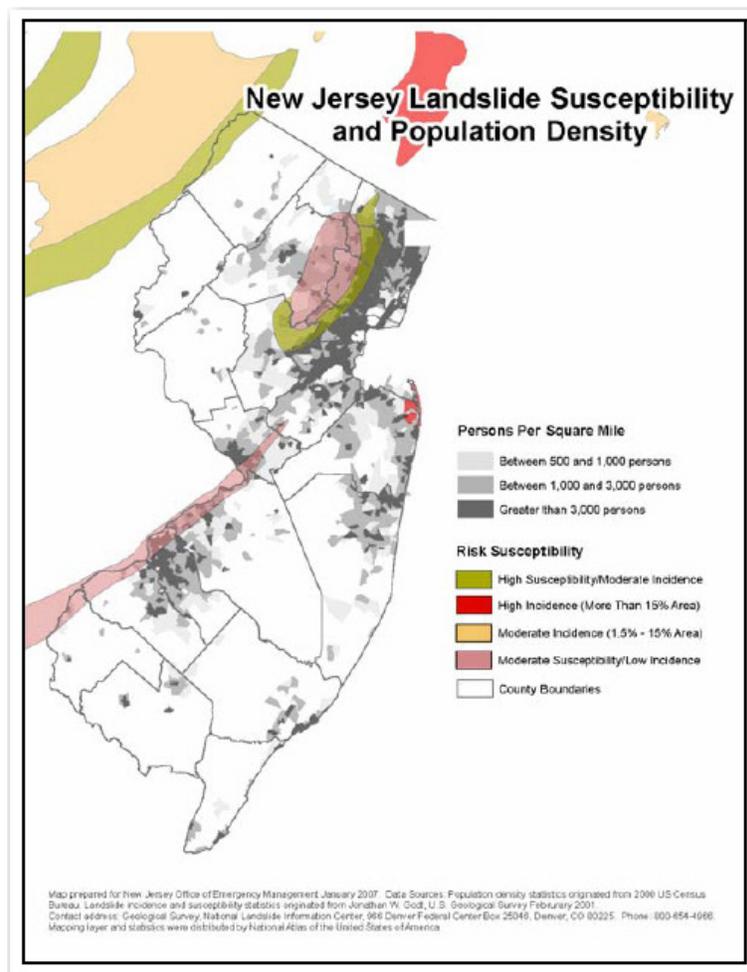
Map prepared for the New Jersey Office of Emergency Management, February, 2007. Transportation locations obtained from the National Atlas of the United States of America, December, 2006. Abandoned mine locations from the New Jersey Geological Survey.



## Probability of Landslide, Sinkhole and Subsidence Occurrences

Landslide probabilities are largely a function of surface geology, but are also influenced by both weather and human activities, as noted above. As part of a HAZUS-based earthquake risk assessment, the NJGS determined landslide susceptibility for seven of the most at-risk Counties in the State, as shown in the series of figures in Appendix W. Figure 4.4-9-5 is an overlay of population density (in gray shades) and landslide susceptibility. The graphic was developed by the New Jersey Geologic Survey.

**Figure 4.4-9-5**  
**Landslide Susceptibility and Population Density in New Jersey**



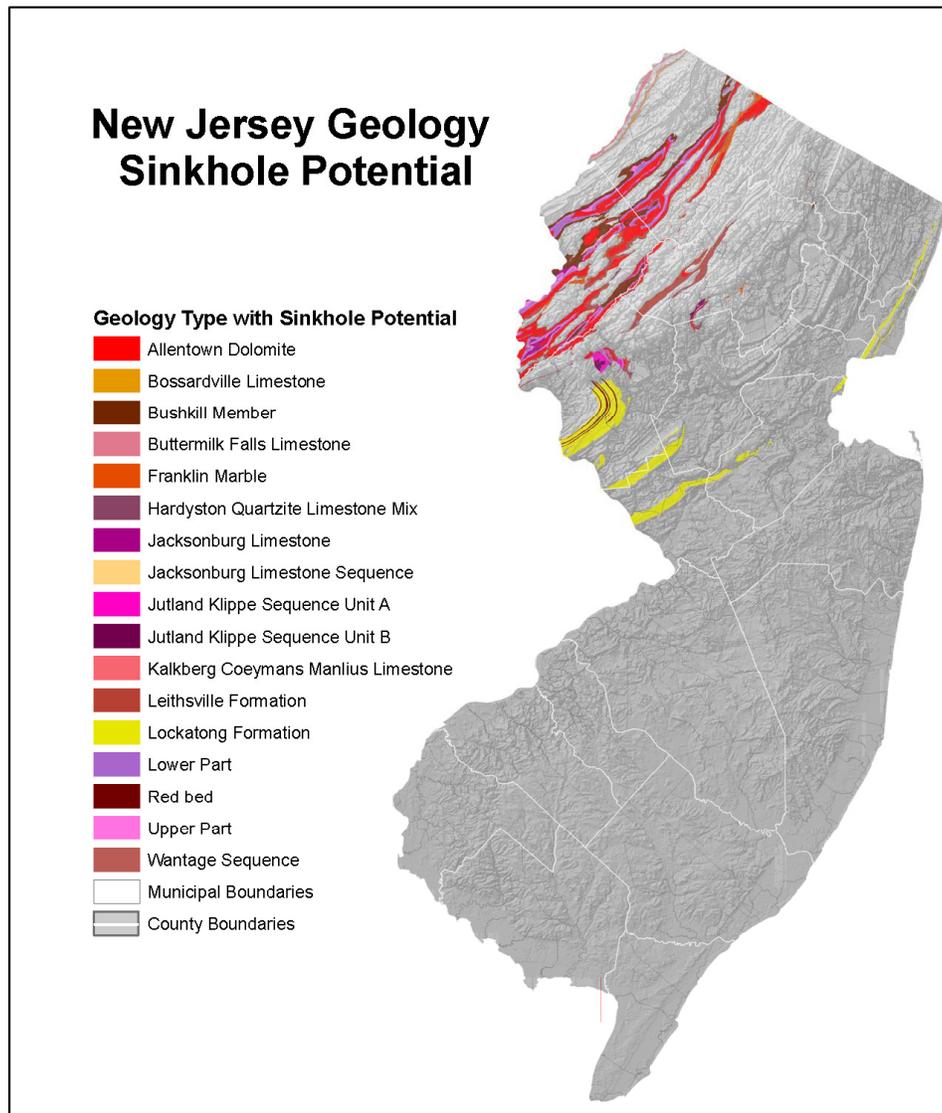
Although this graphic may be of some use on a regional level, landslides are generally somewhat localized, so better-resolved maps and site-specific engineering and geological data are required for a risk



assessment. As development density increases and spreads throughout the State, the effects of sinkhole and collapse subsidence may become more common. Homes and other buildings, roads, utilities, water supplies, and septic systems, as well as dams and other engineered structures in areas prone to sinkhole or collapse development are all subject to damage.

Figure 4.4-9-6 depicts those geologic units that are prone to the development of natural sinkholes. The figure also shows an area in the southern part of the state that is underlain by lime sand, but no significant sinkhole have been identified there to date.

**Figure 4.4-9-6  
New Jersey Geology with Sinkhole Potential**

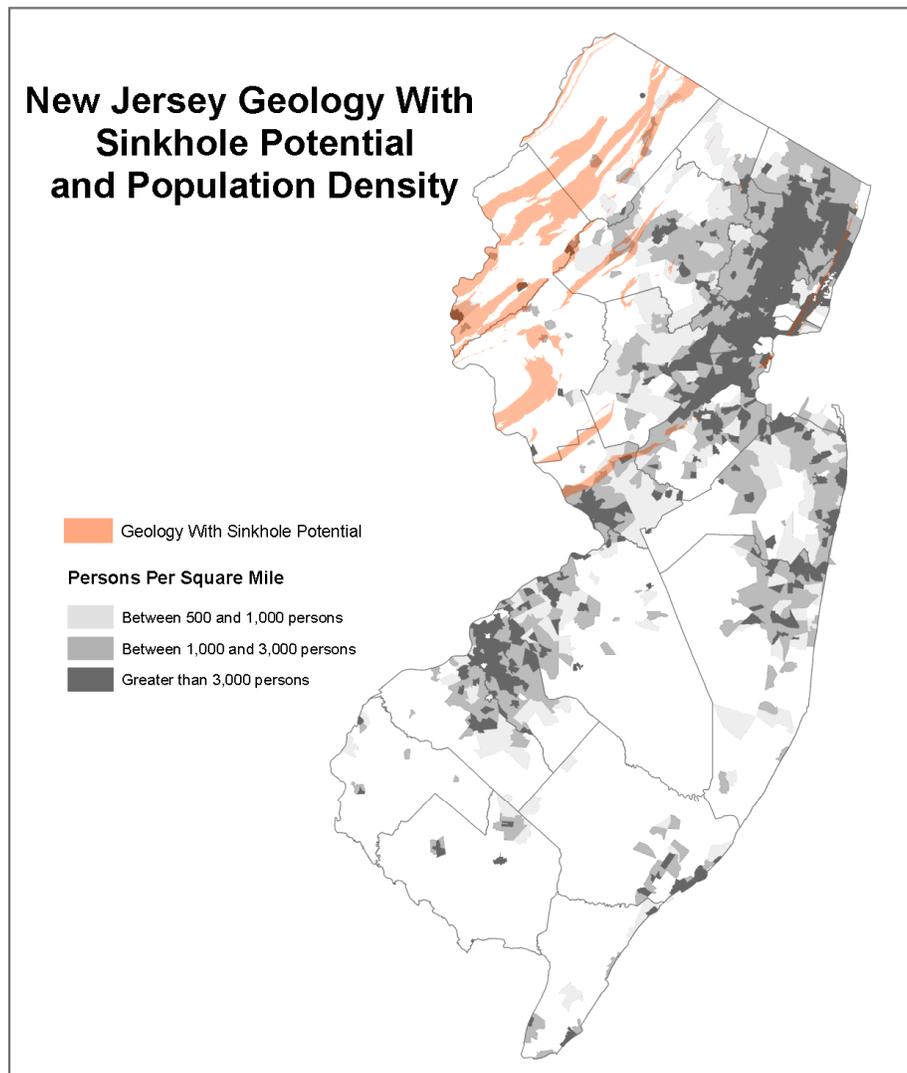


This map was created for the New Jersey Office of Emergency Management, February 2007. Source: Geological statistics used to generate this map were obtained from the New Jersey Geological Survey: <http://www.nj.gov/dep/njgs/geodata/dgs04-6.htm>. GIS data used was scanned and digitized from United States Geological Survey Miscellaneous Investigations and Open-File Series 1:100,000 scale geologic maps compiled from 1984 to 1993.



Figure 4.4-9-7 shows areas that have the potential to develop sinkholes. Note that areas of high sinkhole potential are generally the less populated in the State. Although sinkholes and subsidence may potentially occur within any area that has carbonate geology, the probability of occurrence is greatest in areas where there is a history of past occurrences. As stated in the previous section, past occurrences have historically been in Warren, Sussex, Morris, Somerset and Hunterdon counties.

**Figure 4.4-9-7**  
**New Jersey Geology with Sinkhole Potential and Population Density**



Map prepared for New Jersey Office of Emergency Management January 2007. Data Sources: Population density statistics originated from 2000 US Census Bureau. Geological statistics used to generate this map was obtained from the New Jersey Geological Survey: <http://www.nj.gov/dep/njgs/geodata/dgs04-6.htm>. GIS data used was scanned and digitized from United States Geological Survey Miscellaneous Investigations and Open-File Series 1:100,000 scale geologic maps compiled from 1984 to 1993. Types of geological bedrock prone to sinkhole development includes: calcite, calcium carbonate, marble, dolomite, calcium magnesium carbonate, and limestone.

Carbonate rock traverses the counties of Hunterdon, Morris, Passaic, Somerset, Sussex and Warren, suggesting an increased potential for the development of sinkholes in those areas.



## 4.4-10 Extreme Heat

### Nature of the Extreme Heat Hazard

Extreme summer heat is the combination of very high temperatures and exceptionally humid conditions. If such conditions persist for an extended period of time, it is called a heat wave (FEMA, 1997). Heat stress can be indexed by combining the effects of temperature and humidity, as shown in Table 4.4-1. The index estimates the relationship between dry bulb temperatures (at different humidity) and the skin's resistance to heat and moisture transfer. The higher the temperature or humidity, the higher the apparent temperature.

**Table 4.4-10-1 Heat Index and Disorders**  
**Sources: FEMA, 1997; NWS, 1997**

Danger Category		Heat Disorders	Apparent Temperatures (°F)
IV	Extreme Danger	Heatstroke or sunstroke imminent.	>130
III	Danger	Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible with prolonged exposure and physical activity.	105-130
II	Extreme Caution	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and physical activity.	90-105
I	Caution	Fatigue possible with prolonged exposure and physical activity.	89-90

The major human risks associated with extreme heat are as follows.

- **Heatstroke:** Considered a medical emergency, heatstroke is often fatal. It occurs when the body's responses to heat stress are insufficient to prevent a substantial rise in the body's core temperature. While no standard diagnosis exists, a medical heatstroke condition is usually diagnosed when the body's temperature exceeds 105°F due to environmental temperatures. Rapid cooling is necessary to prevent death, with an average fatality rate of 15 percent even with treatment.
- **Heat Exhaustion:** While much less serious than heatstroke, heat exhaustion victims may complain of dizziness, weakness, or fatigue. Body temperatures may be normal or slightly to moderately elevated. The prognosis is usually good with fluid treatment.
- **Heat Syncope:** This refers to sudden loss of consciousness and is typically associated with people exercising who are not acclimated to warm temperatures. Causes little or no harm to the individual.
- **Heat Cramps:** May occur in people unaccustomed to exercising in the heat and generally ceases to be a problem after acclimatization.

New Jersey has a geographic location that results in the State being influenced by wet, dry, hot, and cold airstreams, making for daily weather that is highly variable. In the summer months extreme heat is not unusual and occurs, especially in the southern portion of the state. Extreme heat is temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high

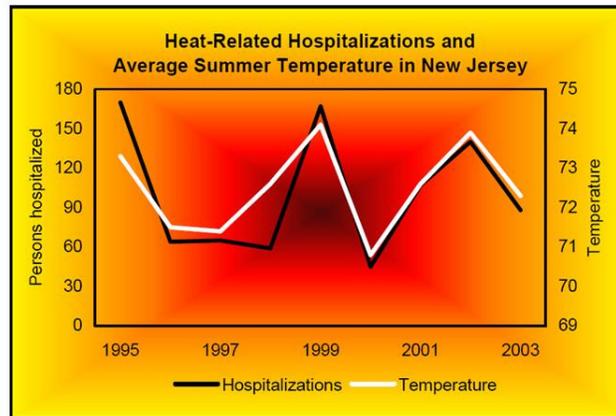


atmospheric pressure traps hazy, damp air near the ground. (CDC October, 2007). Extreme heat events can occur anywhere in the State.

Extreme heat is dangerous and can cause human related illnesses and death. These illnesses include sunburn, heat cramps, heat exhaustion, and heat stroke. In New Jersey extreme heat is responsible for approximately five deaths annually and overexposure to summer heat causes between 25 and 170 hospitalizations in New Jersey every year, depending on the average outdoor temperature. The majority of those hospitalized for this cause are male, aged 65-84, and are hospitalized for three or more days.

Additionally, less severe cases of heat-related illness send many people to hospital emergency departments or only require treatment at home (New Jersey Department of Health, Health Data Fact Sheet 2005). Figure 4.4-1 shows the trends in heat related hospitalizations from 1995 to 2003. As temperature goes up so do the number of people hospitalized for heat related illnesses.

**Figure 4.4-10-1**  
**Heat-related Hospitalizations vs. Average Temperature in New Jersey**



Source: (New Jersey Department of Health, Health Data Fact Sheet 2005).

## Previous Extreme Heat Occurrences

According to the NOAA National Climatic Data Center (NCDC), the hottest day on record in New Jersey was July 10, 1936 the temperature reached 110 degrees Fahrenheit at the Runyon monitoring station (<http://www.ncdc.noaa.gov/oa/pub/data/special/maxtemps.pdf>). The NCDC database reports 82 extreme heat events between 1950 and 2007, with 45 deaths and 251 injuries.

## Probability of Extreme Heat Occurrences

Based on the data available at the NCDC, there is an annual average of about 1.4 extreme heat events in New Jersey. Although global warming effects and normal fluctuations in the weather may influence this average, it is reasonable to assume that this average reflects probabilities going forward in time for this hazard.



## 4.4-11 Coastal Erosion

### Nature of the Coastal Erosion Hazard

Coastal erosion is a dynamic process that is constantly occurring at varying rates along the coasts and shorelines of the U.S. Numerous factors can influence the severity and rate of coastal erosion including human activities, tides, the possibility of rising sea levels, and the frequency and intensity of hurricanes. Strong storms and hurricanes can erode large sections of coastline with a single event. The process of coastal erosion results in permanent changes to the shape and structure of the coastline. Human activities such as poor land use practices and boating activities can also accelerate the process of coastal erosion.

Billions of dollars of economic development are potentially threatened by the impacts of coastal erosion. In a report to Congress in the year 2000 FEMA estimated that erosion may cost property owners along the coast \$500 million a year in structural damages and loss of land. The report also stated as many as 87,000 residential homes may be at risk of eroding into the oceans or Great Lakes over the next 60 years.

On the east coast of the United States, Nor'easters and Hurricanes cause a significant amount of severe beach erosion, as well as flooding in low-lying areas. Beach residents in these areas may actually fear the repeated depredations of nor'easters over those of hurricanes, because they happen more frequently, and cause substantial damage to beach-front property and their dunes. On the west coast, powerful winter storms during El Nino years can cause considerable erosion along sections of the Pacific coastline. El Nino winters can include more frequent storms, large waves, and extreme high tides. Along the pacific coastline, erosion can lead to flooding, collapsed bluffs, destroyed houses and closed roads.

The State of New Jersey has over 130 miles of coastline, most of which is within close proximity to major metropolitan centers of the mid-Atlantic. Beach restoration and maintenance is an ongoing process for New Jersey. The State legislature provides \$25 million annually for beach restoration and every beach on the Atlantic is currently under either a design, engineering or construction phase. According to the New Jersey Department of Environmental Protection (NJDEP) web site there are currently 13 Federal coastal engineering projects and 23 State projects that are either in planned, under construction, or recently completed. The Long Branch-Manasquan Project, between Sandy Hook and Manasquan Inlet, is one of the largest beach construction projects completed in the U.S. with over 25 million cubic yards of sand placed on 25 miles of beaches (Source: U.S. Department of Interior).



**Figure 4.4.11-1**  
**New Jersey Coastal Boundary Map**  
(Source: NOAA)





The coastal erosion problem is studied by various Federal, State and local agencies and organizations. New Jersey Beach Profile Network (NJBPN) has been monitoring and surveying beach erosion along the New Jersey coastline since 1986. The survey data produced by the NJBPN includes cross-sectional profiles and quantitative measurements of volumetric changes along the profiles over time. The NJBPN was developed after the coastal damage caused by a 1984 northeast storm and Hurricane Gloria in 1985. The lack of survey data for any New Jersey coastal region prior to the storm events restricted the State's ability to substantiate the amount of damage and severity of the storm losses from beaches, which prevented the State from quantifying any damage for reimbursement from the Federal Emergency Management Agency (FEMA) (Source: NJBPN).

The NJBPN is designed to provide regional information on coastal zone changes and long term trends, at enough sites to be statistically meaningful to State and local coastal zone managers. The database consists of 100 beach profile locations between Raritan Bay (3 sites in the lower bay), the Atlantic Ocean coast line, and Delaware Bay (4 sites on the western shoreline of Cape May County). Each site has been visited annually in the fall since 1986 and semiannually in the fall and in the spring since 1994. Information collected consists of photographs of the beach/dune system at each site, a topographic profile of the dune, beach and seafloor to a depth of 12 feet; and field notes on significant conditions or geologic change in progress. Any construction activity is noted and necessary information regarding any quantity and duration of such activity is gathered.

**Figure 4.4.11-2**  
**Beach Nourishment Project in Sea Girt, New Jersey**  
(Source: NJDEP)





## Previous Coastal Erosion Occurrences

Nor'easter and Hurricanes can result in significant coastal erosion along New Jersey's shoreline. Four of the past six nor'easters have been severe enough to result in Presidential disaster declarations. All of these storms caused some degree of coastal erosion. Table 4.4.11-1 describes these events.

**Table 4.4.11-1  
 Storm-Induced Coastal Erosion Events**

Date(s)	Description
March 6-8, 1962	FEMA Disaster # 124: The most damaging northeast storm since the 1888 Blizzard struck New Jersey. Although this storm did not produce record surge levels, it inflicted substantially greater overall damages and loss of life than any other storm. This was primarily due to the prolonged duration of the storm that caused damaging overwash and flooding through five successive high tides. Increased development along the coast since the 1944 hurricane also accounted for increased damages. This storm was also responsible for the loss of 22 lives, completely destroyed 1,853 homes and caused major damage to approximately 2,000 additional homes. The total damage caused by this storm to public and private property was about \$85 million (1962 dollars).
December 18, 1992	FEMA Disaster #973: This storm impacted Ocean, Monmouth, Atlantic, Cape May, Cumberland, Bergen, Salem, Middlesex, Somerset, Union, Essex, Hudson counties. Public Assistance, Individual Assistance, Hazard Mitigation Programs were granted with the total eligible amount of \$51.0 million Public Assistance (25% state share \$12.5 million) \$10.5 million Individual Assistance (25% state share \$1.32 million) \$ 2.2 million Hazard Mitigation (50/50 share). In addition 238 municipalities were eligible for Public Assistance.
March 3, 1998	FEMA Disaster # 1206: A severe Nor'easter in February impacted Atlantic, Cape May, and Ocean counties. Various programs were activated for Public Assistance, Individual Assistance, and Hazard Mitigation. The dollar amounts awarded were: Public Assistance \$2.2 million (12.5% state share, 12.5% local share) Disaster Housing Program \$1.1 million Individual/Family Grant Program \$88,184 million (\$28,000 state share) Hazard Mitigation \$477,000.
April 26, 2007	FEMA Disaster # 1694: This was one of the worst Nor'easter storms to hit New Jersey in several decades. While filing for federal disaster relief, acting Governor Codey of New Jersey indicated that the storm caused \$180 million in property damage in New Jersey, making it the second-worst rain storm in its history, after <u>Hurricane Floyd</u> . Individual and Public Assistance programs were issued for Bergen, Burlington, Essex, Passaic, Somerset, Camden, Mercer, and Union Counties. Public Assistance was issued for Atlantic, Hudson, Middlesex, Sussex and Warren Counties. Gloucester County for Individual Assistance.



Two other significant storms caused severe damage to parts of the State in 1994 and 1996, but were not declared Presidential disasters. A storm occurred on December 22, 1994 and dissipated on December 26<sup>th</sup>. This storm caused \$17 million in damages. The long duration of north winds pushed New Jersey tides 2.5 feet above normal, leading to significant coastal erosion and flooding.

Another storm moved into New Jersey on October 18<sup>th</sup>, 1996 and due to climactic conditions became stationary, raining on New Jersey through October 23<sup>rd</sup>. Record rainfall, flooding, and high winds affected New Jersey from Morris County to Middlesex County to Hunterdon County. Hundred-year floods were reached on various streams in Morris, Somerset, and Union Counties. Thousands of electrical customers lost power.

## Probability of Coastal Erosion

As mentioned above, coastal erosion problem is an ongoing problem along many areas of the New Jersey coastline. It is difficult, if not impossible, to assign a probability to the near constant small ongoing erosion that may occur over a continuous period of time. However, a probability can be assigned to larger storm events such as Nor'easter's and Hurricanes which can result in significant storm induced coastal erosion. As described in the sections above related to Nor'easters and Hurricanes, the probabilities of these events range from a few a year (Nor'easters) to less than one significant event per decade on average (hurricanes). The period of time over which this data is provided suggests the probability of coastal erosion will be about the same in the future, with year-to-year variations.



## 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...”

- (ii) 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.



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



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



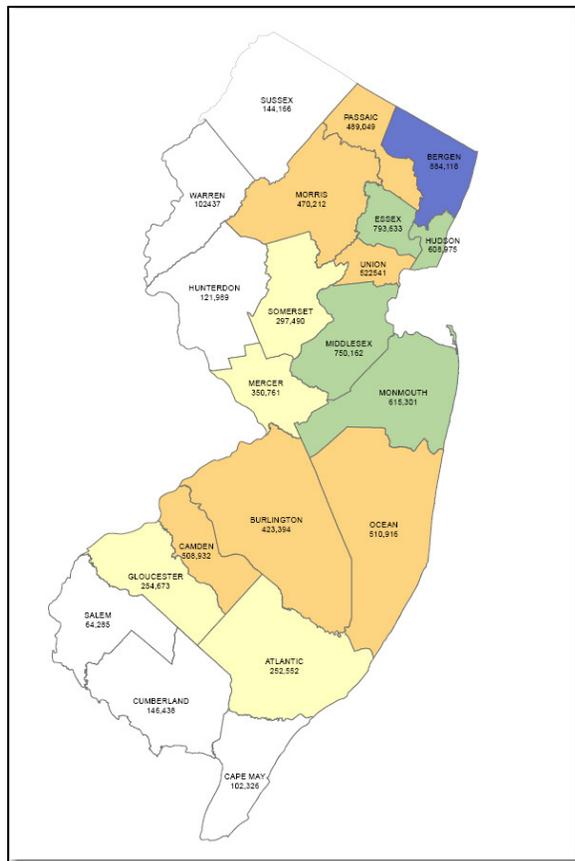
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County	Census on April 1,		NJDOJ Projections to July 1,			MPO Projections			
	1990	2000	2005	2015	2020	2005 Forecast	2015 Forecast	2020 Forecast	2025 Forecast
Ocean	433,203	510,916	551,700	633,000	677,000	527,010	558,961	574,279	590,081
Burlington	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
<b>Statewide</b>	<b>7,730,188</b>	<b>8,414,700</b>	<b>8,4741,700</b>	<b>9,400,700</b>	<b>9,780,600</b>	<b>8,664,913</b>	<b>9,817,258</b>	<b>9,417,726</b>	<b>9,679,180</b>

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**





#### **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 that are exposed to hazards. 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). HAZUS uses the insurance term *exposure* for the value of assets. Assets include both structures and contents, and the dollar figures for the different classes (e.g. residential, agriculture, etc.) are part of the database underlying the HAZUS software. 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 value of structures and assets is a very general proxy for vulnerability on a County level.

Local or regional planners can obtain this information through NJOEM in spreadsheet form.



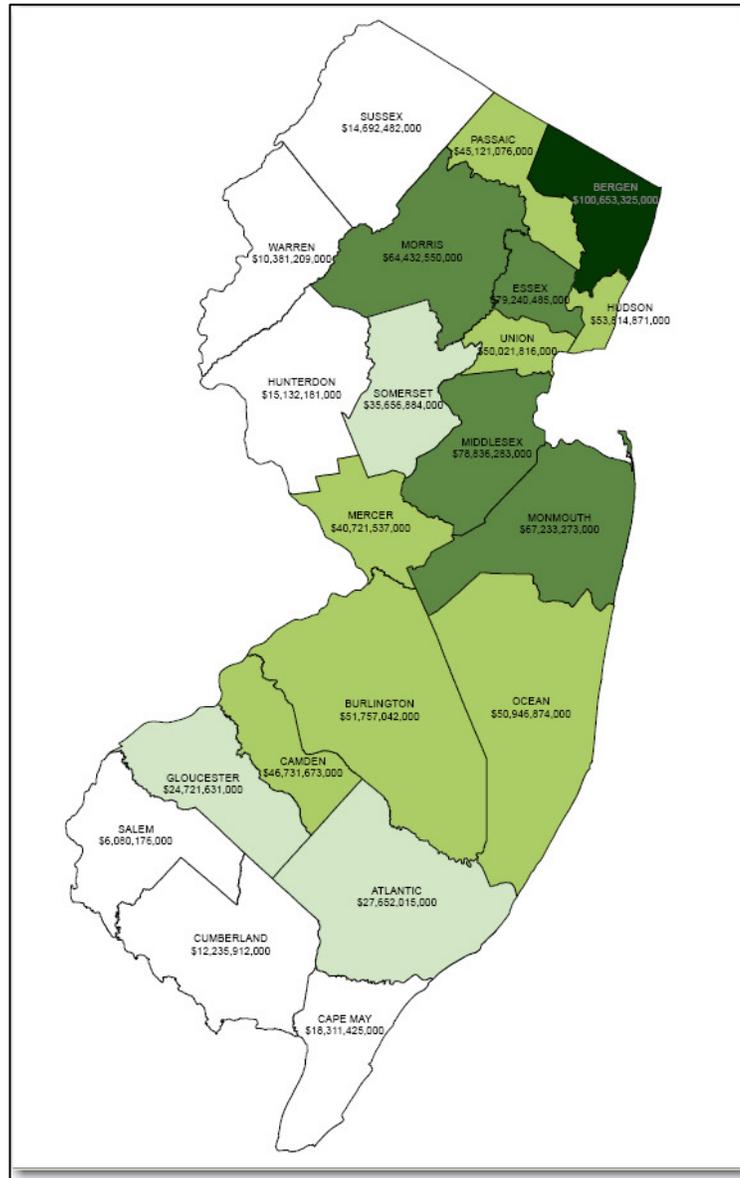
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**Table 4.5-2**  
**Exposure (value) of Assets and Contents in New Jersey by Land Use Type, Sorted by Total Value**  
(Source: FEMA HAZUS) [ref: NJMHP2 structure exposure\_HAZUS data sorted\_122607\_with sum]

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	<b>\$100,653,325,000</b>
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	<b>\$79,240,485,000</b>
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	<b>\$78,836,283,000</b>
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	<b>\$67,233,273,000</b>
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	<b>\$64,432,550,000</b>
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	<b>\$53,814,871,000</b>
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	<b>\$51,757,042,000</b>
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	<b>\$50,946,874,000</b>
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	<b>\$50,021,816,000</b>
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	<b>\$46,731,673,000</b>
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	<b>\$45,121,076,000</b>
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	<b>\$40,721,537,000</b>
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	<b>\$35,656,884,000</b>
Atlantic	\$21,246,799,000	\$4,773,038,000	\$617,441,000	\$49,260,000	\$511,721,000	\$196,074,000	\$257,682,000	<b>\$27,652,015,000</b>
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	<b>\$24,721,631,000</b>
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	<b>\$18,311,425,000</b>
Sussex	\$11,892,557,000	\$2,132,672,000	\$705,032,000	\$65,582,000	\$142,649,000	\$40,635,000	\$153,054,000	<b>\$15,132,181,000</b>
Hunterdon	\$11,560,317,000	\$2,124,176,000	\$597,985,000	\$65,582,000	\$151,716,000	\$39,652,000	\$153,054,000	<b>\$14,692,482,000</b>
Cumberland	\$9,248,998,000	\$1,801,904,000	\$831,467,000	\$50,728,000	\$86,029,000	\$57,162,000	\$159,624,000	<b>\$12,235,912,000</b>
Warren	\$8,167,150,000	\$1,499,989,000	\$366,838,000	\$42,054,000	\$182,016,000	\$23,010,000	\$100,152,000	<b>\$10,381,209,000</b>
Salem	\$4,672,675,000	\$887,637,000	\$303,289,000	\$28,204,000	\$51,606,000	\$28,537,000	\$108,228,000	<b>\$6,080,176,000</b>
<b>Total</b>	<b>\$657,285,085,000</b>	<b>\$166,878,729,000</b>	<b>\$45,314,057,000</b>	<b>\$2,653,936,000</b>	<b>\$10,578,812,000</b>	<b>\$3,147,577,000</b>	<b>\$8,516,524,000</b>	<b>\$894,374,720,000</b>



**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.

**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	<b>\$20,788,683</b>
Somerset	\$12,556,858	\$28,383	\$0	\$0	\$0	\$2,211,389	<b>\$14,796,630</b>
Union	\$8,629,782	\$0	\$0	\$0	\$0	\$1,377,291	<b>\$10,007,073</b>
Essex	\$5,228,770	\$0	\$0	\$0	\$0	\$1,877,623	<b>\$7,106,393</b>
Sussex	\$102,213	\$6,018,541	\$0	\$167,252	\$13,451	\$478,339	<b>\$6,779,796</b>
Passaic	\$3,754,788	\$0	\$0	\$0	\$0	\$2,048,494	<b>\$5,803,282</b>
Burlington	\$0	\$0	\$4,140,560	\$0	\$0	\$1,090,170	<b>\$5,230,730</b>
Middlesex	\$2,383,231	\$0	\$0	\$0	\$0	\$2,431,601	<b>\$4,814,832</b>
Warren	\$158,978	\$0	\$0	\$2,981,911	\$213,099	\$161,839	<b>\$3,515,827</b>
Morris	\$2,074,306	\$640,050	\$0	\$0	\$0	\$0	<b>\$2,714,356</b>
Mercer	\$701,307	\$0	\$0	\$358,633	\$788,499	\$557,387	<b>\$2,405,826</b>
Hunterdon	\$1,619,290	\$0	\$0	\$322,836	\$266,573	\$0	<b>\$2,208,699</b>



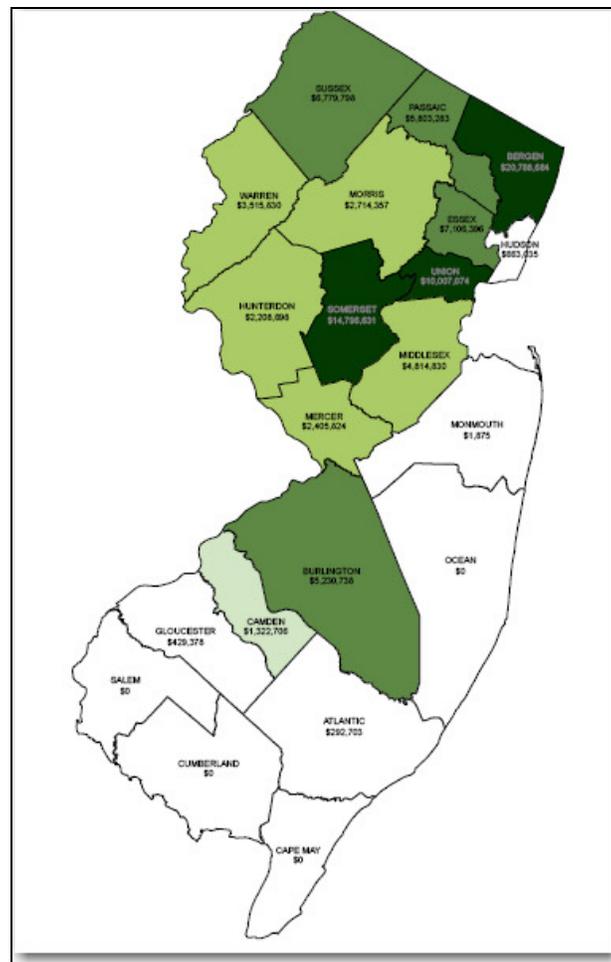
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County	DR-1295	DR-1337	DR- 1530	DR-1563	DR-1653	DR-1694	Total
Camden	\$0	\$0	\$369,476	\$0	\$0	\$953,235	\$1,322,711
Hudson	\$20,877	\$0	\$0	\$0	\$0	\$642,157	\$663,034
Gloucester	\$0	\$0	\$179,795	\$0	\$0	\$249,584	\$429,379
Atlantic	\$0	\$0	\$0	\$0	\$0	\$292,703	\$292,703
Monmouth	\$0	\$0	\$0	\$0	\$0	\$1,875	\$1,875
<b>Total</b>	<b>\$53,116,475</b>	<b>\$6,686,974</b>	<b>\$4,689,831</b>	<b>\$3,830,632</b>	<b>\$1,281,622</b>	<b>\$19,276,295</b>	<b>\$88,881,829</b>

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.**

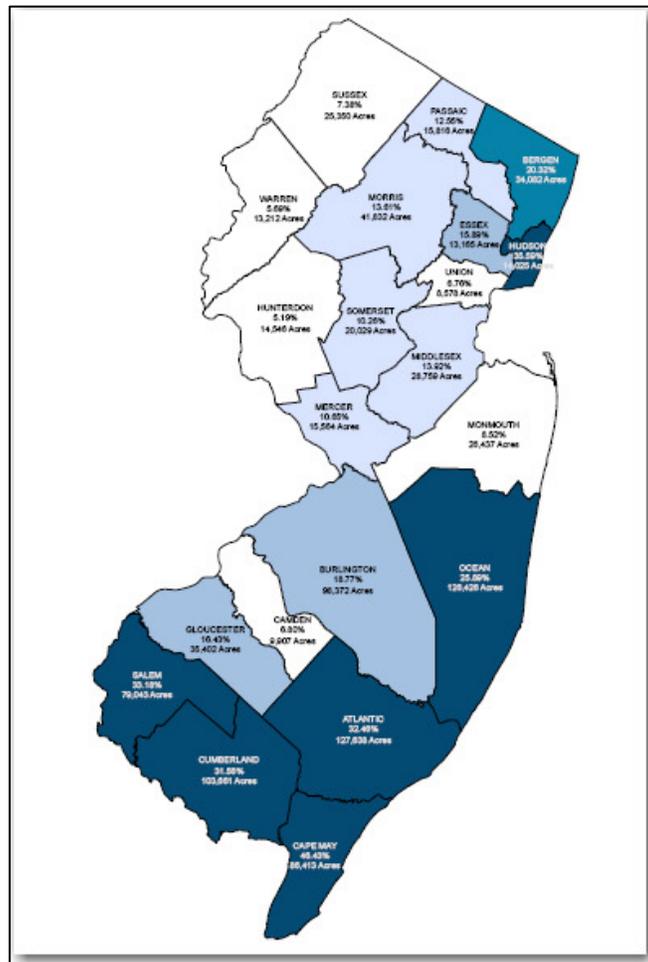
County	Acres in A Zones	Percentage of County in A Zones
Atlantic	127,638	32.46%
Ocean	126,426	25.89%
Cumberland	103,661	31.56%
Burlington	98,372	18.77%
Cape May	86,413	46.43%
Salem	79,043	33.18%
Morris	41,832	13.61%
Gloucester	35,402	16.43%



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County	Acres in A Zones	Percentage of County in A Zones
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%
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%
<b>Statewide</b>	<b>938,258</b>	

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



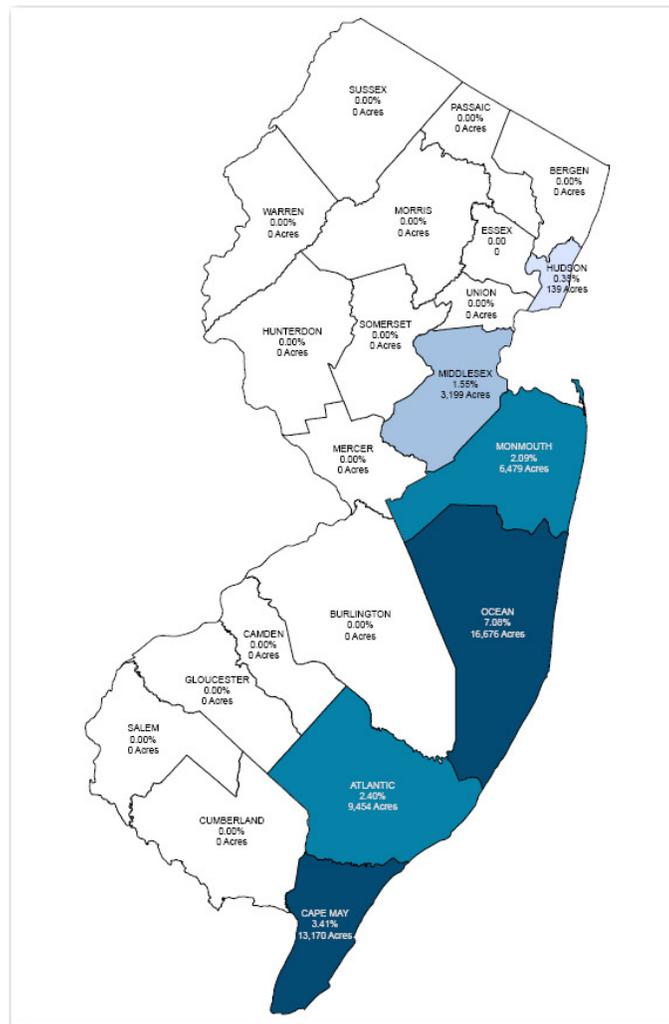


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**Table 4.5-6**  
**Land Area and Percentage of County in FEMA-designated “V” and “VE” Flood Zones,**  
**New Jersey Counties, ordered by Area in Acres (non-zero Counties only)**

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%
<b>Totals</b>	<b>49,118</b>	

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





## 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
<b>Total</b>	<b>268,186</b>	<b>8,826</b>	<b>1,032</b>	<b>1,667,072</b>	<b>1,945,116</b>



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

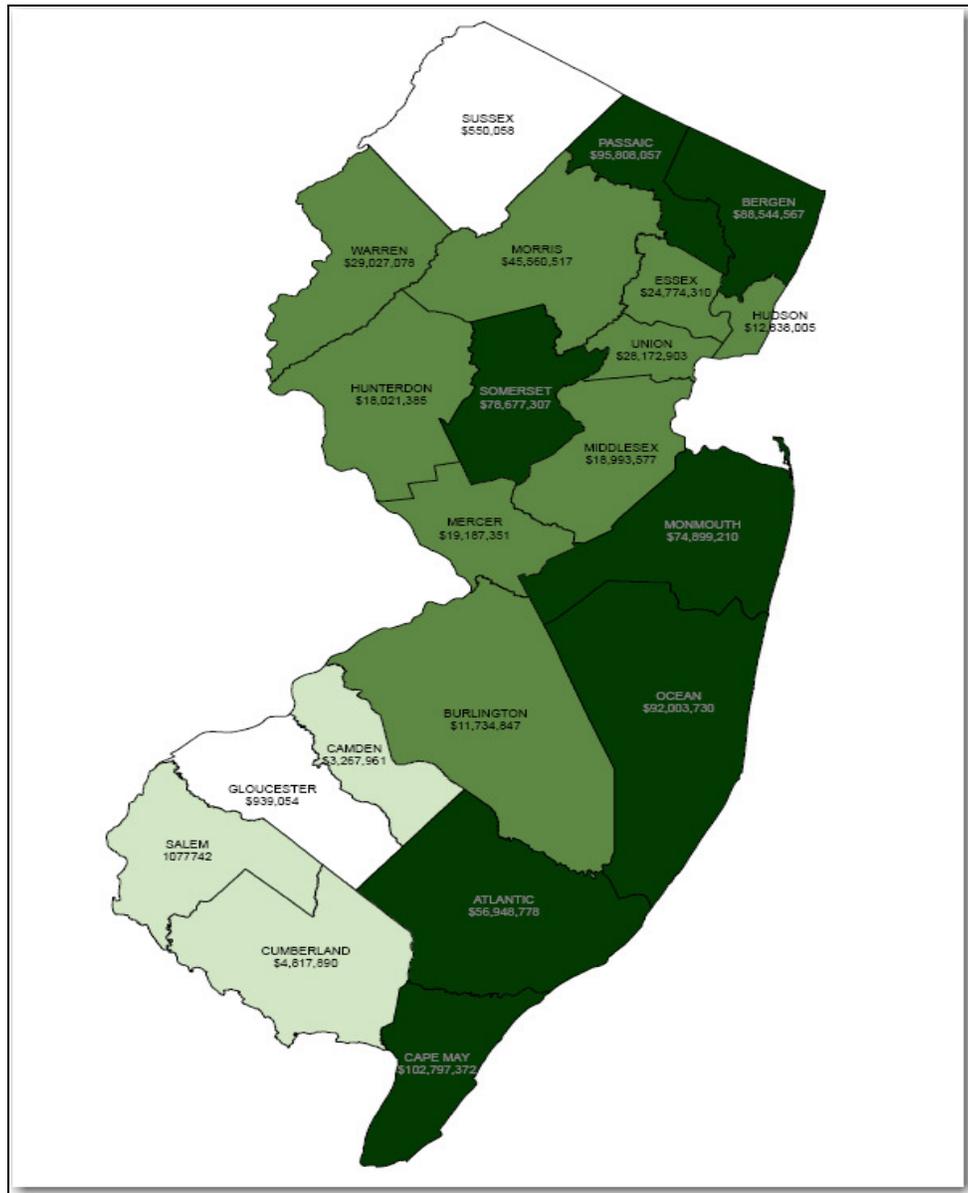
The next measure of flood vulnerability discussed in this Plan is FEMA National Flood Insurance Program (NFIP) records. New Jersey has one of the highest rates of claims payments of any State in the U.S. In addition to suggesting a high level of risk (discussed here and in the Risk Assessment section 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 Flood 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
<b>Total</b>	<b>82,121</b>	<b>\$808,641,699</b>	



**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**

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



## 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 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.

**Table 4.6-1  
 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 [1000s]	Earthquake [1000s]
Atlantic	\$27,652,015	32.46%	2.40%	8,464	5	\$292,703	\$340,118	\$801,908
Bergen	\$100,653,325	25.89%	0.00%	6,304	7	\$20,788,683	\$259,873	\$2,918,946
Burlington	\$50,946,874	31.56%	0.00%	1,077	0	\$5,230,730	\$82,894	\$1,477,459
Camden	\$50,021,816	18.77%	0.00%	894	13	\$1,322,711	\$94,436	\$1,450,633
Cape May	\$18,311,425	46.43%	7.08%	15,599	2	\$0	\$347,237	\$531,031
Cumberland	\$12,235,912	33.18%	0.00%	644	17	\$0	\$11,902	\$354,841
Essex	\$78,836,283	13.61%	0.00%	2,646	11	\$7,106,393	\$200,477	\$2,286,252
Gloucester	\$24,721,631	16.43%	0.00%	299	18	\$429,379	\$47,378	\$716,927
Hudson	\$53,814,871	20.32%	0.35%	1,034	15	\$663,034	\$142,528	\$1,560,631
Hunterdon	\$14,692,482	13.92%	0.00%	947	10	\$2,208,699	\$38,616	\$426,082
Mercer	\$40,721,537	8.52%	0.00%	1,710	14	\$2,405,826	\$67,354	\$1,180,925
Middlesex	\$79,240,485	7.38%	1.55%	1,782	12	\$4,814,832	\$843,336	\$2,297,974
Monmouth	\$64,432,550	10.26%	2.09%	7,079	9	\$1,875	\$770,679	\$1,868,544
Morris	\$67,233,273	12.55%	0.00%	4,977	3	\$2,714,356	\$143,627	\$1,949,765
Ocean	\$46,731,673	10.65%	3.41%	12,765	6	\$0	\$753,916	\$1,355,219
Passaic	\$45,121,076	5.19%	0.00%	7,921	1	\$5,803,282	\$123,498	\$1,308,511
Salem	\$6,080,176	35.59%	0.00%	399	0	\$0	\$12,420	\$176,325
Somerset	\$35,656,884	5.69%	0.00%	3,121	8	\$14,796,630	\$91,055	\$1,034,050
Sussex	\$15,132,181	15.89%	0.00%	108	0	\$6,779,796	\$44,528	\$438,833
Union	\$51,757,042	6.80%	0.00%	3,317	16	\$10,007,073	\$142,355	\$1,500,954



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County	\$ Exposure [1000s]	% County A Zone	% County V Zone	NFIP Claims	# SRL	FEMA PA \$ Losses	Hurricane Wind [1000s]	Earthquake [1000s]
Warren	\$10,381,209	6.76%	0.00%	1,034	4	\$3,515,827	\$30,728	\$301,055



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Table 4.6-2 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 4.6-2  
Summary of Relative Threat to New Jersey Counties from Natural Hazards**

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



## 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. 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.

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**

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

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.



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

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



## 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, only two local plans had been approved in the State, 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. 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.



## Section 5 Mitigation Strategy

### Contents of this Section

- 5.1 Interim Final Rule Requirements for Mitigation Strategy
- 5.2 State Hazard Mitigation Strategy
- 5.3 State Hazard Mitigation Goals, Objectives and Actions
- 5.4 STAPLEE Evaluation of State Mitigation Actions in 2008 Plan Update
- 5.5 Evaluation of State Progress on Goals and Actions from the 2005 Plan
- 5.6 Recent Progress Report on other State Mitigation Actions
- 5.7 Discussion of State Pre- and Post-Disaster Hazard Management Organization, Policies, Programs and Capabilities
- 5.8 Evaluation of State Laws, Regulations, Policies and Programs related to Hazard Mitigation and Development in Hazard Prone Areas
- 5.9 Identification of Funding Sources
- 5.10 General Description and Analysis of the Effectiveness of Local Mitigation Policies, Programs and Capabilities

### 5.1 Interim Final Rule Requirements for Mitigation Strategy

The Interim Final Rule (IFR) Subsection 201.4 (c) (3) requires the State Hazard Mitigation Plan to include a Mitigation Strategy. “(The Mitigation Strategy shall provide) the State’s blueprint for reducing the losses identified in the risk assessment. This section shall include:

- 1) A description of State goals to guide the selection of activities to mitigate and reduce potential losses.
- 2) A discussion of the State’s pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area including: an evaluation of State laws, regulations, policies and programs related to hazard mitigation as well as to development in hazard-prone areas; a discussion of State funding capabilities for hazard mitigation projects; and a general description and analysis of the effectiveness of local mitigation policies, programs and capabilities.
- 3) An identification, evaluation and prioritization of cost-effective, environmentally sound and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified.
- 4) Identification of current and potential sources of Federal, State, local or private funding to implement mitigation activities.

Additionally, the Interim Final Rule (IFR) Subsection 201.4 (d) requires that the plan be updated on a regular basis. Specifically, “(The) plan must be reviewed and revised to reflect changes in development, progress in Statewide mitigation efforts and changes in priorities.”

The first of three tables below is the complete, updated version of State hazard mitigation strategies. The second table is an evaluation of progress on goals, strategies and actions from the 2004 version of the plan, Note that the



original third and fourth goals are struck from the new plan, but are included in this section to reflect the original plan. These sections may be deleted from the final draft that is sent to FEMA Region II for review. The last table in the section is a STAPLEE evaluation of actions in this updated version of the plan.

## 5.2 State Hazard Mitigation Strategy

The Mitigation Strategy of the New Jersey State Hazard Mitigation Plan is the State's blueprint for reducing potential future losses from hazards. The Mitigation Strategy provides information to guide State decision making, including decisions regarding protecting critical State facilities, and to guide local hazard mitigation planning. New Jersey's mitigation strategy consists of:

1. A description of the State's hazard mitigation goals and objectives to guide the selection of activities that will mitigate hazards and reduce future losses
2. Identification, evaluation and prioritization of mitigation actions and activities
3. Identification of current and future sources of Federal, State, local and private funding to implement mitigation activities
4. An evaluation of New Jersey's pre- and post-disaster hazard management policies, programs and capabilities to mitigate hazards
5. Evaluation of State Laws, Regulations, Policies and Programs related to Hazard Mitigation and Development in Hazard Prone Areas
6. General Description and Analysis of the Effectiveness of Local Mitigation Policies, Programs and Capabilities

## 5.3 State Hazard Mitigation Goals, Objectives and Actions

The 2005 version of the New Jersey State Hazard Mitigation Plan identified five goals:

1. Protect life
2. Protect property and ensure continuity of operations
3. Promote a sustainable economy
4. Protect the environment
5. Increase public preparedness

During the 2008 plan update process, the SHMT and MCT determined that goals 3 and 4 from the 2005 plan should be deleted because as stated they are not directly related to natural hazards or hazard mitigation. However, a number of the actions originally listed under those goals were related to mitigation, and were retained in the updated document, but related to different goals. These are reflected in the current goals and actions tables immediately below. As part of the 2008 update, the MCT and SHMT identified two new goals that are included in the present section as numbers 3 and 4. The goals and actions tables below list specific strategies and actions for each of these.

1. Protect life
2. Protect property and ensure continuity of operations
3. Increase public preparedness
4. Develop and maintain an understanding of risks from natural hazards
5. Enhance the capability of NJOEM to continuously make New Jersey less vulnerable to hazards.



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<b>GOAL 1. PROTECT LIFE</b>							
<b>Objective</b>	<b>Action</b>	<b>Priority</b>	<b>Responsible Agency</b>	<b>Projected Timeline</b>	<b>Projected Resources</b>	<b>Rationale for Action and Priority</b>	<b>How Action Contributes to Mitigation Strategy</b>
1.1 Improve warning and emergency communications systems.	1.1.1 Expand reverse 911 implementation.	High	NJOEM Communications Bureau	Ongoing	Existing State Resources	The State is seeking an inexpensive way to expand warning and emergency communication with the public.	Reverse 911 improves local and state capability to protect life.
	1.1.2 Expand Flood Warning Systems (Preparedness Unit).	High	NJOEM Preparedness Unit	Ongoing	Existing State Resources	Improve coverage increases the number of people able to receive warning of potentially life threatening flooding events.	Expanding and enhancing this system improves local and state capability to protect life.
1.2 Effectively address laws and regulations that address hazard mitigation issues.	1.2.1 Encourage enforcement of Flood Plain Management as it relates to new and existing construction.	High	NJOEM, NJDEP, others	Ongoing	Existing State Resources and Federal grant funds (FEMA CAP-SSSE)	To guide communities in a more effective control and use of floodplains.	Improve disaster resistance of structures within the floodplain. Coordinate with the NFIP participating communities through the Community Assistance Program to ensure that they are adopting, properly using and enforcing the Local Flood Damage Prevention ordinances.
	1.2.2 Encourage adoption of regulations that include exemptions to life safety/property protection mitigation efforts in tightly regulated environmental laws.	Medium	Various	Ongoing	To be determined; multi-agency initiative	Prescribed burning and mechanical fuel reduction efforts are hindered when not considered during development of environmental laws and regulations	



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	1.2.3 Provide a legislative process to conduct wildland fuel reduction efforts on private properties.	Medium	NJFS	Ongoing	NJFS	Incomplete cooperation on various land ownerships disrupts linear continuity of mitigation efforts	Protects life and property.
1.3 Reduce impacts of hazards on vulnerable populations.	1.3.1 Encourage participation in existing programs – FMA, PDM, HMGP.	High	NJOEM Mitigation Unit, NJDEM, NJDCA NJ State League of Municipalities	Ongoing	Existing local, State and Federal grant funds.	Significant number of households are in floodplains and are potentially at risk to hazards and repetitive losses. Opportunities exist to coordinate with “smart growth” and “safe growth” planning initiatives.	Increasing municipal involvement in and public support for improving the structural integrity of vulnerable homes will improve the safety of households which would otherwise be at risk.
1.4 Strengthen State and local building code enforcement.	1.4.1 Integrate NFIP standards and Firewise into the uniform construction codes utilized by the State.	High	NJDCA NJDEP	2 years	Existing State funds	Incorporate NFIP requirements into the New Jersey Uniform Construction Code to reduce flood losses.	Reduction of flood losses will reduce flood insurance claims.
1.5 Train emergency responders.	1.5.1 Promote Community Emergency Response Team (CERT) training.	Medium	NJOEM Training Unit	Ongoing	Existing State Resources	To enhance local communities' ability to respond to hazard events.	Provide public and communities with immediate pool trained first responders.
	1.5.2 Utilize the NJOEM Training Unit to train emergency responders.	Medium	NJOEM Training Unit	Ongoing	Existing State Resources	To enhance local communities' awareness of risks.	Enhance community abilities to effectively respond to hazard events
	1.5.3 Encourage educational programs (Rutgers, UMDNJ).	Medium	NJOEM Mitigation - Preparedness unit	Ongoing	Existing State resources	Continued participation in this joint program leads to a stronger understanding of hazards and risks within the emergency management community as well as in the private sector.	Enhance community abilities to effectively respond to hazard events



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	1.5.4 Ensure Incident Command System use, qualifications, and standards during all incident response and event planning.	Medium	Various	Begin within one year, then ongoing	Existing State resources	DHS requirement	Protects life and property.
1.6 Ensure that State critical facilities are protected from potential damage or collapse in earthquakes.	1.6.1 Implement seismic retrofits for a limited number of especially critical facilities, which are especially vulnerable seismically and located in high hazard areas.	Medium	NJOEM, NJGS	10 to 15 years, then ongoing	FEMA grant funds, grants from other federal or State agencies TBD.	Potential for deaths and casualties in certain combinations of building types and occupancies means that some critical facilities should be protected from seismic hazards.	Protects life and property. Will help State maintain operations in the event of an earthquake.



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Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
2.1 Protect critical State facility assets.	2.1.1 Generate preliminary State critical facilities information for the NJ State Hazard Mitigation Plan (SHMP).	Highest	NJ Treasury NJOIT/GIS NJOEM	6 months	Existing State Resources	Establishes comprehensive GIS-based repository for data on critical State facilities.	Data base will allow identification of critical state facilities so that they may be targeted for future mitigation projects.
	Establish comprehensive GIS-based repository for data on critical State facilities. (See also newly added action at end of this section related to inventory of State facilities)	High		3 years			
	2.1.2 Prioritize structural and nonstructural retrofits for critical State owned facilities based on their vulnerability to natural hazards.	High	NJ Treasury NJOEM	3 years	Existing State Resources and possible mitigation grant funds	Prioritizing will address the most vulnerable structures first.	Retrofitting facilities based on their vulnerability will preserve important state buildings, as well as protect their records, systems and occupants from hazard events.
	2.1.3 Expand State facilities risk management program.	High	NJOEM NJ Treasury	Ongoing	Existing resources	Maintain flood protection and fire protection	Increases safety of personnel and reduces losses due to fire/flood.
	2.1.4 Provide training seminars in identifying potential hazards to State bureaus responsible for rental/leasing of properties for State offices.	Medium	NJOEM NJ Treasury	Ongoing	Existing resources	Training will augment existing initiatives of Treasury and the State's insurance carriers by expanding the number of hazards addressed and will use all existing hazard profiling information.	Identification of potential hazards will identify vulnerabilities and avoid losses to State facilities through mitigation or relocation. Securing facility contents will protect them from damage and also minimize flood insurance claims.



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Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
	2.1.5 Conduct a survey of State agencies as the basis for identifying their most critical facilities, and use this as the basis for prioritizing vulnerability assessments and (subsequently) mitigation grant funds.	Medium	NJOEM, all concerned State agencies, Treasury	To be determined	Existing NJOEM and State agency staff resources.	Critical first step in identifying appropriate sites and operations for mitigation priorities.	Protects life, property and continuity of operations.
2.2 Protect critical non-state owned assets.	2.2.1 Inventory non-state owned critical assets that are vulnerable to natural hazards.	High	NJOEM State Agencies Local Emergency Management Coordinators	Ongoing	Existing resources	Establishes comprehensive GIS-based repository for data on critical non-State owned facilities.	Database will allow identification of non-State owned critical facilities so that they may be targeted for future mitigation projects.
	2.2.2 Encourage training of owners and operators of non-state owned critical facilities for hazard mitigation.	High	NJOEM State Agencies Local Emergency Management Coordinators	Ongoing	Existing resources	Targeted training will augment existing initiatives of NJOEM and insurance carriers.	Targeted training efforts based on identification of potential hazards will reduce vulnerabilities and losses to critical facilities through mitigation or relocation. Training to secure contents of critical facilities will protect assets from damage and minimize flood insurance claims..



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Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
	2.2.3 Continue funding the non-lapsing Shore Protection Fund for shore protection projects associated with the protection, stabilization, restoration or maintenance of the shore, including monitoring studies and land acquisition.	High	NJDEP, Bureau of Coastal Engineering	Ongoing.	Existing resources.	Implemented recommendations and methods would reduce flooding from storm surge and protect vulnerable evacuation routes on barrier islands.	Partnerships with the U.S. Army Corps of Engineers and local governments allow the State to leverage our funding to implement mitigation projects with larger scale protection. The fund supports coastal engineering research, the Beach Monitoring Network and dune-system assessments.
2.3 Reduce repetitive and severe repetitive flood losses Statewide.	2.3.1 Inventory damaged structures.	High	NJOEM, NJDEP NJ Treasury	Ongoing	Existing State Assets and Federal grants	Identifying repetitive loss areas and properties helps communities develop a strategy to reduce future hazard losses.	Retrofitting, elevating or removing repetitive loss properties from known hazard areas protect property and lives as well as preserve personal, state and federal financial resources.
	2.3.2 Develop and implement a detailed severe repetitive loss mitigation strategy that will qualify the State for 90-10 cost share under the FEMA SRL program.	High	NJOEM	Immediate and ongoing	Existing State resources, in context of State Mitigation Plan update (which used FEMA grant funds)	First step in the State implementing a clear, long-term program of mitigating properties that constitute the most significant losses to the National Flood Insurance Program.	Protects property. See Appendix G of 2008 version of State plan – Severe Repetitive Loss Mitigation Strategy.
	2.3.3 Conduct yearly workshops related to FEMA hazard mitigation grant programs.	High	NJOEM	Ongoing	Existing State Assets and Federal grants	Making local officials aware of FMA increases participation.	FMA contributes to the mitigations strategy to reduce future flood losses.



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Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
	2.3.4 Promote acquisition and elevation of repetitive loss and severe repetitive loss structures.	High	NJOEM	Ongoing	Federal grants	To eliminate repetitive loss structures	Structures will no longer be flooded thereby reducing repetitive loss claims
	2.3.5 Conduct community outreach, workshops and training to increase NFIP participation.	High	NJOEM NJ Treasury	Ongoing	Existing State Resources	Encourages participation in the program so that losses will be covered and allows eligibility in the FMA program.	Allows for people to receive flood insurance claims and maintains eligibility in the FMA program of which flood insurance is a requirement.
	2.3.6 Regulate development to reduce flood losses in vulnerable fluvial and coastal areas.	High	NJDEP	Ongoing	Existing resources	Necessary to reduce flood insurance losses in floodprone areas.	Promulgates regulations governing development in flood hazard areas which reduce flood losses and ensures a safer community.
	2.3.7 Continue NJDEP Green Acres, Blue Acres and Flood Control acquisition funds to promote more acquisition of repetitive loss and severe repetitive loss structures.	Medium	NJDEP NJOEM NJ State League of Municipalities	Ongoing	New and existing State appropriations	Requested in local mitigation planning efforts to eliminate repetitive loss structures.	Augments Federal funding to ensure that more structures will no longer be flooded thereby reducing repetitive loss claims.
	2.3.8 Continue State funding for federal flood control projects through annual state appropriations under the HR-6 Flood Control project budget.	High	NJDEP, Bureau of Dam Safety & Flood Control	Ongoing	Existing State resources	Implemented recommendations and methods would reduce flooding and protect vulnerable public and private properties, infrastructure, utilities and municipal services	Partnerships with the U.S. Army Corps of Engineers and local governments allow the State to leverage our funding to implement flood mitigation projects that provide larger scale protection.



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**GOAL 2. PROTECT PROPERTY AND ENSURE CONTINUITY OF OPERATIONS**

Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
	2.3.9 Ensure enforcement of the seismic design provisions in the International Building Code for all new buildings and infrastructure in New Jersey.	Medium	Local governments; State government	Ongoing	Existing local and State resources	Long-term continued enforcement is best form of mitigation for most hazards.	Best possible long-term mitigation against damages from earthquakes, especially for new construction
2.4 Ensure that State-owned and operated critical facilities are protected against potential wind damage.	2.4.1 Undertake cost-effective wind retrofits and upgrades of the most critical state facilities.	Medium	State government	To be determined	State resources and/or FEMA grant funds	Protects key State resources. Part of possible eventual enhanced State plan status.	Protects lives, property and essential State functions.
2.5 Identify and mitigate local or regional critical facilities that are in flood velocity zones	2.5.1 Use HAZUS to identify local or regional police, fire, hospital and emergency operations centers that are in FEMA-designated V and VE flood zones.	Medium to High	NJOEM and local/regional authorities	One year	Existing NJOEM and local/regional resources	First step in initiating mitigation activities to protect critical facilities.	Protects property, and because the facilities in question are critical in nature, by extension these activities also contribute to the goal of protecting life, as well as maintaining the effective operation of government operations that may be essential in the post-event environment.
	2.5.2 Undertake detailed vulnerability assessments and develop mitigation options for critical facilities in V and VE zones.	Medium to High	NJOEM and local/regional authorities	To be determined based on funding.	To be determined, probably NJOEM and regional or local entities.	Step in process of securing grant funds to mitigate risks to these sites.	Contributes to goals of protecting property and life.
	2.5.3 Initiate mitigation projects to reduce risks to critical facilities located in V and VE zones	Medium to High	NJOEM and local/regional authorities	To be determined based on funding.	FEMA grant programs, with State	Protects critical facilities.	Contributes to goals of protecting property and life.



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Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
2.6 Continue to ensure minimal risk from wildfires and urban interface fires.	2.6.1 Continue mechanical thinning and prescribed fire use to reduce hazardous wildland fuel accumulations Statewide, particularly in high-risk areas.	High	NJFS	Ongoing.	NJFS, federal programs	Historically vulnerable areas require continual mitigation efforts to manage risk. Many vulnerable areas are subject to increasing development pressures, meaning that risk is gradually increasing, although the probability of fire may remain stable because of mitigation efforts.	Improving the health of the forests will make less fuel available for wildland fire and protect forest resources. Protects property and life.
	2.6.2 Encourage community acceptance and inclusion of Firewise concepts in municipal and regional planning	Medium	NJDEP, Forest Fire Service	Ongoing	Fosters defensible space and community development standards to improve survivability of residences during wildfire incidents	Allows continuity of mitigation efforts between communities and other open lands.	Improving the health of the forests will make less fuel available for wildland fire and protect forest resources.
	2.6.3 Develop and implement effective silviculture strategies that improve the health of forests and reduce the amount of fuels available for wildland fires from dead and dying trees.	Medium	NJDEP, Forest Fire Service	Ongoing	Existing resources and National Fire Plan grants	A portion of the state's forests has trees killed or defoliated by forest insects or disease.	Improving the health of the forests will make less fuel available for wildland fire and protect forest resources.



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Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
	2.6.4 Limit the number of wildfires to fewer than 2,000 annually and the acreage burned to less than ½ of 1% of the state forest.	Medium	NJ DEP Forest Fire Service	Ongoing	Existing resources	Minimizes wildfire ignitions and limits acreages burned by breaking up large areas of hazardous fuels.	Provides access for suppression and enforcement as well as contingency lines for prescribed burning and wildfire control. Improve public acceptance of efforts
2.7 Ensure continuity of critical business operations.	2.7.1 Update and maintain continuity of government - continuity of operations plans to enable the state government to provide critical services during an interruption of business.	High	NJOEM NJOIT	Ongoing	Existing resources	Critical services are still necessary during an interruption of business.	The existence and exercise of these plans will assure that State Government services will continue to be provided regardless of the hazards faced.



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<b>GOAL 3. INCREASE PUBLIC PREPAREDNESS</b>							
Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
3.1 Improve public awareness and preparedness for natural hazards and the risks they pose.	3.1.1 Educate the public through NJOEM and NJFS outreach programs and hazard mitigation workshops.	High	NJOEM NJFS	Ongoing	Existing State resources	To increase participation in hazard mitigation programs for the prevention of potential loss of life and damage to structures.	Encourages the development of Pre Disaster Mitigation plans and participation in mitigation grant programs.
	3.1.2 Participate in the Emergency Preparedness Conference with workshops.	High	NJOEM NJFS	Ongoing	Existing State resources	The Emergency Preparedness Conference is an important venue to promote and increase participation in hazard mitigation programs and reaches a wide variety of people and interests.	Encourages the development of Pre Disaster Mitigation plans and participation in mitigation grant programs.
	3.1.3 Promote continuing education of state and local officials through Rutgers programs.	Medium	NJOEM Rutgers University	Ongoing	Existing State resources	To make local officials and emergency management coordinators aware of possible hazards and actions to reduce hazards and vulnerabilities in their community.	Increases protection to property and life in the state.
3.2 Improve hazard Information data bases and maps.	3.2.1 Incorporate existing HAZUS /NYCEM earthquake studies into the SHMP and indicate completion schedule for other counties	Highest	NJOEM	6 months	Existing State resources	HAZUS and NYCEM data will be invaluable in the development of mitigation planning, for both the State and local communities by providing a comprehensive database for mitigation planning	Assists in developing state and local mitigation plans with current information.



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<b>GOAL 3. INCREASE PUBLIC PREPAREDNESS</b>							
Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
	3.2.2 Incorporate additional profiling and vulnerability information recommended by FEMA into the SHMP.	High	NJOEM	Ongoing	Existing State resources	To increase statewide vulnerability and hazard trends.	Decreases losses through identification of hazard prone areas. Increases protection of vulnerable state activities.
	3.2.3 Develop a hazard event GIS database to help State and local emergency managers with hazard mitigation and other planning initiatives.	High	NJOEM NJOIT/GIS NJFS	1 Year	Existing resources	The current NJOEM GIS database to capture and organize the volume of information generated by research and actual disaster events needs to be expanded.	Improving knowledge of hazards and hazard events will improve mitigation and other planning designs to reduce the impact of hazard events on local and state economies.
	3.2.4 Expand and enhance GIS/HAZUS hazard mitigation databases and use for analysis and mapping in the SHMP.	High	NJOEM NJOIT/GIS	1 Year	Existing resources and mitigation grants	Provide a data base for the identification of hazardous areas and provide loss estimations for hurricanes and flood winds	Provide rationalization for future land use planning.
	3.2.5 Develop state hazard profiles for manmade and technological hazards.	High	NJOEM NJDC Office of Smart Growth Local Planning and Emergency Management Agencies	Ongoing	Mitigation grants	Existing profiles primarily discuss state and local vulnerability to natural hazards.	Improving knowledge of manmade hazards and technological hazard events will improve mitigation and other planning designs to reduce the impact of hazard events on local and state economies.



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<b>GOAL 3. INCREASE PUBLIC PREPAREDNESS</b>							
Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
3.3 Enhance community outreach.	3.3.1 Develop a cadre of supplemental staff to assist NJOEM with education of affected communities, project assessment and development of mitigation projects. This staff may be comprised of volunteers, temporary reservists, and permanent personnel.	High	NJOEM	2 Years	Mitigation grants	Allow flexibility in staffing and increase during periods of disasters. Hiring staff is necessary for the Mitigation Unit to fulfill its responsibilities and manage its increased workload resulting from recent disasters and commitments in the SHMP.	Provide better public relations, education and identification of viable hazard mitigation projects.
3.4 Increase development of local mitigation planning.	3.4.1 Conduct community outreach, workshops and training opportunities to promote development of PDM plans.	High	NJOEM	Ongoing	Mitigation grants and technical assistance funds.	Development of FEMA approved plans is required for HMGP and PDM funds	Approved plans will allow communities to receive mitigation grants to implement projects that will protect life and property.
	3.4.2 Increase NJOEM staffing in areas of planning, engineering and management.	High	NJOEM,	Ongoing	Mitigation grants	Additional staff required to expand expertise, for the timely development of hazard mitigation plans and to facilitate implementation of projects.	Development of viable local hazard mitigation plans and projects.
	3.4.3 Revise the SHMP and post it on the web so it is more useable to the public and to local governments developing local mitigation plans.	Highest	NJOEM SHMT	6 months	Existing state mitigation grants	To enhance local jurisdictions ability to utilize the State plan to develop ongoing and comprehensive mitigation strategies.	Will provide a user friendly guidance to local jurisdictions.



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<b>GOAL 3. INCREASE PUBLIC PREPAREDNESS</b>							
Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
<p>3.5 Ensure that citizens of the State have at least some understanding of earthquake risk, how to respond if any earthquake occurs, and best practices for mitigation on a local or individual level.</p> <p>3.6 Encourage involvement in advancing mitigation among State, regional and local agencies.</p>	3.4.4 Develop and maintain local government mitigation planning assistance/coordination web page.	Highest	NJOEM NJ Treasury NJOIT/GIS	6 months	Existing State resources	Provide up to date reference for the development and updating of local hazard mitigation plans.	This local information will be utilized in the updating of the State Hazard Mitigation Plan.
	3.4.5 Ensure that each municipality and county develops a wildfire preparedness plan for incorporation into their local and county emergency management plans.	Medium	NJOEM NJDEP Forest Fire Service	Ongoing	FEMA Fire Management Assistance Grant Program; National Fire Plan grants and NJDEP (National Fire Plan-funded) Community Wildfire Hazard Mitigation Grants, others.	Provides resources for preparing mitigation plans and implementation of measures to mitigate wildfire hazards	Helps to address goals of protecting life and property.
	3.5.1 Enhance public education and outreach efforts to increase awareness of earthquake hazards and risk in New Jersey.	Low to Medium	NJGS, NJOEM	Ongoing	Existing State staff and funds.	Protects life and property.	Advances goals of protecting life and property.
	3.6.1 Encourage the NJ League of Municipalities to become more involved in mitigation activities.	Medium	NJOEM, NJ League of Municipalities	TBD	Existing staff	Helps to spread concepts of mitigation to new areas.	Advances all goals in the plan by increasing preparedness and knowledge of citizens, and law and policymakers.



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GOAL 4 DEVELOP AND MAINTAIN AN UNDERSTANDING OF RISKS							
Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
4.1 Ensure that the State Hazard mitigation Plan is maintained as a current "living" document, and is	4.1.1 Beginning immediately after the adoption of the 2008 update, the State will continuously update the State Hazard Mitigation Plan to ensure that it includes the most current technical information, serves as a reference and guidance document for local and regional planners, and reflects current State policies, practices and priorities. The plan will also be reviewed and edited for clarity and completeness.	High	NJOEM	Commencing immediately, then ongoing	Existing staff, support from MCT and SHMT. Potential for additional funding through FEMA grant programs.	Federal requirement. In order to maximize the utility of the plan, it must be constantly updated to include most recent information.	Basis for most of the State's decisions about mitigation actions and strategies.
4.2 Ensure that the State has a complete and accurate GIS-based inventory of its facilities, in particular those that are critical to response and recovery from the impacts of natural and manmade hazards.	4.2.1 Compile a GIS-based inventory of critical facilities Statewide (State-, local-, and privately-owned), including fire and police stations, major medical facilities, major public buildings important for emergency response and recovery, and critical lifeline transportation and utility nodes such as major bridges, water treatment plants, wastewater treatment plants and high voltage electric substations.	High	NJOEM/ Treasurer	Two to five years	Existing staff, possibly consultants depending on funding availability	Developing basic information such as this will allow the State to meet federal requirements for prioritizing mitigation grant funds that will be directed to reducing losses to State-owned and operated facilities. Furthermore, and more importantly, this information will allow the State to make informed decisions regarding the use of federal and State resources to reduce potential damages.	This action is the basic building block of a mitigation strategy. Completing this action is the first step in meeting the goals of protecting lives and property, as related to State facilities



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<b>GOAL 4 DEVELOP AND MAINTAIN AN UNDERSTANDING OF RISKS</b>							
Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
4.2 Ensure that the State obtains and maintains best available information related to risks from flood hazards.	4.2.1 Continuously update repetitive loss and severe repetitive loss lists from the NFIP.	High	NJOEM	Ongoing	Existing staff	Essential to continuing the State's effort to reduce flood losses. Enables NJOEM to appropriately prioritize its actions to mitigate repetitive loss and severe repetitive loss properties, in accordance with FEMA requirements (and potentially qualifies the State and local jurisdictions for the 90-10 federal-local match under the SRL program.	The State mitigation strategy has a focus on reducing losses to property by implementing appropriate flood mitigation activities. Keeping these lists up to date allows the State to prioritize assistance and funds.
	4.2.2 Continue working with local and regional jurisdictions to encourage their cooperation in making repetitive (and SRL) property mitigation a high priority, and to offer technical support in carrying out the requirements of FEMA mitigation programs. Specifically, the State will ensure that such jurisdictions have the most current and accurate information about SRL and RL properties.	High	NJOEM	Ongoing	Existing staff, with support from FEMA RII.	Basic requirement to initiate and sustain momentum	Initiates a long-term process to protect property from effects of repetitive flooding.
4.3 Ensure that the State obtains and maintains best available information related to risks from earthquake hazards.	4.3.1 Overlay an inventory of critical facilities with the level of seismic hazard at each location, using the USGS national seismic hazard maps and the New Jersey Geological Survey maps of seismic soil classes.	Medium	NJGS, NJOEM, potentially others	Two to five years	To be determined	Serves as first step in a long-term plan to reduce risks to the most critical State facilities.	Results in protecting both life and property.



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<b>GOAL 4 DEVELOP AND MAINTAIN AN UNDERSTANDING OF RISKS</b>							
Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
	4.3.2 Prioritize earthquake risk by conducting more detailed risk assessments of the critical facilities as they are identified, taking into account the relative importance of the facility, the level of seismic hazard a preliminary vulnerability.	Medium	NJGS, NJOEM, potentially others	Two to five years, starting after earlier phases described above.	To be determined	Serves as first step in a long-term plan to reduce risks to the most critical State facilities.	Results in protecting both life and property.
	4.3.3 Complete HAZUS loss estimation runs for the mostly likely damaging earthquakes for New Jersey, such as M5.0 or M5.5 earthquakes on the Ramapo Fault in New Jersey or on active faults in New York northeast of New Jersey, with compilation of results for all counties with significant damage from the scenario earthquakes considered.	Medium	NJGS	Estimated at three years.	Existing NJGS staff and financial resources.	Part of a larger process to identify most at-risk areas, as basis to determine where State mitigation resources can best be used henceforth.	Results in protecting both life and property.



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GOAL 4 DEVELOP AND MAINTAIN AN UNDERSTANDING OF RISKS								
Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy	
4.4 Ensure that the risks related to abandoned mines are understood and mitigated.	4.4.1 Develop a GIS database of abandoned mines based on collection of accurate locations using a Global Positioning System (GPS).	Medium	NJDEP, NJGS	Three years	FEMA and/or USGS (?) grant funds, existing State resources.	The number and distribution of mines Statewide creates widespread hazards and a range of risks to citizens and physical assets. The database will include information on the known size and depth of the mines.	Mapping is an essential first step in fully understanding risks related to abandoned mines, and in developing and prioritizing appropriate mitigation actions. Improved knowledge of the subsurface hazard locations relative to existing roads and building will assist in assigning a priority for remediation.	
4.5 Ensure that the State has an understanding of the wind risks to state owned and operated critical facilities.	4.5.1 Using a prioritized list of State facilities, conduct a survey of wind vulnerabilities, based on criteria such as age of the facility, value of operations, proximity to the coast, etc.	Medium	NJOEM, with cooperation of State agencies that own or operate the facilities	To be determined	State funds, dependent on budget priorities.	Although wind is not as significant a risk to the State as some other hazards, there are likely some State facilities that are quite vulnerable to wind hazards, and where these vulnerabilities may be relatively inexpensive to mitigate.	Basis for prioritizing actions to mitigate risk.	



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Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
4.6 Ensure that the State has an understanding of wildfire and urban interface fire risks, on a near-real-time basis.	4.6.1 Develop and implement a State database/GIS to track and archive past wildfire occurrences, as well as current conditions related to wildfire and urban interface fire risks (i.e. drought conditions, wind, fuel load, etc.)	Medium	NJFFS	Within 2 years	PDM Grant	Map of all areas of the State with the ranking of the threat from wildland fuels will assist in local and regional planning	Provides basis for Pinelands Commission and other defensible space regulations and enforcement.
4.7 Provide incentives for mitigation planning and actions.	4.7.1 Provide grants, planning tools, training and technical assistance to increase the number of public and private sector hazard mitigation plans and initiatives, especially for multi-jurisdiction districts.	High	NJOEM	Ongoing	Existing Resources, Mitigation Grant	Providing incentives and resources encourages organizations to develop hazard mitigation plans and initiatives they otherwise would not have	Expanding the number of hazard mitigation initiative will improve the state's resistance to hazards and reduce the impact of hazard events on the State's economy.
4.8 Form partnerships to leverage and share resources for mitigation.	4.8.1 Ensure the coordination of growth management plans and policies with hazard mitigation and response planning. Coordinate with the State Planning Commission to integrate the State Development and Redevelopment Plan within the SHMP.	High	NJOEM SHMT State Planning Commission NJDCA Office of Smart Growth	Ongoing	Existing State Resources	To ensure that growth plans do not conflict with hazard mitigation and response planning.	To enhance the State's coordination abilities.



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	4.8.2 Coordinate with the Casino Reinvestment Development Authority on mitigation projects.	High	NJOEM NJ Attorney General's Office CRDA	Ongoing	Existing Resources	Provide a source of additional funding for mitigation projects.	Allows for greater participation of mitigation actions throughout the state at all jurisdictional levels, thus increasing the number of completed projects.
	4.8.3 Identify and describe existing plans addressing hazard mitigation issues for review and integration into the SHMP.	Medium	NJOEM, SHMT	1 Year	Existing State resources	Develop plans for their effective use and integration with other agencies' for use of existing resources to reduce losses.	Enhances local capabilities to utilize public and private resources.

GOAL 5 ENHANCE THE CAPABILITY OF NJOEM TO CONTINUOUSLY MAKE NEW JERSEY LESS VULNERABLE TO HAZARDS							
Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
5.1 Institutionalize hazard mitigation	5.1.1 Seek funding for additional staff and resources	High	NJOEM	Commencing immediately, then ongoing	To be determined, probably State of New Jersey and FEMA.	Federal requirement. In order to maximize the utility of the plan, it must be constantly updated to include most recent information.	Basis for most of the State's decisions about mitigation actions and strategies.



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**GOAL 5 ENHANCE THE CAPABILITY OF NJOEM TO CONTINUOUSLY MAKE NEW JERSEY LESS VULNERABLE TO HAZARDS**

Objective	Action	Priority	Responsible Agency	Projected Timeline	Projected Resources	Rationale for Action and Priority	How Action Contributes to Mitigation Strategy
	5.1.2 Provide ongoing staff and resources to keep the State plan a living document.	High	NJOEM	Continuous as part of normal budget and staffing activities.	State, NJOEM.	Ensures that the plan is a current and technically accurate document.	Ensures that all aspects of the HMP are current, and enhances resources available to local and regional planners.
	5.1.3 Continuously update and enhance the State plan. Begin by incorporating recommended FEMA revisions. Institute stronger plan maintenance procedures, such as having agencies responsible for mitigation actions provide annual progress reports to the SHMO.	High	NJOEM	Commences immediately after plan update is adopted, continuous thereafter	NJOEM, FEMA	Required to ensure that the plan is a current document, and remains useful to the State, as well as to local and regional planners.	The plan is the basis for prioritizing all actions.
5.2 Improve coordination with mitigation planning partners	5.2.1	Medium	NJOEM, FEMA	Beginning immediately, ongoing.	NJOEM, FEMA, NJ counties and local jurisdictions.	Ensures that mitigation planning continues to evolve in the State, and that efforts of State, federal government and local jurisdictions are aligned.	Advances
5.3 Maximize utilization of best technology	5.3.1	Medium	State, NJOEM.	Ongoing.	Various, including NJOEM, FEMA, local and national partners.	Increases technical quality of HMP and abilities of State, local and regional planners.	Ensures that technical aspects of the plan and mitigation activities are based on best available technology and data.



## 5.4 STAPLEE Assessment of Mitigation Actions in 2008 Plan Update

Goal 1 PROTECT LIFE																								
STAPLEE Criteria		S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)			F (Environmental)					
Considerations	LEGEND: + Presents a positive impact - Presents a negative impact N Not Applicable	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/ Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/ Water	Effect on Endangered Species	Effect on HAZMAT/ Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws
		For Alternative Actions																						
1.1.1	Expand reverse 911 implementation.	+	+	+	+	+	-	-	-	+	+	+	+	+	N	+	+	+	-	N	N	N	+	+
1.1.2	Expand Flood Warning Systems (Preparedness Unit).	+	+	+	+	+	+	+	-	-	-	+	+	N	-	+	+	+	+	N	N	N	+	+
1.2.1	Encourage enforcement of Floodplain Management as it relates to new and existing construction.	+	+	+	+	+	+	+	-	-	-	+	+	N	-	+	+	+	+	N	N	N	+	+
1.2.2	Encourage adoption of regulations that include exemptions to life safety/property protection mitigation efforts in tightly regulated environmental laws.	+	+	+	+	+	+	+	-	-	-	+	+	N	-	+	+	+	+	N	N	N	+	+
1.2.3	Provide a legislative process to conduct wildland fuel reduction efforts on private properties	+	+	+	+	+	+	+	-	-	-	+	+	N	-	+	+	+	+	N	N	N	+	+
1.3.1	Encourage participation in existing programs – FMA, PDM, HMGP.	N	+	+	+	+	-	+	-	+	-	+	+	N	-	+	+	+	+	N	N	N	+	+
1.4.1	Integrate NFIP standards into the uniform construction codes utilized by the State.	+	+	+	+	+	+	-	-	+	+	+	N	N	+	+	-	+	+	+	N	+	+	+
1.5.1	Promote Community Emergency Response Team (CERT) training.	+	+	+	+	+	-	-	+	+	+	+	N	N	+	+	+	+	+	+	+	+	+	+
1.5.2	Utilize the NJOEM Training Unit to train emergency responders.	+		+	+	+	-	-	N	+	+	N	+	+	+	+	-	N	+	N	N	+	+	



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		1.5.3 Encourage educational programs (Rutgers, UMDNJ).		+	+	+	+	+	-	-	N	+	+	+	+	+	+	+	-	+	+	N	N	N
1.5.4 Ensure Incident Command System use, qualifications, and standards during all incident response and event planning.		+	+	+	+	+	-	-	-	+	N	+	+	+	N	+	-	N	-	N	N	N	+	+
1.6.1 Implement seismic retrofits for a limited number of especially critical facilities, which are especially vulnerable seismically and located in high hazard areas.		+	+	+	+	+	+	-	+	+	-	+	+	+	+	+	-	+	-	N	N	N	N	+



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**GOAL 2. PROTECT PROPERTY AND ENSURE CONTINUITY OF OPERATIONS**

STAPLEE Criteria		S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)				
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		2.1.1 Generate preliminary State critical facilities information for the NJ State Hazard Mitigation Plan (SHMP).		+	N	+	N	+	-	-	-	+	N	N	+	+	+	+	-	+	+	N	N	N
Establish comprehensive GIS-based repository for data on critical State facilities.																								
2.1.2 Prioritize structural and nonstructural retrofits for critical State owned facilities based on their vulnerability to natural hazards.		+	N	+	N	+	-	-	-	+	N	+	+	+	+	+	-	+	+	N	N	N	+	+
2.1.3 Expand State facilities risk management program.		+	N	+	N	+	-	-	-	+	N	+	+	+	+	+	-	+	+	N	N	N	+	+
2.1.4 Provide training seminars in identifying potential hazards to State bureaus responsible for rental/leasing of properties for State offices.		N	+	+	+	+	-	+	-	+	-	+	+	N	-	+	+	+	+	N	N	N	+	+
2.1.5 Conduct a survey of State agencies as the basis for identifying their most critical facilities, and use this as the basis for prioritizing vulnerability assessments and (subsequently) mitigation grant funds.		+	N	+	N	N	+	N	N	+	N	N	+	N	+	N	-	N	+	N	N	N	+	+
2.2.1 Inventory non-state owned critical assets that are vulnerable to natural hazards.		+	+	+	+	+	+	-	-	+	+	+	N	N	+	+	-	+	+	+	N	N	+	+
2.2.2 Encourage training of owners and operators of non-state owned critical facilities for hazard mitigation.		+	+	+	+	+	-	-	+	+	+	+	N	N	+	+	+	+	+	N	N	N	+	+



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For Alternative Actions 																								
		+	N	+	+	+	+	+	N	+	+	+	+	N	N	+	-	N	+	+	+	N	+	+
		+	+	+	+	+	-	-	-	+	+	+	+	+	N	+	+	+	+	-	+	N	+	+
		+	+	+	+	+	-	N	N	+	N	+	+	N	N	+	+	+	+	N	N	N	N	N
		+	+	+	+	+	-	+	+	+	N	+	+	+	+	+	+	+	+	+	N	N	+	+
		+	+	+	+	+	+	-	+	+	N	+	+	+	N	+	-	+	-	+	N	N	+	+
		-	-	+	+	+	+	+	-	+	-	-	+	N	-	+	+	+	+	+	+	N	+	+
		+	+	N	+	N	N	-	-	+	+	+	+	N	-	+	+	+	+	+	N	N	+	+



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		2.3.8 Continue State funding for federal flood control projects through annual state appropriations under the HR-6 Flood Control project budget.		+	+	+	+	+	+	-	+	+	N	+	+	N	N	+	-	N	N	+	N	N
2.3.9 Ensure enforcement of the seismic design provisions in the International Building Code for all new buildings and infrastructure in New Jersey.		+	+	+	+	N	+	+	N	+	N	+	+	+	N	+	N	+	N	N	N	N	N	+
2.4.1 Undertake cost-effective wind retrofits and upgrades of the most critical state facilities.		+	+	+	+	+	-	-	N	-	N	+	+	+	N	+	-	N	-	N	N	N	N	+
2.5.1 Use HAZUS to identify local or regional police, fire, hospital and emergency operations centers that are in FEMA-designated V and VE flood zones.		+	N	+	N	+	-	+	N	+	N	+	+	N	+	+	+	N	+	N	N	N	N	+
2.5.2 Undertake detailed vulnerability assessments and develop mitigation options for critical facilities in V and VE zones.		+	+	+	+	+	-	-	N	-	N	+	+	N	N	+	-	+	-	N	N	N	N	+
2.5.3 Initiate mitigation projects to reduce risks to critical facilities located in V and VE zones		+	+	+	+	+	-	-	N	-	N	+	+	N	N	+	-	+	-	N	N	N	N	+
2.6.2 Continue mechanical thinning and prescribed fire use to reduce hazardous wildland fuel accumulations Statewide, particularly in high-risk areas.		+	+	+	-	+	-	-	-	-	N	+	+	N	N	+	-	+	-	N	N	N	N	+
2.6.2 Encourage community acceptance and inclusion of Firewise concepts in municipal and regional planning		+	+	+	+	+	-	-	-	+	+	+	+	N	N	+	+	+	-	+	-	-	+	+



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		2.6.3 Develop and implement effective silviculture strategies that improve the health of forests and reduce the amount of fuels available for wildland fires from dead and dying trees.		-	-	-	+	+	-	-	-	+	N	+	+	+	-	+	-	+	-	+	+	+
2.6.4 Limit the number of wildfires to fewer than 2,000 annually and the acreage burned to less than 1/2 of 1% of the state forest.		+	+	+	+	+	-	-	-	+	N	+	+	N	N	+	-	+	-	+	+	N	+	N
2.7.1 Update and maintain continuity of government - continuity of operations plans to enable the state government to provide critical services during an interruption of business.		+	N	+	+	+	-	-	N	+	N	+	+	N	N	+	-	N	+	N	N	N	+	+



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**GOAL 3. INCREASE PUBLIC PREPAREDNESS**

STAPLEE Criteria		S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)		E (Economic)				E (Environmental)							
		Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/ Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic	Outside Funding Required	Effect on Land/ Water	Effect on Endangered Species	Effect on HAZMAT/ Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws		
Considerations For Alternative Actions 	<b>LEGEND:</b> + Presents a positive impact - Presents a negative impact N Not Applicable	3.1.1 Educate the public through NJOEM outreach programs and hazard mitigation workshops.	+	+	+	+	+	-	-	-	+	+	+	+	N	N	+	+	+	-	+	-	-	+	+	
		3.1.2 Participate in the Emergency Preparedness Conference with workshops.	+	+	+	+	+	+	-	+	+	+	+	+	N	N	+	+	+	-	N	N	N	N	N	+
		3.1.3 Promote continuing education of state and local officials through Rutgers programs.	+	+	+	+	+	+	-	+	+	N	+	+	N	N	+	-	+	-	N	N	N	N	N	+
		3.2.1 Incorporate existing HAZUS /NYCEM earthquake studies into the SHMP and indicate completion schedule for other counties	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	-	+	N	N	N	N	+
		3.2.2 Incorporate additional profiling and vulnerability information recommended by FEMA into the SHMP.	+	+	+	+	-	-	+	+	+	N	+	+	N	+	+	-	+	-	+	+	+	+	+	+
		3.2.3 Develop a hazard event GIS database to help State and local emergency managers with hazard mitigation and other planning initiatives.	+	+	+	+	+	-	-	-	+	+	+	+	+	N	+	+	+	-	+	+	+	+	+	+
		3.2.4 Expand and enhance GIS/HAZUS hazard mitigation databases and use for analysis and mapping in the SHMP.	+	+	+	+	+	-	+	+	+	N	+	+	N	-	+	+	+	+	+	N	N	N	N	+
		3.2.5 Develop state hazard profiles for manmade and technological hazards.	+	+	+	+	+	-	-	-	+	+	+	+	+	N	+	+	+	-	+	+	+	+	+	+



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STAPLEE Criteria		S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)				
Considerations		Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/ Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic	Outside Funding Required	Effect on Land/ Water	Effect on Endangered Species	Effect on HAZMAT/ Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws
For Alternative Actions 	<b>LEGEND:</b> + Presents a positive impact - Presents a negative impact N Not Applicable																							
3.3.1 Develop a cadre of supplemental staff to assist NJOEM with education of affected communities, project assessment and development of mitigation projects. This staff may be comprised of volunteers, temporary reservists, and permanent personnel.		+	+	+	+	+	+	-	-	+	+	+	+	+	N	+	+	+	+	N	N	N	N	+
3.4.1 Conduct community outreach, workshops and training opportunities to promote development of PDM plans.		+	+	+	+	+	+	-	-	+	+	-	+	N	N	+	-	+	-	+	N	N	+	+
3.4.2 Increase NJOEM staffing in areas of planning, engineering and management.		+	+	+	+	+	+	-	-	+	+	+	+	N	N	+	-	+	-	+	N	N	+	+
3.4.3 Revise the SHMP and post it on the web so it is more useable to the public and to local governments developing local mitigation plans.		+	+	+	-	+	N	N	+	+	N	+	+	N	N	+	+	+	N	+	+	+	+	+
3.4.4 Develop and maintain local government mitigation planning assistance/coordination web page.		+	+	+	+	+	-	-	-	+	N	+	+	N	N	+	+	+	-	N	N	N	+	+
3.4.5 Ensure that each municipality and county develops a wildfire preparedness plan for incorporation into their local and county emergency management plans.		+	+	+	+	N	-	-	-	+	N	+	+	N	N	+	N	+	-	+	+	+	+	+
3.5.1 Enhance public education and outreach efforts to increase awareness of earthquake hazards and risk in New Jersey.		+	+	+	-	+	-	-	N	+	N	+	+	N	N	+	+	N	+	N	N	N	N	+



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**GOAL 3. INCREASE PUBLIC PREPAREDNESS**

STAPLEE Criteria		S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)				
Considerations	LEGEND: + Presents a positive impact - Presents a negative impact N Not Applicable	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/ Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic	Outside Funding Required	Effect on Land/ Water	Effect on Endangered Species	Effect on HAZMAT/ Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws
3.6.1 Encourage the NJ League of Municipalities to become more involved in mitigation activities.		+	+	+	-	+	-	-	N	+	N	+	+	N	N	+	+	N	+	N	N	N	N	+



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<b>GOAL 4 DEVELOP AND MAINTAIN AN UNDERSTANDING OF RISKS</b>																								
STAPLEE Criteria		S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)		E (Economic)			E (Environmental)						
Considerations	LEGEND: + Presents a positive impact - Presents a negative impact N Not Applicable	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/ Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic	Outside Funding Required	Effect on Land/ Water	Effect on Endangered Species	Effect on HAZMAT/ Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws
For Alternative Actions 																								
4.1.1 Compile a GIS-based inventory of critical facilities Statewide (State-, local-, and privately-owned), including fire and police stations, major medical facilities, major public buildings important for emergency response and recovery, and critical lifeline transportation and utility nodes such as major bridges, water treatment plants, wastewater treatment plants and high voltage electric substations.		+	N	+	-	+	-	-	N	+	N	+	+	N	+	+	-	-	-	N	N	N	+	+
4.2.1 Continuously update repetitive loss and severe repetitive loss lists from the NFIP.		+	N	+	N	+	-	+	+	+	N	+	+	N	N	+	-	+	-	N	N	N	+	+
4.2.2 Continue working with local and regional jurisdictions to encourage their cooperation in making repetitive (and SRL) property mitigation a high priority, and to offer technical support in carrying out the requirements of FEMA mitigation programs. Specifically, the State will ensure that such jurisdictions have the most current and accurate information about SRL and RL properties.		+	+	+	+	+	-	-	N	+	N	+	+	+	N	+	-	N	+	N	N	N	+	+



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GOAL 4 DEVELOP AND MAINTAIN AN UNDERSTANDING OF RISKS																								
STAPLEE Criteria		S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)			E (Environmental)					
Considerations	LEGEND: + Presents a positive impact - Presents a negative impact N Not Applicable	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/ Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic	Outside Funding Required	Effect on Land/ Water	Effect on Endangered Species	Effect on HAZMAT/ Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws
4.3.1 Overlay an inventory of critical facilities with the level of seismic hazard at each location, using the USGS national seismic hazard maps and the New Jersey Geological Survey maps of seismic soil classes.		+	N	+	-	+	-	-	N	+	N	+	+	N	N	+	+	N	+	N	N	N	+	+
4.3.2 Prioritize earthquake risk by conducting more detailed risk assessments of the critical facilities as they are identified, taking into account the relative importance of the facility, the level of seismic hazard a preliminary vulnerability.		+	N	+	N	+	+	-	N	+	N	+	+	N	N	+	+	N	+	N	N	N	+	+
4.3.3 Complete HAZUS loss estimation runs for the mostly likely damaging earthquakes for New Jersey, such as M5.0 or M5.5 earthquakes on the Ramapo Fault in New Jersey or on active faults in New York northeast of New Jersey, with compilation of results for all counties with significant damage from the scenario earthquakes considered.		+	N	+	N	+	+	-	N	+	N	+	+	N	N	+	+	N	+	N	N	N	+	+
4.4.1 Develop a GIS database of abandoned mines based on collection of accurate locations using a Global Positioning System (GPS).		+	N	+	N	+	-	-	N	+	N	+	+	N	N	+	-	N	-	N	N	+	+	N



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<b>GOAL 4 DEVELOP AND MAINTAIN AN UNDERSTANDING OF RISKS</b>																								
STAPLEE Criteria		S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)			E (Environmental)					
Considerations	LEGEND: + Presents a positive impact - Presents a negative impact N Not Applicable	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocation	Maintenance/ Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic	Outside Funding Required	Effect on Land/ Water	Effect on Endangered Species	Effect on HAZMAT/ Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws
For Alternative Actions 																								
4.5.1 Using a prioritized list of State facilities, conduct a survey of wind vulnerabilities, based on criteria such as age of the facility, value of operations, proximity to the coast, etc.		+	+	+	N	+	-	-	N	+	+	N	+	N	+	+	-	N	+	N	N	N	+	+
4.6 Ensure that the State has an understanding of wildfire and urban interface fire risks, on a near-real-time basis.		+	+	+	N	+	-	-	N	+	+	N	+	N	+	+	-	N	+	N	N	N	+	+
4.7.1 Provide grants, planning tools, training and technical assistance to increase the number of public and private sector hazard mitigation plans and initiatives, especially for multi-jurisdiction districts.		+	+	+	N	+	-	+	N	+	+	+	+	+	+	-	N	-	N	N	N	N	+	+
4.8.1 Ensure the coordination of growth management plans and policies with hazard mitigation and response planning. Coordinate with the State Planning Commission to integrate the State Development and Redevelopment Plan within the SHMP.		+	N	+	+	+	-	-	N	+	N	+	+	N	+	+	-	+	+	N	N	N	+	+
4.8.2 Coordinate with the Casino Reinvestment Development Authority on mitigation projects.		+	N	+	+	+	-	N	N	+	+	+	+	+	-	+	+	+	+	N	N	N	+	+
4.8.3 Identify and describe existing plans addressing hazard mitigation issues for review and integration into the SHMP.		+	N	+	-	+	+	N	N	+	N	+	+	+	+	+	+	-	+	N	N	N	+	+



## 5.5 Evaluation of State Progress on Goals and Actions from the 2005 Plan

### Goal 1 Protect Life (from original)

<b>Protect Life Objective</b>	<b>Action</b>	<b>Priority</b>	<b>Interim Progress</b>	<b>Future Actions</b>
1.1 Improve warning and emergency communications systems.	1.1.1 Expand reverse 911 implementation.	High	Complete: The State has a reverse 911 call system in place. Actual emergency activation has proven the system to be effective and viable	No additional action indicated except to continue maintaining, upgrading and operating the system to maximize its efficiency.
	1.1.2 Expand Flood Warning Systems (Preparedness Unit).	High	The state utilizes a warning system consisting of water level and flow gauges and rainfall collection points that primarily covers two riverine systems. A statewide tide telemetry system services 15 of 21 counties.  Tide Telemetry System (Bergen County to Cape May, then to Trenton) is currently under emergency funding from NJOEM (50/50 share with USGS).	The continuing effort for expansion is primarily through the State Climatologist. Funding is from NJOEM, Army Corps and NOAA. The goal of the program is to eventually provide river gauge and telemetry coverage for the entire state. Funding availability greatly impacts the speed of progress within this effort.
1.2 Effectively address laws and regulations that address hazard mitigation issues.	1.2.1 Encourage enforcement of Flood Plain Management as it relates to new and existing construction.	High	State Hazard Mitigation Team has an ongoing mission to use floodplain management as a central tool in mitigating hazards.	Formation of a sub-working group within the State Hazard Mitigation Team will occur between January and March of 2008. The mandate for this group will be to facilitate, coordinate and guide collaborative hazard mitigation efforts between State Agencies as well as non-State entities.



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<b>Protect Life</b>				
<b>Objective</b>	<b>Action</b>	<b>Priority</b>	<b>Interim Progress</b>	<b>Future Actions</b>
1.3 Reduce impacts of hazards on vulnerable populations.	1.3.1 Encourage participation in existing programs – FMA, PDM, HMGP.	High	The State has implemented a range of mitigation activities that are intended to accomplish this goal. These activities include acquisitions, elevations and facilitating funding of mitigation planning grants that will cover the entire state within about two years.	The risk and vulnerability sections of this plan will help the State identify the jurisdictions that are most vulnerable to natural hazards, and to develop and prioritize appropriate actions to reduce losses. New Jersey intends to remain very actively involved in the mitigation planning process through direct assistance to grantees, and by reviewing documents as they are developed. In addition to this, the State intends to continue developing its capabilities to identify and facilitate mitigation projects and policy changes to reduce risks.
1.4 Strengthen State and local building code enforcement.	1.4.1 Integrate NFIP standards into the uniform construction codes utilized by the State.	High	In 2005 and 2006 FEMA's Rich Einhorn & DEP provided educational sessions for construction code officials through the Department of Community Affairs Division of Codes and Standards continuing education seminar series & the Building Safety Week conference. DCA also invited ASFPM's Cleighton Smith to give training on the CFM program.	Formation of a sub-working group within the State Hazard Mitigation Team will occur between January and March of 2008. The mandate for this group will be to facilitate, coordinate and guide collaborative hazard mitigation efforts between State Agencies as well as non-State entities.
1.5 Train emergency responders.	1.5.1 Promote Community Emergency Response Team (CERT) training.	Medium	New Jersey continues to have one of the strongest CERT programs in the nation. The NJOEM Support Services Unit as well as the Training Unit play an integral part in maintaining the CERT Program.	This program is anticipated to continue as it is.



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<b>Protect Life Objective</b>	<b>Action</b>	<b>Priority</b>	<b>Interim Progress</b>	<b>Future Actions</b>
	1.5.2 Utilize the NJOEM Training Unit to train emergency responders.	Medium	The NJOEM Training Unit provides training to personnel from government and private industry on a variety of FEMA courses in an effort to better prepare them to deal with natural, manmade and technological emergencies. This training covers the four concepts of Emergency management to include Preparedness, Mitigation, Response and Recovery activities.	The State intends to maintain its focus on effective training for emergency responders.
	1.5.3 Encourage educational programs (Rutgers, UMDNJ).	Medium	The loss of 2 staff without replacement has greatly impacted on the Preparedness Units ability to conduct outreach. Instructional commitments with the University are being met. Some of the general outreach programs have been curtailed. Coordinated outreach has continued at the county level in conjunction with the counties. Additional staff is anticipated.	Prior levels of activity are expected to be attained in the first half of 2008.



## Goal 2 Protect Property (from original)

Protect Property Objective	Action	Priority	Interim Progress	Future Actions
2.1 Protect critical State facility assets.	2.1.1 Generate preliminary State critical facilities information for the NJ State Hazard Mitigation Plan (SHMP).	Highest	NJ OMB maintains a data directory of state owned facilities known as LBAM. NJOEM has coordinated an effort to provide greater access to this program.	In October of 2007 some very limited data became available for the first time and will be incorporated into the 2008 State Hazard Mitigation Plan update. Additionally, NJOEM intends to seek additional planning grant funds in FY 2008 to further develop this information in the context of hazard mitigation planning.
	2.1.2 Prioritize structural and nonstructural retrofits for critical State owned facilities based on their vulnerability to natural hazards.	High	The State is still formulating initial activities related to this action. NJOEM submitted a FEMA grant application in 2007 for a mitigation project to reduce flooding at the state garage in Trenton.	NJOEM anticipates the imminent submission of the first projects dealing with state facilities. Any submitted project applications that are deemed acceptable via the evaluation process will be considered in the FY2008 PDM-C funding cycle. NJOEM intends to bring this action to the attention of the SHMT in a future meeting of the group, to determine what specific courses of action may be indicated.
	2.1.3 Expand State facilities risk management program.	High	There has been limited progress on this action due to a lack of staffing and resources at the State level.	The State intends to move forward on this action to the extent that staff resources and funding permit.
	2.1.4 Provide training seminars in identifying potential hazards to State bureaus responsible for rental/leasing of properties for State offices.	Medium	There has been limited progress on this action due to a lack of staffing and resources at the State level.	



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Protect Property Objective	Action	Priority	Interim Progress	Future Actions
2.2 Protect critical non-state owned facility assets.	2.2.1 Inventory non-state owned critical assets that are vulnerable to natural hazards.	High	The Preparedness Bureau has been engaged in an ongoing effort to inventory critical assets, but because much of the data is sensitive in nature, it cannot be directly used by other organizations. As noted in 'Future Actions', NJOEM intends to use the local hazard mitigation plans as the starting point for this inventory, and will remain engaged with local planners to ensure that appropriate information is provided.	As local multi-jurisdictional plans are developed, non-state owned critical facilities will be identified and assessed. Each facility will be considered within the regular evaluation process for further mitigation actions. Local plan completion schedule: Burlington Co. Dec 2007, Essex Co. March 2008, Hudson Co. March 2008, Somerset Co. August 2008, Monmouth Co. August 2008, S. Regional 4 Co. December 2009, Atlantic Co. November 2009, Cape May Co. December 2009, Middlesex Co. November 2009, Morris Co. March 2010, Passaic Co. July 2009, Union Co. May 2009.
	2.2.2 Encourage training of owners and operators of non-state owned critical facilities for hazard mitigation.	High	The State has conducted workshops on disaster- and mitigation-related programs, but budget and staffing constraints have limited these efforts to some degree.	The State will continue these efforts within the limitations of funds and staffing.
2.3 Reduce repetitive losses.	2.3.1 Inventory damaged structures.	High	As part of the 2007/08 State plan update, NJOEM has obtained detailed records of both repetitive loss and severe repetitive loss properties across New Jersey. This is the best possible information to support mitigation activities because it provides both the locations of the properties, but also detailed loss histories that can be used for risk assessment and prioritizing additional actions.	The reduction of repetitive loss properties continues within the limited communities eligible for program funds. As the county level multi-jurisdictional plans are adopted, NJOEM anticipates a sharp increase in requested funding. As of November of 2007, NJOEM was managing over \$27 million in plan development and projects. The State will endeavor to maintain the most current records possible on repetitive loss and severe repetitive loss structures Statewide, and will make this information available to local planners.



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Protect Property Objective	Action	Priority	Interim Progress	Future Actions
	2.3.2 Conduct yearly FMA workshops.	High		Every year prior to FMA program fund release, NJOEM conducts a series of FMA oriented workshops for any interested entities. Workshops are conducted upon request as well. Program rollouts are conducted in conjunction with any other programs as a result of disaster or program funding cycles opening. Workshops are held at the NJ Emergency Managers Conference yearly
	2.3.3 Promote acquisition and elevation of repetitive loss structures.	High	Even with limited community eligibility, Over \$20 million has been spent in reducing repetitive loss properties. NJOEM has worked closely with NJDEP to maximize the use of mitigation funds to complete elevations and buyouts.	NJOEM remains committed in prioritizing the reduction of SRL properties. Repetitive loss structure reduction remains the focus of every outreach, workshop, or activity that members of the Mitigation Unit participate in. Appendix G of this plan identifies specific strategies related to severe repetitive loss properties. The State intends to maintain and increase its current efforts to find synergies between FEMA grant programs and State programs such as <i>Green Acres</i> .
	2.3.4 Conduct community outreach, workshops and training to increase NFIP participation.	High	NJDEP has held workshops between 2005 and 2008, including most recently a presentation to building officials in Essex County.	NJDEP is the lead agency with regard to the NFIP. NJDEP's goal is to hold at least four workshops annually. NJOEM and NJDEP are working towards better coordination of effort in reaching the appropriate target audiences concerning NFIP related subject matter.



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	2.3.5 Regulate development to reduce flood losses in vulnerable coastal areas.	High	New Jersey's Coastal Zone Management Rules (N.J.A.C. 7:7E) include the standards for development in coastal areas. The Special Areas of concern that are codified in these rules include Overwash Areas, Coastal High Hazard Areas, Erosion Hazard Areas, Barrier Island Corridor, Bay Islands, Beaches, Filled Water's Edge, Existing Lagoon Edges, Flood Hazard Areas, Riparian Zones, Wetlands, Wetlands Buffers, Coastal Bluffs. To ensure appropriate manipulation or beaches, protection of dunes and proper construction of boardwalks we have adopted Standards Applicable to Routine Beach Maintenance, Standards Applicable to Emergency Post-Storm Beach Restoration, Standards Applicable to Dune Creation and Maintenance Standards Applicable to Construction of Boardwalks. Stormwater Management Rules (N.J.A.C. 7:8) have been adopted that apply to the coastal zone and require a buffer up to 300 feet wide along Category One water.	NJDEP is presently working toward re-adoption of coastal zone management laws at the State level – the current regulations sunset in August, 2009. The Agency recently (early 2008) held the first meeting to solicit input from the public.
	2.3.6 Replenish NJDEP acquisition fund to promote more acquisition of repetitive loss and severe repetitive loss structures.	Medium	Referendum passed in Fall 2007 for one-year funding for Green Acres program. Blue Acres component received \$12M.	2008 funding depends on action by NJ State legislature.



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<b>Protect Property Objective</b>	<b>Action</b>	<b>Priority</b>	<b>Interim Progress</b>	<b>Future Actions</b>
	2.3.7 Continue NJDEP Green Acres, Blue Acres and Flood Control acquisition funds to promote more acquisition of repetitive loss and severe repetitive loss structures.	Medium	The Blue Acres bond described in the attachment was approved by NJ voters in Nov. 2007. NJOEM met in December 2007 with members of NJDEP Green Acres Program and the Environmental Infrastructure Trust to discuss how we can coordinate SRL applications with bond fund recipients to better leverage available funding sources. The meeting attendees will participate on the bond fund steering committee.	Continue this effort, as it has been successful in promoting mitigation.



**Goal 3 Promote a Sustainable Economy (from original)**

<b>Interim Progress</b>	<b>Future Actions</b>	<b>Priority</b>	<b>Interim Progress</b>	<b>Future Actions</b>
3.1 Provide incentives for mitigation planning and actions.	3.1.1 Provide grants, planning tools, training and technical assistance to increase the number of public and private sector hazard mitigation plans and initiatives, especially for multi-jurisdiction districts.	Medium	No significant movement to meet this goal.	3.1 Provide incentives for mitigation planning and actions.
3.2 Form partnerships to leverage and share resources for mitigation.	3.2.1 Ensure the coordination of growth management plans and policies with hazard mitigation and response planning. Coordinate with the State Planning Commission to integrate the State Development and Redevelopment Plan within the SHMP.	Medium	No significant movement to meet this goal.	3.2 Form partnerships to leverage and share resources for mitigation.
	3.2.2 Coordinate with the Casino Reinvestment Development Authority on mitigation projects.	Medium	No significant movement to meet this goal.	
	3.2.3 Identify and describe existing plans addressing hazard mitigation issues for review and integration into the SHMP.	Medium	No significant movement to meet this goal.	



Goal 4 Protect the Environment (from original)

Interim Progress	Future Actions	Priority	Interim Progress	Future Actions
4.1 Implement hazard mitigation policies to protect the environment.	4.1.1 Develop and implement effective silviculture strategies that improve the health of forests and reduce the amount of fuels available for wildland fires from dead and dying trees.	Medium	No significant movement to meet this goal.	The Forest Fire Service has applied through an HMGP grant to complete the collection of data and create a data base of historical events and current trends. This data base will be utilized to help guide future mitigation efforts as well as a resource for local governments use.
	4.1.2 Limit the number of wildfires to fewer than 2,000 annually and the acreage burned to less than 1/2 of 1% of the state forest.	Medium	No significant movement to meet this goal.	The Forest Fire Service has applied through an HMGP grant to complete the collection of data and create a data base of historical events and current trends. This data base will be utilized to help guide future mitigation efforts as well as a resource for local governments use.
	4.1.3 Analyze municipalities' dune systems to identify weaknesses from such aspects as lack of vegetation, storm surge overtopping and over-wash, and walk-through vulnerabilities.	Medium	No significant movement to meet this goal.	The Forest Fire Service has applied through an HMGP grant to complete the collection of data and create a data base of historical events and current trends. This data base will be utilized to help guide future mitigation efforts as well as a resource for local governments use.



## Goal 5 Increase Public Preparedness (from original)

Increase Public Preparedness Objective	Action	Priority	Interim Progress	Future Actions
5.1 Improve public awareness and preparedness for natural hazards and the risks they pose.	5.1.1 Educate the public through NJOEM outreach programs and hazard mitigation workshops.	High	FEMA currently provides four avenues for funding mitigation activities. Flood mitigation Assistance (FMA), Pre Disaster Mitigation-Competitive (PDM-C), Hazard mitigation Grant Program (HMGP), and Repetitive Flood Claims (RFC). A 5th funding program, Severe Repetitive Loss (SRL), will be opening sometime in early 2008. Prior to each funding stream opening, a series of outreach workshops are initiated in targeted areas and anywhere requested. HMGP driven outreach and workshops are conducted within all of the affected areas as well as targeted non affected areas	NJOEM will continue to conduct workshops in relation to the availability of grant funds, when staffing and funds are available for this purpose.
	5.1.2 Participate in the Emergency Preparedness Conference with workshops.	High	Program overview workshops are conducted by Mitigation personnel at each annual Emergency Preparedness Conference	The State will participate in such activities contingent upon staffing and funding availability. The State is participating in such a workshop the first week of May, 2008, in Atlantic City.
	5.1.3 Promote continuing education of state and local officials through Rutgers programs.	Medium	The NJOEM Field Training Unit conducts classes twice yearly through Rutgers University. Mitigation personnel are part of this course of instruction	The State has not determined if this action will remain a priority. If it does, any activities will be contingent upon staffing and funds
5.2 Improve hazard Information data bases and maps.	5.2.1 Incorporate existing HAZUS /NYCEM earthquake studies into the SHMP and indicate completion schedule for other counties	Highest	The 2008 version of the State plan includes limited HAZUS calculations in the hazard identification section.	The State will continue to incorporate technical information about earthquakes as it becomes available. Some of the local plans may include useful data and more detailed studies; if this is the case, the State will merge it into the State plan as appropriate.



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Increase Public Preparedness Objective	Action	Priority	Interim Progress	Future Actions
	5.2.2 Incorporate additional profiling and vulnerability information recommended by FEMA into the SHMP.	High	The State has incorporated extensive and newly-developed profiling and vulnerability information into the HMP update.	NJOEM will continue
	5.2.3 Develop a hazard event GIS database to help State and local emergency managers with hazard mitigation and other planning initiatives.	High	There has been limited progress on this action due to constraints on staffing and funding.	NJOEM intends to pursue this action, contingent upon staffing and funds availability. Development of local and regional hazard mitigation plans may offer an opportunity to begin a scoping process to determine needs and what type of product would best suit the purposes of the State and local planners during future updates.
	5.2.4 Expand and enhance GIS/HAZUS hazard mitigation databases and use for analysis and mapping in the SHMP.	High	The 2008 HMP update includes various data sets that were either calculated by or extracted from HAZUS.	The State will continue this effort, contingent upon funding. NJOEM will encourage local and regional planners to use GIS and HAZUS information in developing county and regional plans, and will provide the technical data it has developed as part of the State HMP update process.
	5.2.5 Develop state hazard profiles for manmade and technological hazards.	High	There has been limited progress on this action because of constraints on staffing and funding.	NJOEM intends to pursue a federal grant for this purpose, and to introduce a manmade and technological hazard section into the next HMP update.
5.3 Enhance community outreach.	5.3.1 Develop a cadre of supplemental staff to assist NJOEM with education of affected communities, project assessment and development of mitigation projects. This staff may be comprised of volunteers, temporary reservists, and permanent personnel.	High	No movement on this objective. As long as the budgetary constraints remain as they are, no forward movement will be realized	NJOEM intends to maintain this as a priority, but staffing and budgetary constraints are expected to limit progress in the immediate future.



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<b>Increase Public Preparedness Objective</b>	<b>Action</b>	<b>Priority</b>	<b>Interim Progress</b>	<b>Future Actions</b>
5.4 Increase development of local mitigation planning.	5.4.1 Conduct community outreach, workshops and training opportunities to promote development of PDM plans.	High	Over the last year or so, NJOEM made securing planning grants a top priority, with the result that every County in the State is now developing a mitigation plan, either individually, or as part of a regional effort.	The State intends to continue its efforts to promote mitigation planning, and will provide support to Counties and regional planners as mitigation plans are developed in 2008 and 2009.
	5.4.2 Increase NJOEM staffing in areas of planning, engineering and management.	High	There has been limited progress in this area because of budgetary limitations.	NJOEM intends to continue seeking funding to advance this action, but the outcome is uncertain because of known budgetary limitations at the State level.
	5.4.3 Revise the SHMP and post it on the web so it is more useable to the public and to local governments developing local mitigation plans.	Highest	As part of the plan development process, the State posted the HMP on three web sites.	When the State HMP is completed and adopted, NJOEM will ensure that it is posted on various web sites, or that links are provided to the NJOEM site.



## Recent Progress on Other State Mitigation Actions

### January 2008 NJDEP Flood Update – Delaware River

The following represents a summary of some of the initiatives of the Report on Delaware River Flood Mitigation that are currently being undertaken by the NJDEP.

#### 1. Updated Flood Hazard Area Control Act Rules

On November 5, 2007, the NJ Department of Environmental Protection adopted new Flood Hazard Area Control Act rules (N.J.A.C. 7:13), which incorporate more stringent standards for development in flood hazard areas and riparian zones adjacent to surface waters throughout the State. The Department has adopted these new rules in order to better protect the public from the hazards of flooding, preserve the quality of surface waters, and protect the wildlife and vegetation that exist within and depend upon such areas for sustenance and habitat.

In order to minimize the impacts of development on flooding, a 0% net-fill requirement (which was previously implemented only in the Highlands Preservation Area and Central Passaic Basin) will now apply to all non-tidal flood hazard areas of the State. The new rules also expand the preservation of near-stream vegetation (previously protected within 25 or 50 feet of streams) by implementing new riparian zones that are 50, 150 or 300 feet in width along each side of surface waters throughout the State. The riparian zone width depends on the environmental resources being protected, with the most protective 300-ft riparian zone applicable to waters designated as Category One and certain upstream tributaries. Certain waters supporting trout, or habitats of threatened or endangered species critically dependant on the watercourse to survive, or watercourses which flow through areas that contain acid-producing soil deposits, receive a 150-ft riparian zone.

Some of the other highlights of the new rule include allowing the use of Federal flood mapping in communities where no State flood mapping is available, and providing a simplified method to approximate flood depths in communities where no State or Federal flood mapping is available; requiring floor elevations and roadway surfaces to be set at least one foot above the State's flood hazard area design flood elevation in order to provide increased flood protection for buildings and public roadways; creating 46 permits-by-rule and 16 general permits to both facilitate and encourage projects that have no adverse impact on flooding and the environment, including a permit-by-rule for elevating homes, which requires no prior NJDEP approval, and a free, expedited general permit for the reconstruction and elevation of homes damaged by flooding; and Amending the Coastal Permit Program rules (N.J.A.C. 7:7) and Coastal Zone Management rules (N.J.A.C. 7:7E) to incorporate equivalent flood protection and stream buffers to all waters and flood hazard areas Statewide.

#### 2. Updated Floodplain Study & Mapping Delineation

The NJDEP has set aside \$1,000,000 to begin the preparation of new floodplain delineations and associated mapping for the main stem of the Delaware River. On May 16, 2006, the NJDEP executed a Collaborative Technical Partnership (CTP) agreement with the Federal Emergency Management Agency (FEMA) in order to leverage NJDEP funding with the current federal Flood Map Modernization Program resources. FEMA will also be contributing an additional \$2,500,000 dollars towards completion of this effort.

The NJDEP has also coordinated with USGS and FEMA on the development of updated hydrologic information for the main stem of the Delaware River. On May 2007, the USGS recommended flood magnitude and frequencies for the 8 gaging stations along the main stem Delaware River in New Jersey, New York, and Pennsylvania. These figures were developed by Bob Schopp, USGS NJ Water Science Center and Gary Firda, USGS NY Water Science



Center. These figures were developed in consultation with the U.S Army Corps of Engineers Philadelphia District, FEMA Regions II and III, NJDEP-State NFIP Coordinator's Office and DRBC. USGS plans to post a web-based report documenting the assumptions that were made in determining these discharges.

Medina Consultants, the flood mapping contractor, is currently in the process of performing field surveys of river cross-sections along a 126 miles reach of the main stem of the Delaware River. In addition, various stages of LiDAR acquisitions are planned for the four counties along the Delaware River. The surveyed river cross-sections, the LiDAR information and the updated hydrology will be incorporated into updated hydraulic modeling for preparation of the new mapping. This state of the art new mapping will be a valuable resource during times of emergency and for the regulation of land use along the floodplain area. The goal of this mapping effort is to more accurately define the limits of the flood hazard area and associated base flood elevation.

### **3. Flood Mitigation Feasibility Study**

The NJDEP has committed funding to be cost shared with the US Army Corps of Engineers (USACE) for the preparation of a feasibility study to evaluate possible flood mitigation options, including flood-proofing and removing or relocating structures within the floodplain of the Mid-Delaware River Basin. The Feasibility Cost Share Agreement between NJDEP and the USACE was signed on July 27, 2006. The NJDEP and USACE have met with Delaware River town residents and local officials to perform visual inspections and gather information on the 2004, 2005 and 2006 flooding. NJ continues to provide cost-share funding and the USACE continues to move forward on the study.

### **4. Upgrades to USGS Streamgaging Program**

The NJDEP has committed funding for the upgrade, replacement, and addition of streamgages along the Delaware River. On June 9, 2006, the NJDEP signed a joint funding agreement with the United States Geological Survey (USGS) to provide various upgrades to streamgaging programs in NJ. Along the Delaware River, the scope of work includes the addition of high-data rate satellite transmitters to provide better aerial data coverage on a real-time basis and to develop flood data for use in design of flood control measures, major gage repairs in order to improve streamflow data accuracy, and the addition of raingages to aid the National Weather Service (NWS) in flood-forecasting and refinement of their radar estimates of precipitation.

To date, major gage repairs and upgrades have been accomplished to the existing gages at the Delaware River at Montague, Riegelsville, and Trenton. In addition, a radar stage gage has been installed and a tipping-bucket rain gage has been re-installed at the Delaware River at Stockton and a radar stage and rain gage has been installed at the Delaware River at Lambertville.

### **1. Multi-Jurisdictional Flood Mitigation Plan**

FEMA has awarded the Delaware River Basin Commission (DRBC) a grant under the Flood Mitigation Assistance program for the preparation of a multi-jurisdictional Flood Mitigation Plan (FMP) for 64 municipalities located within Sussex, Warren, Hunterdon and Mercer Counties that have boundaries either partially or entirely within the Delaware River drainage basin.

NJDEP has provided cost share funding for the FEMA grant. *NJOEM, NJDEP, and the DRBC will lead this effort to develop the FMP, which will be part of future All-Hazard Mitigation Plans.* NJOEM, NJDEP, and DRBC have held kick-off, planning, and technical assistance meetings with county and municipal representatives in order to engage local community participation. Local involvement in the planning process is crucial for the identification of



critical facilities, flood-prone areas, community goals and desired local mitigation actions for the successful development of a FMP.

NJOEM, NJDEP, and DRBC continue to work with local municipalities on the goal of completing the plan by early 2008. This plan would provide the four counties with a valuable asset that could be incorporated into a future All-Hazards Plan.

#### **6. Updated State Hazard Mitigation Plan**

Representatives from a number of NJDEP programs, including the State NFIP Coordinator's Office, actively participate in NJOEM planning and technical meetings under the State Hazard Mitigation Team. We have implemented new processes and partnerships to address issues that FEMA raises regarding the current state plan. NJDEP is currently participating in a core work group to support NJOEM with their FEMA required three year update to the current state plan. NJDEP also supports future effort that would earn the state an enhanced classification and increase the mitigation grant funding that is available for hazard mitigation projects from 7.5% to 20%.

#### **7. Develop a Flood Analysis Modeling Tool**

The NJDEP has committed funding to the DRBC for development of a flood analysis model. This model will allow the evaluation of existing reservoirs for flood mitigation purposes by providing data to evaluate the effects of various reservoir operating alternatives on flooding at locations downstream of the reservoirs. The scope of work for this project has been finalized and USGS has signed an agreement with DRBC on June 20, 2007. Development of the model will be by a multi-agency project team which will include participation of the National Weather Service (NWS), the USACE, and USGS. The flood analysis model is scheduled to be completed within eighteen months, or in January 2009.

#### **8. Blue Acres Program for New Jersey**

Governor Corzine signed into law the "Green Acres, Farmland, Blue Acres, and Historic Preservation Bond Act of 2007" which was presented to the voters and approved at the November 2007 election. The bond act will provide \$12,000,000 for the state to acquire, for recreation and conservation purposes, lands in the floodway of the Delaware River, Passaic River, and Raritan River, and their respective tributaries, that have been damaged by, or may be prone to incurring damage caused by storm-related flooding or that may buffer or protect lands from such damage.

### **Shore Protection Program Projects**

Below are all the state-local shore protection projects that the NJDEP, Bureau of Shore Protection has completed or is currently working on since FY03:

#### **FY03**

Deal Lake Roadway Bulkhead (Loch Arbour)  
Stockton Lake Bulkhead (State Police Camp/DoD, Sea Girt)  
Fletcher Lake Outfall (Bradley Beach/Ocean Grove)  
Spring Lake Pool Club Intake Pipes  
Neptune Township Fishing Pier  
Sea Isle City Beachfill  
Old Bridge Groin



Port Republic Bulkhead  
Brigantine Beachfill

#### **FY04**

City of Wildwood Bulkhead Replacements  
Brooklawn Borough Shoreline Stabilization  
Longport Borough Stone Revetment 17th to 22nd Streets  
Stone Harbor Borough Bulkhead Replacements  
Seaside Heights Borough Bulkhead and Revetment  
Wildwood Crest Borough Sunset Lake Bulkhead  
West Wildwood Borough Bulkhead Replacements  
Pennsville Bulkhead Phase 2  
Rumson Borough Grant Avenue  
Fortesque Phase II Bulkhead  
Jersey City Bulkhead (Palisades)  
Cape May Point Gabion Extension  
Monmouth County Parks/ Pews Creek Jetty  
Beachwood Borough Beachfill  
Beachwood Borough Bulkhead

#### **FY05**

Wreck Pond Outfall Extension  
Waretown Bulkhead  
Ventnor City Martindale Avenue Groin  
Union Beach Beachfill  
Little Egg Harbor Bulkhead  
City of Trenton Bulkhead  
Red Bank Borough Bulkhead  
Upper Township Ocean Drive Revetment  
Island Beach State Park Revetment  
Barnegat Light Bulkhead

#### **FY06**

Deal Lake Flume  
Beach Haven Geo-Tubes  
Palisades - Jersey City  
City of North Wildwood Beachfill  
Leonardo Marina Breakwater  
Bayonne Harbor Bulkhead  
Long Branch Surfing Reef Design

#### **FY07**

The Spy House, Monmouth County Parks  
The Cove/Cape May City Grading and Fencing



Absecon Bulkhead Reimbursement  
 Trenton Bulkhead Reimbursement  
 Forked River Marina Bulkhead  
 Basket Flats/Maurcie River - Commercial Township  
 Marine Police Station & Commercial Township Bulkhead  
 Ocean City Beachfill

**FY08**

Borough of Monmouth Beach Seawall  
 Monmouth County/Boro of Manasquan Fisherman's Cove Bulkhead  
 Ocean City Beachfill  
 Cape May Point Gabions  
 Keyport Phase II Bulkhead  
 City of Trenton Bulkhead  
 Borough of Belmar Bulkhead  
 Fortesque State Marina Bulkhead

\* The fiscal year (FY) indicated is the year the money was appropriated.

**State Flood Control Grant Program**

The "Dam, Lake, Stream, Flood Control, Water Resources, and Wastewater Treatment Project Bond Act of 2003" provided \$25,000,000 for grants to implement state and local flood control projects. The following represents a current list of flood control projects that have been funded by the NJDEP, Flood Control Section through the Bond Act of 2003:

<b><u>Project</u></b>	<b><u>Project Sponsor</u></b>	<b><u>Grant Amount</u></b>
Regional Flood Management Plan	Atlantic County	\$200,000
Weasel Brook Culvert	Clifton City	\$1,318,500
Pine Mt. Levee & Tide Gate	Cumberland County	\$600,000
Culvert Replacement	Dunellen Borough	\$900,000
Bulkhead Construction	Egg Harbor Township	\$2,000,000
Detention Basin	Franklin Township	\$200,000
Storm Sewer	Galloway Township	\$640,897
Repaupo Creek Flood Gate	Greenwich Township	\$2,250,000
Buyout	Lawrence Township	\$750,000
Flood Management Plan	Mahwah Township	\$150,000
Flood Management Plan	Maplewood Township	\$182,250
Storm Sewer	Mount Arlington Borough	\$208,000
Channel Improvement	North Caldwell Borough	\$261,750
Channel Improvement	Oakland Borough	\$346,725
Bridge & Channel Improvement	Roselle Borough	\$5,055,000
Pine Brook Culvert	Washington Township	\$255,000
Buyout	Wayne Township	\$1,800,000
W.Br.Elizabeth River Sewer	Union Township	\$1,185,000
Map Modernization	NJDEP	\$1,000,000
Lower Saddle River Project	NJDEP	\$3,696,878
USGS Stream Gage	NJDEP	\$1,000,000



## 5.6 Discussion of State Pre- and Post-Disaster Hazard Management Organization, Policies, Programs and Capabilities

### 5.6.1 Pre- and Post-Disaster Hazard Management Organization Emergency Management in New Jersey

The NJ Office of Emergency Management office has evolved from a small agency with limited planning, training, and response capabilities to its present status as an integral part of state government. Before 1950, federal and state disaster relief programs focused on protecting the population of the United States from acts of war. At that time, key functions of the integrated emergency management program model used today - evacuation planning, sheltering, volunteer management, alert and warning, and resource management - were elements of the "civilian defense plans" developed to prepare for war-related activities.

During the 1950's and 1960's, the New Jersey Civil Defense Office was primarily responsible for coordination with its designated federal counterpart to disseminate information on civil defense, to maintain civil defense communications, and to provide for civil defense training programs. Nationally, the federal government offered assistance on a per-incident basis to victims of natural disasters. Emergency management programs dedicated to specific hazards were scattered around the national government in various Federal agencies. During this time, the realization was growing that managing an emergency successfully included attention to all phases of the emergency -- mitigation (risk reduction), preparedness, response, and recovery - and similar emergency management strategies could apply whether the emergency was a flood, earthquake, drought, fire, chemical spill or a terrorist attack.

The increase in technological disasters in the 1970's and 1980's - many due to hazardous chemical emergencies - brought about the "all-hazard" approach to emergency management and the emergence of state offices with a much broader scope of responsibility. In 1979, after the Three Mile Island Nuclear Generating Station incident, President Carter established the Federal Emergency Management Agency (FEMA). This vested in the President all functions that had been delegated or assigned to the Civil Defense Prepared Agency, the Federal Disaster Assistance Administration, the Federal Preparedness Agency, and the agencies named in the Earthquake Hazards Reduction Act of 1977.

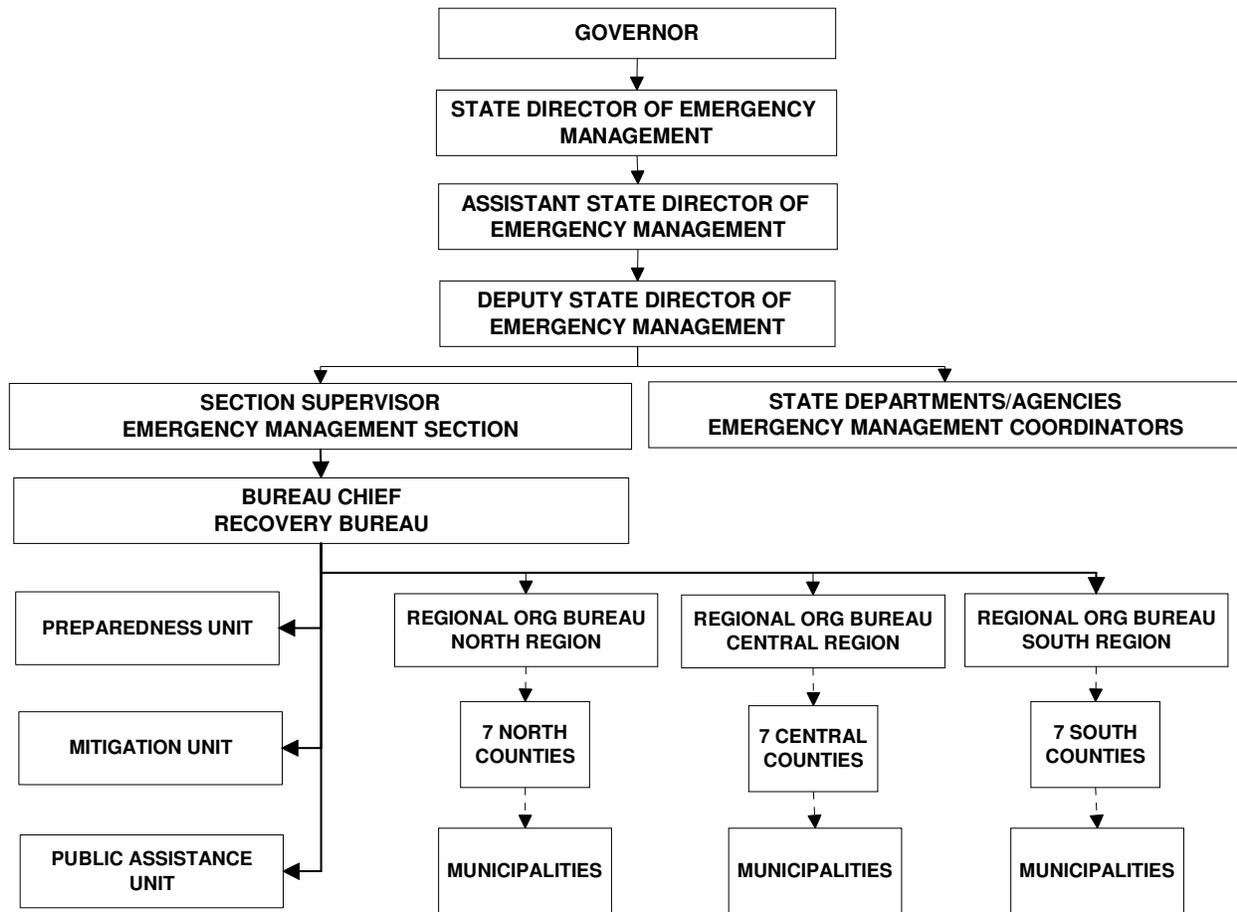
In 1980, amendments to the Civil Defense Act mandated FEMA to work with the State and local governments to assist them in setting up emergency management programs. These amendments prescribed the coordination and support role that FEMA continues to play to State and local governments. Amendments to the Civil Defense Act also provided for "dual use" of funds, meaning that Federal funding to the states maybe used to prepare for and respond to natural and technological emergencies to the extent that the use of funds is consistent with, contributes to, and does not detract from attack preparedness. Once all emergency programs were established under FEMA, work began to consolidate functional activities that were similar for all emergencies (such as evacuation or public education) into a unified planning effort.

On July 22, 1979 a Reorganization Plan was submitted to the New Jersey Legislature to transfer the functions, powers and duties of the Office of Civilian Defense Director from the Department of Defense to the Department of Law and Public Safety. On December 17, 1980, Governor Brendan Byrne established the Office of Emergency Management in the Division of State Police, Department of Law and Public Safety. The Superintendent of the New Jersey State Police was appointed as the State Director.



With the incorporation of FEMA within the new United States Department of Homeland Security in 2003, the role and organization of the New Jersey Office of Emergency Management continues to evolve.

**Figure 5.6-1-1**  
**Structure of Emergency Management in the State of New Jersey**



## The Governor

Emergency management in New Jersey is under the direct control of the Governor, who is conferred specific emergency powers under the New Jersey Constitution and statutes. These authorities are typically recited in the Governor's Executive Orders declaring states of emergency.

## State Director of Emergency Management

In New Jersey, the Superintendent of the State Police, a Division within the New Jersey Department of Law and Public Safety, is the State Director of Emergency Management.



## **Emergency Management Section**

The Emergency Management Section Supervisor holds the rank of Major and also serves as Deputy State Director, Office of Emergency Management. The Section is under the command of the Superintendent of State Police, who is the State Director, Office of Emergency Management. The Supervisor and staff facilitate the flow of information to and from the various Bureaus supervised and serve as a conduit for communication with other Division entities. The Section is also responsible for planning, directing and coordinating emergency operations within the State which are beyond local control. The Emergency Management Section was reorganized in 2004 to better address needs arising from enhanced homeland security and anti-terrorism concerns.

## **Recovery Bureau**

The Bureau Chief of the Recovery Bureau supervises the preparedness, mitigation and public assistance units and three regional coordinators. The Preparedness Unit is responsible for disseminating preparedness information in advance of a disaster or potential disaster. The NJOEM Preparedness Unit maintains an extensive library of natural disaster preparedness and recovery information on its Family and Community Emergency Preparedness website, accessible through [www.nj.gov/njoem](http://www.nj.gov/njoem) or [www.njsp.org/njoem](http://www.njsp.org/njoem). Such information, featured prominently on the New Jersey State Police and NJOEM website "home" pages, is a critical part of New Jersey's efforts to protect public health and safety and to minimize loss of life and property in the event of a disaster.

The Mitigation Unit undertakes hazard mitigation planning and the review of mitigation projects in advance of potential disasters, and is also activated during and immediately after disasters to evaluate existing and proposed mitigation measures in the affected areas. The Public Assistance Unit accepts and reviews applications for funds for emergency work submitted by local individuals, households and businesses as well as from local governments during and immediately after a disaster.

Each Regional Coordinator is the primary liaison for NJOEM with the County Emergency Management Coordinators for seven contiguous counties in their assigned region (North, Central and South). Responsibilities of the Regional Coordinators fall into seventeen (17) different functional categories. They are required to attend County, Municipal and other agency meetings; attend and conduct NJSP and NJOEM training; conduct, exercise and participate in local exercises; respond to all major incidents and disasters; provide direct EOP development assistance; and to conduct compliance surveys, State Police details, program support and other administrative functions. Regional personnel represent the Governor and State Director of Emergency Management at all emergency and disaster situations in the State. They monitor these situations and assure proper response and recovery activities. Response to an incident provides interaction between local and state government that expedites and centralizes the State's response. These activities include State, County and Municipal EOC activations, participation in actual operations, and technical assistance during the response and recovery phase. They are also responsible for providing status reports of events, through channels, to the Office of the Governor and Attorney General. In the post-emergency phase, they are responsible for the incident's evaluation and critique. It is also the responsibility of the Regional Units to assist with the development, review and compliance of all county and municipal Emergency Operations Plans. Regional personnel meet with and evaluate all Emergency Management Assistance (EMA) funded jurisdictions for year-end reports, development and review of Emergency Operation Plans (EOPs), exercises, and performance review of semi-annual and final EMA claim forms. New Jersey has currently achieved a compliance rate of 95% approved EOPs.



- The North Region coordinates emergency management activities throughout the northern seven (7) counties and two hundred and six (206) municipalities. In 2004, thirty-one (31) of these two hundred and six (206) political subdivisions received EMA Funding.
- The Central Region coordinates emergency management activities throughout the central seven (7) counties and one hundred and ninety -two (192) municipalities. In 2004, thirty-five (35) of these one hundred and ninety-two (192) political subdivisions received EMA Funding.
- The South Region coordinates emergency management activities throughout the southern seven (7) counties and one hundred sixty seven (167) municipalities. In 2004, twenty-four (24) of these one hundred sixty seven (167) political subdivisions receive Emergency Management Assistance (EMA) Funding.

## New Jersey Office of Emergency Management Mitigation Unit

The Mitigation Unit of the New Jersey Office of Emergency Management administers the Flood Mitigation Assistance Program (FMA), the Hazard Mitigation Grant Program (HMGP), the Repetitive Flood Claims (RFC) Program, the Severe Repetitive Loss (SRL) Program, the Repetitive Loss (RL) Program, and the Pre-Disaster Mitigation (PDM) grant program.

### 5.6.2 Pre- and Post-Disaster Hazard Policies, Programs and Capabilities

#### ➤ Training and Outreach

The New Jersey Office of Emergency Management, in cooperation with other State agencies and FEMA, seeks to mitigate hazards and reduce repetitive losses due to flooding through the implementation of programs such as the HMGP, FMA, RFC, SRL, RL, and PDM Programs. Each program functions in a different manner, but they all achieve the same objective to provide funding for hazard mitigation projects or reduce repetitive losses of flood prone structures. This will not only save Federal funds, but lives and reduce the risk of personal injury to response personnel in a disaster situation.

NJOEM Mitigation Unit makes Counties and Municipalities aware of these programs through letters, emails, meetings and conferences announcing upcoming grants that eligible communities may apply for and encouraging applications. Additional workshops are held to further explain the available programs. Upon receiving completed applications, NJOEM screens applicants based on existing plans and potential project needs. Follow-up is conducted through extensive use of email communications and telephone contacts. The State Hazard Mitigation Team is convened and staffed by the Mitigation Unit to review all applications considered for funding. The approved project applications and planning grant information are forwarded to FEMA for review and approval. Upon notification from FEMA of acceptance, NJOEM notifies the appropriate municipalities of the award. The process is described in more detail in Section 6.

#### ➤ Emergency Operations Planning and Management

Whenever a disaster occurs, or is predicted to occur, the State Emergency Operations Center is activated and staffed with personnel from NJOEM Mitigation Unit as well as other State Police emergency management units and various State Agencies. A 24/7 schedule for staffing is developed in advance each month, so the EOC may be activated at any time at a moment's notice. The State Emergency Operations Plan addresses the State's response to



any disaster or emergency. It provides the basis for coordinated emergency operations involving disaster planning, response, recovery and mitigation. The Emergency Operations Plan defines the relationships between NJOEM and other entities, both government and volunteer, serving citizens prior to, during and after emergencies. The Plan involves twenty seven federal agencies, sixteen State departments, and twenty four State and volunteer agencies. The New Jersey Office of Emergency Management responds to the resource requests of the counties when they are overwhelmed and in need of assistance whether it is a Statewide disaster or one on a more local (county) level. During a post disaster period, the NJOEM Mitigation Unit personnel work closely with all of the communities involved to assist with the Hazard Mitigation Grant Program in the same manner as with the pre-disaster programs.

### ➤ NJOEM Mitigation Unit Resources

The NJOEM currently performs its assigned roles with the following staff configuration:

- 1 Enlisted Unit Head
- 2 Principal Planners
- 1 Senior Planner

## Evaluation of New Jersey State Hazard Mitigation Division

Limited staffing has hampered the NJOEM in addressing hazard mitigation initiatives in all its program goals. In order to effectively perform the increasing number and complexity of tasks required for hazard mitigation planning, the NJOEM Mitigation Unit will require at least four additional staff, including:

- 2 additional Professional Planner
- 1 Professional Engineer
- 1 GIS specialist
- 1 Clerical staff

However, even with limited staff, the Division continues to provide support in planning and project management.

The nation's most densely populated State is also home to a wide array of natural resources and therefore New Jersey must carefully balance development and preservation of the use of its land, coast and water. The State recognizes the direct benefit of carefully planning land use in coordination with growth management and has passed laws regulating land use, preservation of land and water, floodplains, growth, and emergency management to protect the land. In addition, the State also recognizes that proper planning can reduce the potential for hazard to impact the State.

Staff from the New Jersey Office of Emergency Management Mitigation/Preparedness Unit worked with the State Hazard Mitigation Team to identify Agencies and Organizations that have programs or policies which impact hazard mitigation activities. The team then evaluated these programs and policies to develop a better understanding of State government activities and effectiveness related to hazard mitigation. The following state hazard mitigation capability table is the result of this effort.

Appendix U of the 2008 Plan identifies the most significant State funded and/or State administered programs, policies, regulations or practices related to hazard mitigation or loss reduction by agency, department or organization. Some of the listed programs provide funding for various hazard mitigation activities. Other State and federal programs or initiatives may support or facilitate hazard mitigation or loss reduction. The team determined that, where possible, it would provide examples of mitigation support as a measure of effectiveness of the organizations, programs and



policies. Also in the effectiveness section, the team determined which programs, policies and organizations support pre-hazard mitigation, post-hazard mitigation, or in some cases, both. Finally, while most of the programs and policies are existing programs, there have been a few new programs that are included, although evaluation is premature. More detailed information on these programs is available on the Department or Agencies website.

## 5.7 Evaluation of State Laws, Regulations, Policies and Programs related to Hazard Mitigation and Development in Hazard Prone Areas

In addition to evaluating the programs and policies capabilities of the State, the MCT also identified Federal and State Laws and Regulations that impact hazard mitigation. The Team focused on the effectiveness of these statutes and regulations when implemented. If the Statutes or regulations have not been effective, the Team provided recommendations that could help improve them and if any progress or actions have been started to make those improvements.

**Table 5.7-1  
Federal and State Mitigation Laws and Regulations  
that impact the Development in Hazard Prone Areas**

Statute and Corresponding Regulations	Description	Agency Oversight And Effectiveness
<p>Disaster Mitigation Act of 2000 (DMA 2000) P.L. 106-390</p>	<p>DMA 2000 provides an opportunity for states, Tribes and local governments to take a new and revitalized approach to mitigation planning. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Act) by repealing the previous mitigation planning provisions (Section 409) and replacing them with a new set of mitigation plan requirements (Section 322). This new section emphasizes the need for state, Tribal, and local entities to closely coordinate mitigation planning and implementation efforts. Local mitigation plans and authorized up to 7% of HMGP funds available to a state to be used for development of state, Tribal, and local mitigation plans.</p>	<p>The NJOEM Mitigation Unit is the lead agency within NJ to promote mitigation planning. The Law sets forth a more granular review of mitigation planning. Once approved, the applicant is eligible for applying for federal funds for mitigation of hazards. The rules provide detailed guidance on what applicants should include in a plan.</p>
<p>FEMA, Interim Final Rules, (IFR)44 CFR PART 201.4</p>	<p>Through the IFR, FEMA has prepared policy and procedures for the review and approval by the Agency of state and local emergency all hazard mitigation plans.</p>	<p>In NJ, the State has prepared an All Hazards Mitigation Plan that provides actions based on risk assessments and capabilities of the State to achieve and fund mitigation activities based on those actions. Both the Law and regulations have been effective in encouraging the Counties to prepare plans. As of February, 2008, all 21 Counties in NJ have initiated the preparations of All Hazard Mitigation Plans.</p>



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Statute and Corresponding Regulations	Description	Agency Oversight And Effectiveness
Robert T. Stafford Disaster Relief and Emergency Assistance Act	The Act provides an orderly and continuing means of assistance by the Federal Government to State and local governments in carrying out their responsibilities to alleviate the suffering and damage which result from such disasters by—(1) revising and broadening the scope of existing disaster relief programs; (2) encouraging the development of comprehensive disaster preparedness and assistance plans, programs, capabilities, and organizations by the States and by local governments; (3) achieving greater coordination and responsiveness of disaster preparedness and relief programs; (4) encouraging individuals, States, and local governments to protect themselves by obtaining insurance coverage to supplement or replace governmental assistance; (5) encouraging hazard mitigation measures to reduce losses from disasters, including development of land use and construction regulations; and (6) providing Federal assistance programs for both public and private losses sustained in disasters.	From a mitigation perspective of the Act, the NJOEM Mitigation Unit is the lead agency that reviews, submits and then administers federal funding programs that mitigate hazards. These programs are extremely effective to help find projects that are cost beneficial to help reduce damages from hazards.
Bunning-Bereuter-Blumenauser Flood Insurance Reform Act of 2004	The Flood Insurance Reform Act of 2004 amended the 1994 National Flood Insurance Reform Act of 1968 to reduce losses to properties for which repetitive flood insurance claim payments have been made. The Act established the pilot program for mitigation of severe repetitive loss properties. It gave FEMA the authority to fund mitigation activities for individual repetitive loss claims properties. The Act provides additional coverage for compliance with land use and control measures.	NJ DEP, Flood Control Division is the lead coordinator of New Jersey's NFIP efforts. NJOEM Mitigation Unit is the agency working with NJ communities with severe repetitive loss properties. This Statute is effective in that it helps NJ residents with affordable flood insurance and gives additional tools to the States and communities to mitigate severe repetitive loss properties.
<b>State Laws</b>		
Freshwater Wetland Protection Act (N.J.S.A. 13 B:1)	NJ enacted this law to support development and enhancement of state, local, and tribal wetland protection programs. Projects must clearly demonstrate a direct link to increasing a state's ability to protect wetland resources. Grants are federally funded and administered by the NJ DEP.	NJ DEP reports to US EPA the amount of wetlands filled annually. Also, USACE nationwide permits require wetland mitigation be a part of the permit. (3-2007). NJ DEP current rule proposal requires mitigation for general permits that was not previously required. This current rule proposal is an effective measure to protect the State's wetland resources.
Freshwater Wetland Protection Rules (N.J.A.C. 7:7A)	Regulations to support the New Jersey freshwater wetlands program which protects freshwater wetlands, and upland areas within 150 feet of wetlands (sometimes called "buffers"), from development which will impair the wetlands.	



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Statute and Corresponding Regulations	Description	Agency Oversight And Effectiveness
<p>Flood Hazard Area Control Act (N.J.S.A. 58:16A-52)</p> <p>Flood Hazard Area Control Regulation (N.J.A.C. 7:13)</p>	<p>NJ enacted this law to delineate and mark flood hazard areas, to authorize the Department of Environmental Protection to adopt land use regulations for the flood hazard area, to control stream encroachments, to coordinate effectively the development, dissemination, and use of information on floods and flood damages that may be available, to authorize the delegation of certain administrative and enforcement functions to county governing bodies and to integrate the flood control activities of the municipal, county, State and Federal Governments.</p> <p>The intent of the regulations is minimize potential on and off site damage to public or private property caused by development which, at times of flood, subject structures to flooding and increase flood heights and/or velocities both upstream and downstream. These rules are also intended to safeguard the public from the dangers and damages caused by materials being swept onto nearby or downstream lands, to protect and enhance the public's health and welfare by minimizing the degradation of water quality from point and non point pollution sources and to protect wildlife and fisheries by preserving and enhancing water quality and the environment associated with the floodplain and the watercourses that create them.</p>	<p>Following a major rainstorm in the last days of March 2005 and another between Friday, April 1 and Sunday, April 3, 2005, the Delaware River overflowed its banks, flooding an estimated 3,500 homes and forcing the evacuation of more than 5,500 people. In response, Acting Governor Richard J. Codey formed a Flood Mitigation Task Force to study and implement measures to reduce future impacts of flooding in New Jersey Communities. On August 22, 2006, Governor Jon Corzine released the final report of the Flood Mitigation Task Force. The report called for amending the current Flood Hazard regulations and the NJDEP began a proposed rulemaking improving the regulations. The new rules went into effect in November, 2007. The new rules are discussed in more detail in below. NJDEP is the lead agency.</p>
<p>Safe Dam Act of 1981</p> <p>NJAC 7:24A - Dam Restoration and Inland Water Projects Loan Program Rules:</p>	<p>No municipality, corporation or person shall, without the consent of the Commissioner of Environmental Protection, build any reservoir or construct any dam, or repair, alter or improve existing dams on any river or stream in this State or between this State and any other state which will raise the waters of the river or stream more than five feet above its usual mean low water height.</p> <p>These rules are for the purpose of administering the Dam Restoration and Inland Water Projects Loan Program. This program is a low interest loan program to assist local government units, private lake associations, and private dam owners with the repair and restoration of dams and implementing inland water projects. The 1992 Green Acres, Clean Water, Farmland and Historic Preservation Bond Act made available \$15 million for dam restoration and inland water projects and the 2003 Dam, Lake, Stream, Flood Control, Water Resources and Wastewater Treatment Project Bond Act made available \$95 million for dam restoration projects. The Department awards and administers loans for projects in accordance with the adopted regulations.</p>	<p>Repairs of 95 high and significant hazard dams have already been funded. It is a revolving loan program so that as money is paid back into the program additional loan applications for future projects can be accepted.</p>



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<p>Waterfront Development Statute (N.J.S.A. 12:5-1) Coastal Permit Program (N.J.A.C. 7:7)</p>	<p>This Law sets forth the requirements of filling or dredging of, or placement or construction of structures, pilings or other obstructions in any tidal waterway, or in certain upland areas adjacent to tidal waterways outside the area regulated under CAFRA. These requirements are fully explained in N.J.A.C. 7:7-2.3. These rules establish the procedures by which the Department of Environmental Protection will review permit applications and appeals from permit decisions the Waterfront Development Law.</p>	<p>This law is implemented through New Jersey's Coastal Zone Management Rules N.J.A.C. 7:7E-1.1 <u>et seq.</u> Since they were finalized in September 1980 these rules have effectively regulated developments in coastal high hazard areas, erosion hazard areas, flood hazard areas and permits issued required construction in accordance with the NFIP requirements in A and V zones. Effective November 5, 2007 the CZM rules incorporate the new and more stringent Flood Hazard Area Control Act rules standards, including protection of riparian buffers along tidal water courses that can be 50', 150' and 300' along environmentally sensitive (Category-1) waterways.</p>
<p>Coastal Area Facility Review Act (CAFRA) (N.J.S.A. 13:19)</p>	<p>CAFRA applies to projects near coastal waters in the southern part of the State. The law divides the CAFRA area into pieces or zones, and regulates different types of development in each zone. Generally, the closer you are to the water, the more likely it is that your development will be regulated. The CAFRA law regulates almost all development activities involved in residential, commercial, or industrial development, including construction, relocation, and enlargement of buildings or structures; and all related work, such as excavation, grading, shore protection structures, and site preparation.</p>	<p>This law is implemented through New Jersey's Coastal Zone Management Rules N.J.A.C. 7:7E-1.1 <u>et seq.</u> Since they were finalized in September 1980 these rules have effectively regulated larger developments (25 residential units or more, 300 commercial parking spaces or more) in coastal high hazard areas, erosion hazard areas, flood hazard areas and permits issued required construction in accordance with the NFIP requirements in A and V zones. Effective July 1994 the CAFRA jurisdiction was expanded to include every single family residential development within 150' of the mean high water line, beach or dune. The threshold for regulation over commercial development was lowered to capture smaller commercial developments and the DEP gained authority over any disturbance to a beach or dune area or the placement of a structure in these areas. Effective November 5, 2007 the CZM rules incorporate the new and more stringent Flood Hazard Area Control Act rules standards, including protection of riparian buffers along tidal water courses that can be 50', 150' and 300' along environmentally sensitive (Category-1) waterways.</p>



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<p>Construction Permits (N.J.S.A. 13:1D-29 to 34)</p>	<p>The Law mandates timely decisions by the Department of Environmental Protection on construction permit applications to assure adequate public notice of procedures and to continue effective administration of the substantive provisions of other laws.</p>	<p>NJ, by this Law, must issue permits in 90-days &amp; over see fees &amp; review process, including allowing for a 30-day extension. It has no environmental unless a deadline is missed on making a decision (approve or deny) the permit is automatically issued without any special conditions. This does not apply to FWW rules, only coastal &amp; flood hazard regs. NJDEP has processes to ensure that processing the permits under the law with very few issued by default. If necessary NJDEP requests the applicant to "waive" the 90-day law, or an application can be technically deficient which stops the 90 day clock for review.</p>
<p>Environmental Aid Act (N.J.S.A. 13:1H – 1 to 7)</p> <p>Office of Environmental Services Matching Grants Program for Local Environmental Agencies (N.J.A.C 7:5)</p>	<p>State aid may be granted by the department to a local environmental agency for any purpose that the agency is authorized to perform by law and for the preparation of an environmental index. An environmental index shall be a report on environmental conditions within the locality and community objectives concerning open areas, parks, water supply, solid waste, wildlife protection, soil resources, air pollution, water pollution and others. The department may provide technical assistance in addition to or in lieu of State aid to any local environmental agency for the purpose indicated in this act.</p> <p>The purpose of the funding dedicated under this act is to assist local environmental commissions and soil conservation districts with funding for a variety of local environmental projects including: community education projects; environmental resource inventories; beach monitoring and management projects; environmental trail designs; lake rehabilitation studies; stream and water quality testing; wellhead delineation; GIS mapping projects; NEPPS indicator projects; and surveys of threatened and endangered species. The maximum annual grant is \$2,500. Applicant must match at least 50% of the total cost of the project.</p>	<p>This program is very effective and there is no need for improvement. At <a href="http://www.state.nj.us/dep/esp/projects">http://www.state.nj.us/dep/esp/projects</a> funded by this grant are reported. Just a few examples of projects that support mitigation that have been funded in the past include Waterways Beach Monitoring and Management Strategy, Dune Project, Beach Protection and Storm Drainage Plan, Beach Storm Water Drainage Analysis, Stream Corridor/Greenway Protection Plan, Shoreline Bioengineering Demonstration and Outreach Project, Stream Pamphlet/Education Project.</p>



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Aid for Urban Environmental Concerns Act (N.J.S.A. 13: 1H 1 to 7) Office of Environmental Services Matching Grants Program for Local Environmental Agencies (N.J.A.C. 7:5)	In 1979 the New Jersey Legislature declared that urban communities, where the high population and building densities, aged housing stock, economic decline and incidence of poverty present special problems, have unique environmental concerns; and that State assistance can help environmental agencies meet such concerns. The department may grant up to \$10,000.00 per year in State aid to any environmental agency for a project or projects addressing urban environmental concerns within an eligible municipality. The contribution by the Department of Environmental Protection shall not exceed 80% of the cost of the project which qualifies for assistance under this act.	This law provides assistance to urban communities for projects such as artwork in public places, street scaping, flower gardens, flowering trees, neighborhood sitting places and recreation areas. The department may grant up to \$10,000.00 per year in State aid to any environmental agency for a project or projects addressing urban environmental concerns within an eligible municipality. The contribution by the department shall not exceed 80% of the cost of the project which qualifies for assistance under this act. This program is implemented through the Garden State Preservation Trust and the Green Acres Program.



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<p>New Jersey Green Acres Land Acquisition Acts of 1961, 1971 and Green Acres Land Acquisition and Recreation Opportunities Act (N.J.S.A. 13:8a 19-55 and 8B 1-9)</p> <p>Green Acres Program (N.J.A.C 7:36)</p>	<p>The Legislature enacted the New Jersey Acres Land Acquisition Acts in order to achieve, in partnership with others, a system of interconnected open spaces, whose protection will preserve and enhance New Jersey's natural environment and its historic, scenic, and recreational resources for public use and enjoyment. On November 3, 1998, New Jersey voters approved a referendum which creates a stable source of funding for open space, farmland, and historic preservation and recreation development, and on June 30, 1999, the Garden State Preservation Trust Act was signed into law. The law establishes, for the first time in history, a stable source of funding for preservation efforts. Green Acres assists local government units and nonprofits in their efforts to increase and preserve permanent outdoor recreation areas for public use and enjoyment, and conservation areas for the protection of natural resources such as waterways, wildlife habitat, wetlands, forests, and view sheds. A secondary benefit of these laws and rules is that flood prone properties are often purchased and not available for future development.</p> <p>These rules implement the Green Acres laws, governing the award of loans or matching grants, or both, to local government units for the acquisition or development of land, and 50 percent matching grants to nonprofits for the acquisition or development of land, for outdoor recreation and conservation purposes. These rules establish project eligibility requirements, application requirements, funding award categories and criteria, matching grant and loan terms, and program administrative requirements. The rules also contain procedures for the disposal, or diversion to a use other than recreation and conservation, of those lands acquired or developed with Green Acres funding or otherwise encumbered with Green Acres restrictions.</p>	<p><b>The program is effective</b></p> <p><b>The link for the 1995 blue acres description was not functioning to obtain more info.</b></p> <p><b>Blue Acres</b> was created with the passage of the Green Acres, Farmland, Historic Preservation and Blue Acres Bond Act of 1995. The bond act contains <b>\$15 million for Inland acquisition in the Passaic River Basin, including repetitive loss properties.</b></p> <p><b>2007 Blue Acres Program for New Jersey</b></p> <p>Governor Corzine signed into law the "Green Acres, Farmland, Blue Acres, and Historic Preservation Bond Act of 2007" which will be presented to the voters at this November 2007 election. The bond act will provide \$12,000,000 for the state to acquire, for recreation and conservation purposes, lands in the floodway of the Delaware River, Passaic River, and Raritan River, and their respective tributaries, that have been damaged by, or may be prone to incurring damage caused by storm-related flooding or that may buffer or protect lands from such damage.</p> <p><b>Coastal Blue Acres (CBA)</b> was created with the passage of the Green Acres, Farmland, Historic Preservation and Blue Acres Bond Act of 1995. The bond act contains \$15 million for grants and loans to municipalities and counties to acquire lands in coastal areas that have been damaged by storms, that may be prone to storm damage, or that buffer or protect other lands from storm damage, for recreation and conservation purposes. The act defines coastal areas as those within the CAFRA Zone</p> <p>CBA funds are divided into two parts:</p> <ul style="list-style-type: none"> <li>● Pre-storm: \$6 million. Acquisition of unimproved and largely unimproved storm prone and buffer lands is funded with 75 percent grant/25 percent loan. <b>(Please note that as of November 1998, all Pre-Storm funds have been committed to projects. No Pre-Storm funds are currently available)</b></li> <li>● Post-storm: \$9 million. Acquisition of lands that have suffered at least a 50 percent reduction in value as a result</li> </ul>



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<p>Forest Fire Prevention and Control Act (N.J.S.A. 13:9-44 to 44.10)</p>	<p>The Forest Fire Service is responsible to determine wildfire hazards, remove or cause to be removed brush, undergrowth or other material which contributes to wildfire hazards, maintain or cause to be maintained fire breaks, set backfires, plow lands, close roads and make regulations for burning brush, summon any male person between the ages of eighteen and fifty, who may be within the jurisdiction of the state, to assist in extinguishing fires, require the use of property needed for extinguishing fires, issue permits, collect extinguishment cost and fines for violations, control and direct all persons and apparatus engaged in extinguishing wildfires, have the right of entry upon lands to inspect and ascertain compliance and extinguish wildfires, investigate fires to determine cause, close the woods to all unauthorized persons in an emergency, arrest without warrant anyone violating the Forest Fire Laws.</p>	<p>The laws that apply are 13:9-2, 9-23 &amp; 9-24. Unfortunately, there was never any administrative code added. There is no procedure for implementing mitigation work on private property without permission, either with absentee ownerships or those hostile to the mitigation.</p> <p>Also, Forest Fire mitigation efforts are not exempted in other environmental regulations. Certain mitigation efforts sometimes occur where there is threatened &amp; endangered habitat, even when that habitat was caused by past prescribed burning operations (one mitigation effort used by FF). Lastly, regulations limit prescribed burning to narrow windows of opportunity. Larger windows would allow completion of more acres per year.</p>
<p>Wetlands Act of 1970 (N.J.S.A. 13:9A – 1 to 10)</p> <p>Coastal Zone (CZM) rules Program (N.J.A.C. 7:7E)</p>	<p>1970 the New Jersey Legislature declared that one of the most vital and productive areas of our natural world is the so-called "estuarine zone," that area between the sea and the land; that this area protects the land from the force of the sea, moderates our weather, provides a home for water fowl and for all our fish and shellfish, and assists in absorbing sewage discharge by the rivers of the land it is necessary to preserve the ecological balance of this area and prevent its further deterioration and destruction by regulating the dredging, filling, removing or otherwise altering or polluting.</p> <p>CZM rules mandate the use and development of coastal resources, to be used primarily by the Land Use Regulation Program in the Department in reviewing permit applications under the Coastal Area Facility Review Act (CAFRA), N.J.S.A. 13:19-1 et seq. (as amended to July 19, 1993), Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq., Waterfront Development Law, N.J.S.A. 12:5-3, Water Quality Certification (401 of the Federal Clean Water Act), and Federal Consistency Determinations (307 of the Federal Coastal Zone Management Act). The rules also provide a basis for recommendations by the Program to the Tidelands Resource Council on applications for riparian grants, leases and licenses.</p>	<p>NOAA has oversight of the funds received for the Coastal Zone Management and NJDEP administers the regulatory program. NJDEP must report to NOAA twice a year grant activities (Status, implementation, completion)</p>



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<p>Pineland Protection Act (N.J.S.A. 13:18A-30 to 49)</p> <p>Pinelands Comprehensive Management Plan (CMP) (N.J.A.C. 7:50)</p>	<p>In 1979 the New Jersey Legislature declared the protection of the NJ Pinelands and established a regional planning and management commission empowered to prepare and oversee the implementation of a comprehensive management plan for the pinelands area.</p> <p>The Legislature further declared that a certain portion of the pinelands area is especially vulnerable to the environmental degradation of surface and ground waters which would be occasioned by the improper development or use thereof; that the degradation of such waters would result in a severe adverse impact upon the entire pinelands area; that it is necessary to designate this portion as a preservation area, wherein more stringent restrictions on the development and use of land should be utilized and public acquisition of land or interests therein should be concentrated</p> <p>The CMP implements the regulations and standards designed to promote orderly development of the Pinelands so as to preserve and protect the significant and unique natural, ecological, agricultural, archaeological, historical, scenic, cultural and recreational resources of the Pinelands. The Pinelands Commission bears the ultimate responsibility for implementing and enforcing the provisions of the Pinelands Protection Act and this Plan.</p>	<p>Under the Pinelands Comprehensive Management Plan are established Management Programs and Minimum Standards that are intended to provide protection of wetlands, vegetation, fish and wildlife, water quality management and forest fire management. Flood and wildfire mitigation is a secondary benefit of the development constraints placed on environmentally sensitive areas.</p> <p>Under the Pinelands Comprehensive Management Plan are established Management Programs and Minimum Standards that are intended to provide protection of wetlands, vegetation, fish and wildlife, water quality management and forest fire management. Flood and wildfire mitigation is a secondary benefit of the development constraints placed on environmentally sensitive areas.</p> <p>Under the Pinelands Comprehensive Management Plan are established Management Programs and Minimum Standards that are intended to provide protection of wetlands, vegetation, fish and wildlife, water quality management and forest fire management. Flood and wildfire mitigation is a secondary benefit of the development constraints placed on environmentally sensitive areas.</p> <p>Under the Pinelands Comprehensive Management Plan are established Management Programs and Minimum Standards that are intended to provide protection of wetlands, vegetation, fish and wildlife, water quality management and forest fire management. Flood and wildfire mitigation is a secondary benefit of the development constraints placed on environmentally sensitive areas.</p> <p>Under the Pinelands Comprehensive Management Plan are established Management Programs and Minimum Standards that are intended to provide protection of wetlands, vegetation, fish and wildlife, water quality management and forest fire management. Flood and wildfire mitigation is a secondary benefit of the development constraints placed on environmentally sensitive areas.</p>



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<p>New Jersey Pollutant Discharge Elimination System Stormwater Regulation Program (NJPDES) Rules (N.J.A.C. 7:14A).</p> <p>Stormwater Management Rules (N.J.A.C. 7:8)</p>	<p>These NJPDES Rules are intended to address and reduce pollutants associated with existing stormwater runoff. These NJPDES Rules govern the issuance of permits to entities that own or operate small municipal separate storm sewer systems, known as MS4s. The permit program establishes the Statewide Basic Requirements that must be implemented to reduce nonpoint source pollutant loads from these sources. The Statewide Basic Requirements include measures such as: the adoption of ordinances (litter control, pet waste, wildlife feeding, proper waste disposal, etc.); the development of a municipal stormwater management plan and implementing ordinance(s); requiring certain maintenance activities (such as street sweeping and catch basin cleaning); implementing solids and floatables control; locating discharge points and stenciling catch basins; and a public education component.</p> <p>These Rules set forth the required components of regional and municipal stormwater management plans, and establish the stormwater management design and performance standards for new (proposed) development. The design and performance standards for new development include groundwater recharge, runoff quantity controls, runoff quality controls, and buffers around <a href="#">Category One</a> (C1) waters.</p>	<p>Guidance for the development of Municipal Mitigation Plans was developed and made available in February 2006. Additionally, the Department developed guidance for the Special Water Resources Protection Area (SWRPA) Functional Value Analysis, which is required by the Stormwater Management Rules, of proposed encroachments into the SWRPA adjacent to all Category One waters, which requires a 300-foot buffer. Also provided for guidance documents are to assist municipalities in complying with their Municipal Stormwater General Permit.</p> <p>The program was developed in response to the U. S. Environmental Protection Agency's Phase II rules published in December 1999. The department issued final stormwater rules on February 2, 2004 and four NJPDES general permits authorizing stormwater discharges from Tier A and Tier B municipalities, as well as public complexes, and highway agencies that discharge stormwater from municipal separate storm sewers (MS4s). There are 462 Tier A municipalities and 100 Tier B municipalities.</p> <p>The general permits address stormwater quality issues related to new development, redevelopment and existing development by requiring municipalities to implement a number of Statewide Basic Requirements (SBRs). All municipalities have a local stormwater coordinator and the department has case managers assigned to each municipality for compliance assistance (see below).</p> <p><b>MONETARY ASSISTANCE PROVIDED:</b> To offset some of the costs associated with permit requirements, the state had allocated \$12 million in grant monies to municipalities and counties during fiscal years 04 and 05. Due to the fiscal constraints, there were no additional grants available for subsequent fiscal years. However, the department does provide below-market interest rate loans through the Environmental Infrastructure Financing Program to municipalities for capital improvements such as street sweepers, salt storage structures, and vehicle washing equipment.</p>
<p>Sewage Infrastructure Improvement Act Grants (N.J.A.C. 7:22)</p>		



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<p>Water Pollution Control Quality Act (N.J.S.A. 58:10A-1 to 60)</p> <p>Water Quality Management Planning Rules (N.J.A.C. 7:15)</p>	<p>This Act phased out the Construction Grants Program and required states to establish a State Revolving Fund (SRF) Loan Program. The last year in which construction grants were made for new projects in New Jersey was 1989. Grant awards are available currently to cover increased allowable costs for projects that previously received a construction grant.</p> <p>The current rules became effective on October 2, 1989. These rules serve two basic functions: they establish the Department's general regulatory framework for water quality planning and supplement other Department rules pertaining to wastewater management.</p>	<p>This Act is implemented through a number of regulations and programs throughout the Department including, but not limited to Freshwater Wetlands Protection Act (NJAC 7:7A), Stormwater Management (NJAC 7:8), Water Pollution Control (NJAC 7:9), Surface Water Quality Standards (NJAC 7:9B), Safe Drinking Water Act (NJAC 7:10), Safe Drinking Water Act (NJAC 7:10), Flood Hazard Control Act (NJAC 7:13), Pollutant Discharge Elimination System (NJAC 7:14A), and Water Quality Management (NJAC 7:15). Through these rules we regulate development location and intensity of uses, protect floodplain capacity and riparian buffers, fund restoration of lakes and streams, fund infrastructure improvements that primarily provide environmental health, but secondarily provide mitigation in the form of reduced losses due to infrastructure failure. An integral component of areawide WQMPs are Wastewater Management Plans (WMPs). WMPs are the vehicle through which the continuing planning process integrates local and regional planning into the area-wide WQMPs. The intended purpose of the WMPs is to project future development and estimate the wastewater management needs associated with that development. These plans could also provide the vehicle to ensure that sewer service was not extended into areas inconsistent with State Development and Redevelopment Plan State Planning Area designations and environmentally sensitive areas. Municipalities were to have WMP prepared, reviewed and updated every six years, many WMP jurisdictions either never completed a WMP or have not updated the WMP. Therefore, through Executive Order 109, NJDEP has undertaken a rulemaking to further strengthen and improve the rules.</p>



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Tidelands Act (N.J.S.A 12:3)	Tidelands, also known as "riparian lands" are lands now or formerly flowed by the tide of a natural waterway. This includes lands that were previously flowed by the tide but have been filled and are no longer flowed by the tide. These lands are owned by the people of the State of New Jersey. You must first get permission from the State to use these lands, in the form of a tidelands license, lease or grant, and you must pay for this use.	NJDEP
New Jersey Civilian Defense and Disaster Control Act	The purpose of this act is to provide for the health, safety and welfare of the people of the State of New Jersey and to aid in the prevention of damage to and the destruction of property during any emergency as herein defined by prescribing a course of conduct for the civilian population of this State during such emergency and by centralizing control of all civilian activities having to do with such emergency under the Governor and for that purpose to give to the Governor control over such resources of the State Government and of each and every political subdivision thereof as may be necessary to cope with any condition that shall arise out of such emergency and to invest the Governor with all other power convenient or necessary to effectuate such purpose.	NJOEM



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N.J.S.A. 58:16A-66 et seq	The Commissioner of the Department of Environmental Protection shall in consultation with the United States Army Corps, of Engineers and in coordination with the Office of Emergency Management in the Division of State Police, develop a flood early warning system.	NJDEP/NJOEM have led the efforts for the development of the flood early warning system. The NJOEM and several of the counties in the central and northern tier of the State above the coastal plain have live rain, stream and flood gages. In the back bays and along tidal waters in 14 coastal counties the USGS manages the NJ Tide Telemetry System. All systems transmit telemetry continuously to the NWS, USGS, State Climatologist (NJ WxNet), NJDEP, NJOEM and all affected Counties and many municipalities. These systems were created and installed with Federal assistance through NOAA and the USACOE. O&M is currently done by contractor support with direct funding through our Federal partners, and matching funds via the OHSP and the OAG. NJOEM provides limited pass-through grants for expansion of these systems every year to keep it growing and protecting an ever expanding population base. Data received is used by all agencies when flooding is forecasted, but particularly by the NWS to both monitor precipitation and flood levels in comparison to forecast data in order to provide enhanced pinpoint forecasting. Depending on the types of data receivers at the agency and individual level, flood messages can be received by computer, PDA, cell phone, Blackberry and pagers, alerting emergency managers immediately. Receiving such alerts is limited only by the decision on the part of the each respective agency in issuing such devices to their emergency services community. For the Passaic and Raritan basins a flood warning users group was formed over ten years ago and has since expanded to include participation from all the agencies listed earlier as well as interested counties with monitoring systems in other areas of the State.



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N.J.S.A. 58:16a-101	The office of Emergency Management shall notify the emergency management organization in the counties, which shall then notify the local police departments in the event of a flood situation.	NJOEM does share all data with county level OEM offices. Weather alerts and notices are produced daily, 365 days a year. The local level OEM entities have access to the same data sources as NJOEM. Preparation for approaching events are generally concurrent. The majority of the time State level notifications to local level are redundant but are carried out regardless.
N.J.A.C. § 17	The Governor is authorized to enter into agreements with the governors of any of the states bordering on New Jersey for the protection in the event of emergency of any or all interstate bridges, tunnels, ferries and other communications facilities.	NJ Governor
N.J.S.A. 52:14E-11 (3-10-2003) The Fire Service Resource Emergency Deployment Act	This Act allows for the Fire Division within the Department of Community Affairs to deploy fire assets to a pre-designated location in advance of a disaster or emergency as well as move assets to a pre-designated location to avoid assets being damaged	NJ Community Affairs, Fire Service Division. This has been used successfully in every disaster since the Act was passed.
NJSA 52:27D-126.3 Emergency Building Inspection Act	Enacted on January 17, 2007, this Act to addresses how building code officials would be compensated if called to support damage assessment outside of their jurisdiction.	NJ Community Affairs, Office of Regulatory Affairs. While the Act was passed in early 2007, the regulations were just adopted on December 17, 2007. The Law required that regulations be adopted before the program was implemented and so 2008 implementation will begin

While many of the statutes and corresponding regulations continue to be effective tools in support of hazard mitigations, some of the regulations have been updated since the original plan to help with compliance, enforcement and improved protections. Two of these are the new regulations to implement the Flood Hazard Control Act and new regulations that support planning and updating water quality plans management. Through the proposed rules, many agencies were able to provide comments to improve the existing regulations. Because these regulations are relatively new, it is not possible for the State to provide a meaningful evaluation of them at this time.

### Flood Hazard Area Control Act Rules

Since the approval of the previous plan, the State of New Jersey implemented new rules that repealed the State's existing Flood Hazard Area Control Act rules (N.J.A.C. 7:13) and replace them with comprehensive new rules that will better protect the public from the hazards of flooding. The new rules incorporate significantly more stringent design and construction standards for activities in flood hazard areas in order to reduce flood damage potential and prevent increases in flooding due to development. The rules also reflect a number of recommendations of the draft Report on Delaware River Flood Mitigation and include the following measures:

1. Preserving existing flood storage along inland waterways, which is necessary to prevent future increases in flooding, by implementing a Statewide 0% net-fill standard



2. Preserving natural, vegetated stream corridors by implementing buffers along surface waters, the width of which (50-ft, 150-ft or 300-ft) is dependent on the environmental sensitivity of the water being protected
3. Allowing the use of Federal flood mapping in communities where no State flood mapping is available, and providing a simplified method to approximate flood depths in communities where no State or Federal flood mapping is available
4. Requiring floor elevations and roadway surfaces to be set at least one foot above the State's flood hazard area design flood elevation in order to provide increased flood protection for buildings and public roadways
5. Creating 46 permits-by-rule and 16 general permits to both facilitate and encourage projects that have no adverse impact on flooding and the environment, including a permit-by-rule for elevating homes, which requires no prior NJDEP approval, and a free, expedited general permit for the reconstruction and elevation of homes damaged by flooding
6. Amending the Coastal Permit Program rules (N.J.A.C. 7:7) and Coastal Zone Management rules (N.J.A.C. 7:7E) to incorporate equivalent flood protection and stream buffers to all waters and flood hazard areas Statewide.

These new rules were effective on November 5, 2007 and will help the State protect against development in flood hazard prone areas.

## Water Quality Planning Rules

On April 23, 2007, the Department announced proposed changes to the Water Quality Management Planning rules that would be published in the May 21, 2007 New Jersey Register. The proposed rule amendments would:

- Establish clear standards for delineating appropriate sewer service areas to protect environmentally sensitive areas as well as clear, environmentally protective standards for the review of WQMP amendments.
- Set forth clear standards to require identification of adequate wastewater management alternatives, address water supply, and control nonpoint source pollution (including controls related to stormwater, riparian zones and steep slopes).
- Reassignment of wastewater management planning responsibility to the County Boards of Chosen Freeholders to reduce WMP agencies to a manageable number and afford a regional approach to water resource planning.
- Withdrawal of sewer service areas and re-designation as general wastewater service area of less than 2,000 GPD (septic) where the applicable WMP is not in compliance with the mandatory update schedule contained in the rules.
- A requirement that municipalities pass an ordinance designed to assure septic maintenance.
- A requirement that updated WMPs address septic density in a manner that demonstrates compliance with a 2 mg/L (ppm) nitrate planning target on a HUC 11 watershed basis, and
- Improve consistency with the State Development and Redevelopment Plan

In addition to the program, policy, legal, and regulatory capabilities assessed, the MCT reviewed New Jersey capabilities based upon the type of hazard. This section provides a brief description of that assessment.



## Storms and Flooding

By far, the most repetitive types of disaster affecting New Jersey is flooding caused by storms. The NJOEM has established a strong working group with all 21 County OEMs to utilize HURREVAC software for tracking hurricanes. HURREVAC allows NJOEM and counties to work as a unified team, coordinating notification, communication, activations, public warning, and evacuation and sheltering. By operating together, the State and the counties serve the public better by providing the same advisories and actions.

As part of this effort, an extensive set of email groups has been established and used for all types of communications and warnings. Particularly when an approaching hurricane warrants monitoring, NJOEM send out emails with State EOC status information and advice embedded in jpeg files to keep all emergency managers statewide on board with our direction. NJOEM also utilizes conference calling with the NWS and County Emergency Management Offices to share specific information and needs. Resources are deployed as early as possible to prepare for storm impacts.

Public warning systems have been established in key municipalities along the Atlantic coast. Weather monitoring stations, tide telemetry gages, river and rain gages, and consolidated computer-based software have been acquired all for the purpose of covering the entire State with local-level monitoring. New Jersey is one of the few states in the Nation to have its own WeatherNet. Each year, New Jersey funds further expansion of these systems.

Data from these systems have provided the NJOEM and county and local planners with valuable hazard and vulnerability information. Many small local projects have been funded justified by flood potential and flood damages. This same information also helped to analyze flood inundation maps used by the NJOEM Preparedness Unit in developing Reverse Lane plans and strategies for hurricane evacuation. New Jersey now has four fully function plans, one each for the coastal counties of Cape May, Atlantic, Ocean and Monmouth, involving five State and Interstate highways. These plans are periodically exercised to validate their operational readiness.

Several different types of public information methods were employed over the past few years, all targeted at educating the public about hazards and most importantly, what individuals can do to both prepare and protect their lives and property. Brochures, magnets, full size signage, handouts and other items have been purchased and distributed, some in bi-lingual formats. This effort has been extremely well received, and has extended to other projects such as establishing hurricane insurance programs and the distribution of emergency information through real estate brokers for summer vacationers.

Many large-scale projects and programs are continuing, Dune replenishment, dune fortification, bulkheading, fencing, grass plantings and grading all have helped to build up New Jersey beach fronts to better protect against storm surge and wave action. Inland, flood control measures are being implemented along rivers, creeks and culverts. Many jurisdictions have instituted regular stream and culvert cleaning and tree trimming programs just prior to storm seasons in Spring and Fall. Structural elevations have been done in many cases where properties can be maintained. Unavoidable repetitive losses have led to alternative mitigation efforts such as property acquisition and relocation.

For the past five years, NJOEM and other NJ Agencies utilize HAZUS software to combine soils, demographic and infrastructure data to estimate losses and vulnerabilities from natural hazards. This software also allows policy makers to target stricter development standards for targeting hazard mitigation. The NJOEM has joined the New York Consortium on Earthquake Mitigation, along with New York City, New York State, the New Jersey Geological Survey, Columbia and Princeton Universities and several counties in the metro-NY area. This Consortium is concentrating efforts on assessing the vulnerabilities of the metro-NY area and what can be done to better protect life and property by running model simulations. These computer exercises reveal which areas fail first, how damages result, and what economic and socioeconomic effects result, giving a comprehensive picture of total impact.



## Forest Fires

Wildfires were a major concern in years when drought was prevalent. Several large fires struck the Pine Barrens and other forested areas. Fire services have employed isolation and pre-burn techniques to limit the total acreage affected. This has had excellent results, and our forests have rebounded well. Fire coordinators continue these programs throughout the dry season.

## Dam Failures

The NJDEP has a group dedicated to administering a strict and regulated dam emergency planning initiative with all dam owners and operators in the State. Emergency notification and public warning systems are a required element of these plans. Inspections and fortification programs have been instituted to deal with aging dams as well as increased at-risk (downstream) populations. The NJOEM reviews these plans, paying particular attention to immediate notification systems and emergency response actions.

## 5.8 State Funding Capabilities for Hazard Mitigation Projects

In addition to identifying and evaluating the State's capabilities to address mitigation, another key component to mitigation is funding. As part of the 2008 plan update, the planning team reviewed current sources of federal, State, local or private funding, and tried to identify other potential sources of mitigation funding. Table 5.8-1 summarizes these funding sources, potential availability, applicability of pre- or post-disaster requirements, and the type of funding that is available.

**Table 5.8-1  
 Funding Sources Available for Mitigation Activities**

<b>Funding Source</b>	<b>Description</b>
FMA	<p>Availability: Pre Disaster</p> <p>Description: To implement cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program (NFIP).</p> <p>Funding: In FY 2007, there was \$31 Million available in a nationwide competition.</p>
HMGP	<p>Availability: Post-Disaster</p> <p>Description: To provide funds to States, territories, Indian Tribal governments, and communities to significantly reduce or permanently eliminate future risk to lives and property from natural hazards. HMGP funds projects in accordance with priorities identified in State, Tribal or local hazard mitigation plans, and enables mitigation measures to be implemented during the recovery from a disaster.</p> <p>Funding: a State has a FEMA-approved <i>Standard</i> State Mitigation plan, HMGP funds are available based on up to 15% for amounts not more than \$2 Billion.</p>
PDM	<p>Availability: Pre-Disaster</p> <p>Description: To provide funds to states, territories, Indian Tribal governments, and communities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations.</p> <p>Funding: Nationwide competition, total funding available – FY 2007 was \$100 Million.</p>



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Funding Source	Description
SRL	<p>Availability: Pre Disaster</p> <p>Description: To reduce or eliminate the long-term risk of flood damage to severe repetitive loss residential properties and the associated drain on the National Flood Insurance Fund (NFIF) from such properties.</p> <p>Funding: FEMA is combining the \$ 40 \$40 million FY 2006 and \$40 million FY 2007 funds for a total of \$160 million available.</p>
RFC	<p>Availability: Pre Disaster</p> <p>Description: To reduce or eliminate the long-term risk of flood damage to structures insured under the National Flood Insurance Program (NFIP) that have had one or more claim payment(s) for flood damages.</p> <p>Funding: Nationwide competition for a total of \$10 million</p>
Fire Management Assistance Grant Program	<p>Availability: Post Disaster</p> <p>Description: Assistance for the mitigation, management, and control of fires on publicly or privately owned forests or grasslands, which threaten such destruction as would constitute a major disaster.</p> <p>Funding:</p>
The Community Development Block Grant (CDBG)	<p>Availability: Pre or Post Disaster</p> <p>Description: Federal grant provided to CDBG "entitlement communities" (typically municipalities with populations over 50,000 and urban counties with populations over 200,000) and to all states.</p> <p>Funding: Varies</p>
Reimbursement for Firefighting on Federal Property	<p>Availability: Post Disaster</p> <p>Description: Provides reimbursement only for direct costs and losses over and above normal operating costs.</p> <p>Funding:</p>
National Dam Safety Program	<p>Availability: Pre Disaster</p> <p>Description: National Dam Safety Program (NDSP). The NDSP, which is led by FEMA, is a partnership of the states, federal agencies, and other stakeholders to encourage individual and community responsibility for dam safety.</p> <p>The NDSP, which was formally established by the Water Resources and Development Act of 1996, includes:</p> <p>Funding: Grant Assistance to the States: Provides vital support for the improvement of the state dam safety programs that regulate most of the 79,500 dams in the United States.</p>
Land and Water Conservation Fund (LWCF)	<p>Availability: To States, Local and conservation organizations</p> <p>Description: Funding to States for outdoor recreational development, renovation, land acquisition and planning.</p> <p>Funding: LWCF is authorized at \$900 million annually, a level that has been met only twice during the program's 40-year history. The program is divided into two distinct funding pots: State grants and Federal acquisition funds. In FY 2005, the federal acquisition pot received \$166 million and the state grants program received \$92.5 million for a total of \$258.5 million. In FY 2006 the federal pot received \$114.5 and the state grants received \$30 million. FY 2007 was similar to the year before receiving \$113 million for federal acquisition and \$30 million for state grants.</p>
The Forest Legacy Program (FLP)	<p>Availability: Participation in Forest Legacy is limited to private forest landowners.</p> <p>Description: Federal program in partnership with States, supports State efforts to protect</p>



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Funding Source	Description
	<p>environmentally sensitive forest lands. Designed to encourage the protection of privately owned forest lands, FLP is an entirely voluntary program. To maximize the public benefits it achieves, the program focuses on the acquisition of partial interests in privately owned forest lands. FLP helps the States develop and carry out their forest conservation plans. It encourages and supports acquisition of conservation easements, legally binding agreements transferring a negotiated set of property rights from one party to another, without removing the property from private ownership. Most FLP conservation easements restrict development, require sustainable forestry practices, and protect other values.</p> <p>Funding: To qualify, landowners are required to prepare a multiple resource management plan as part of the conservation easement acquisition. The federal government may fund up to 75% of project costs, with at least 25% coming from private, State or local sources. In addition to gains associated with the sale or donation of property rights, many landowners also benefit from reduced taxes associated with limits placed on land use. In 2008, NJ has one project funded: Sparta Mountain South \$2,474,000.</p>
Transportation Trust Fund	<p>Availability: Pre and Post Disaster</p> <p>Description: Grants are funded by the Transportation Trust Fund through a competitive application based process administered by the Local Aid District Offices.</p> <p>Funding: \$78.75M in TTF funding was available in the FY 2008 Municipal Aid Program.</p> <p>Description: County Aid Program- Administer the County Aid Program for road and bridge infrastructure improvements under county jurisdiction. Each County receives an annual formula based allotment that takes into consideration county road lane mileage and population. The County Aid Program is funded through the Transportation Trust Fund and provides funding for eligible costs of projects included in the County's approved Annual Transportation Program.</p> <p>Funding: \$78.75M in TTF funding was available in the FY 2008 County Aid Program.</p>
Environmental Infrastructure Financing Program	<p>Availability: Pre or Post Disaster</p> <p>Description: Borrowers receive loans in two equal parts: Approximately one half to three quarters comes from a zero interest State Revolving Fund (SRF) maintained by the DEP. The other portion comes from proceeds of highly rated tax-exempt revenue bonds sold by the Trust. Combining these two funds results in a loan that is 50 to 75% lower than traditional loan rates.</p> <p>Funding: Is available for qualified borrowers.</p>
Pinelands Infrastructure Trust Fund	<p>Availability: Pre or Post Disaster</p> <p>Description: This program provides funding for infrastructure projects needed to accommodate existing and future needs in the 23 designated Pinelands Regional Growth Areas.</p> <p>Funding: Funding is available for the construction of new collection systems, interceptors, and the expansion/upgrade of wastewater treatment facilities. Projects certified under this program generally receive a grant for 40 percent of the allowable project costs and a loan for 20 percent of the allowable project costs from the Department. Loans for the remaining project costs may also be received from the Trust.</p>
Meadowlands Infrastructure Trust Fund	<p>Availability: Pre or Post Disaster</p> <p>Description: is a regional zoning and planning agency established by an act of New Jersey State Legislature in 1969. Its founding mandates are to protect the delicate balance of nature, to provide for orderly development, and to manage solid waste activities.</p> <p>Funding: Grants available for stormwater management, updating GIS systems, affordable housing planning, and solid waste disposal for the Counties and Municipalities that are under this Commission.</p>
Green Acres Program	<p>Availability: Pre or Post Disaster</p> <p>Description: The Garden State Preservation Trust leverages this \$98 million in constitutionally dedicated funds to issue bonds and to make the maximum dollars available through three Today, New Jersey has the largest preservation program in the nation for a geographic area of this size. It is financed with Garden State Preservation Trust funds through three partnering</p>



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Funding Source	Description
	<p>agencies: The Green Acres Program, a division of the Department of Environmental Protection to preserve natural lands and recreational parks. The Farmland Preservation Program, administered by the independent State Agriculture Development Committee to acquire the development rights on privately owned farmland. Historic Preservation, administered by the independent New Jersey Historic Trust to provide matching grants to save important historic buildings.</p> <p>Funding: Garden State Preservation Trust Fund Account (Trust Fund) which will receive \$98 million annually for ten years. From FY 2010 through and including FY 2029, debt service on the bonds shall be satisfied by funds deposited into the trust fund from the general fund. These funds will not exceed \$98 million during a Fiscal Year. The bill will allow projects funded under the Trust Fund to begin immediately by allowing \$90 million to be appropriated through the appropriations act for FY 2000.</p>
NJ Small Communities Development Block Grants	<p>Availability: Pre or Post Disaster</p> <p>Description: Provide funds for economic development, housing rehabilitation, community revitalization and public facilities designated to benefit people of low and moderate-income or to address recent local needs for which no other source of funding is available to non-entitlement Counties and Municipalities.</p> <p>Funding: Varies</p>
NJ Open Space Program	<p>Availability: To Counties and Municipalities that have passed a tax assessment on property owners to help purchase land in their community.</p> <p>Description: 53 towns and 13 counties collect 1 to 5 cents on each \$100 of assessed property value. State law requires that the money go to a dedicated trust fund for open space and parks, farmland development easements and historic preservation.</p> <p>Funding: Varies based on county tax amount and assessments of property.</p>
New Jersey Conservation Foundation (NJCF)	<p>Description: NJCF is a private, not-for-profit organization. Through acquisition and stewardship NJCF protects strategic lands, promotes strong land use policies, and forges partnerships to achieve conservation goals. Since 1960, NJCF has protected over 100,000 acres of natural areas and farmland in New Jersey – from the Highlands to the Pine Barrens to the Delaware Bay, from farms to forests to urban and suburban parks.</p> <p>Funding: Provides support through knowing and understanding the many type of grants and programs that exist to help fund land preservation activities.</p>



## 5.9 General Description and Analysis of the Effectiveness of Local Mitigation Policies, Programs and Capabilities

New Jersey has 21 Counties comprised of 566 Municipalities and follows a “home rule” philosophy that each municipality is responsible for local enforcement of building codes, floodplain management, emergency management and zoning local ordinances. In order to ensure a minimum set of standards, NJ has passed laws and regulations mandating each municipality adopt local ordinances with the same basic criteria so jurisdictions may add additional requirements, but cannot have fewer requirements than the State. Having each Municipality with a core set of policies, programs and capabilities at its disposal, allows for more effective mitigation against hazards, regardless of its relative size, population or wealth. While local mitigation policies, programs and capabilities will be discussed in detail in local and multi-jurisdictional hazard mitigation plans that are now being prepared, New Jersey mandates compliance with the Municipal Land Use Law, Uniform Construction Codes, Floodplain Management, and Growth Management, and strongly encourages land and water preservation through incentive programs. These mandates translate into local ordinances, policies or programs that regulate and enforce how zoning, building and open space in the Municipalities. Table 5.9-1 highlights the State Laws that drive the State’s policies to support local jurisdictions’ ability to impact hazard mitigation.

**Table 5.9-1  
 New Jersey Policies that Impact Local hazard Mitigation Efforts**

<b>Policy</b>		<b>Land Use Planning</b>
Description		State of New Jersey Municipal Land Use Law (MLUL) L.1975, c. 291, s. 1, eff. Aug. 1, 1976, is the legislative foundation of the land use process, including decisions by Planning Boards and Zoning Boards of Adjustment, in the State of New Jersey. It defines the powers and responsibilities of boards and is essential to their functions and decisions. It also provides the required components of a municipal Master Plan.
Applicability		Every municipal agency shall adopt and may amend reasonable rules and regulations, not inconsistent with this act or with any applicable ordinance, for the administration of its functions, powers and duties.
Effectiveness		The MLUL requires that each municipality prepare a comprehensive plan and update that plan every 6 years. These plans help jurisdictions review their land use plans and policies with public participation.
<b>Policy</b>		<b>Floodplain Management</b>
Description		NJ State Law Flood Hazard Area Control Act (N.J.S.A. 58:16A-52)The National Flood Insurance Act of 1968 is a federal program (NFIP) enabling property owners in participating communities to purchase insurance as protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. As further incentive for communities to surpass the NFIP basic requirements, the Community Rating System (CRS) recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements.
Applicability		The Act and regulations attempts to minimize damage to life and property from flooding caused by development within fluvial and tidal flood hazard areas, to preserve the quality of surface waters, and to protect the wildlife and vegetation that exist within and depend upon such areas for sustenance and habitat. While it does not require local adoption, as it is enforced by the NJ Department of Environmental Protections, the floodplain ordinances of each municipality need to be reviewed to be in compliance with this new regulations.



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Effectiveness	Flood Hazard Control Act: Regulations for the Flood Hazard Control Act were adopted in November, 2007 so it is difficult to quantify the effectiveness at this time. NFIP: There are 546 municipalities that participate in the NFIP in the State of New Jersey. 45 of the 566 municipalities participate in the CRS program. 9 communities with a Class 9 rating (5% premium reduction); 23 with a Class 8 rating (10% premium reduction); 11 with a Class 7 rating (15% premium reduction) and 2 with a Class 6 rating (20% premium reduction). The avg. savings per policy holder is about \$87.00 per year or a total community savings of about \$9,384,397 per year. The NJ Dam Safety program, new state stormwater management requirements, and the development of all hazard mitigation plans, are some of the efforts at the State level that are available to provide CRS credits for all NJ municipalities.
<b>Policy Building Codes</b>	
Description	Uniform Construction Code (Uniform Construction Code Act of 1975) requires all jurisdictions to have current land use master plans (reexamined every six years), zoning and other land development ordinances. The UCC adopts up-to-date building codes as its Building Subcode and One- and Two-Family Subcode. These Subcodes contain requirements that address construction in both A and V flood zones.  Also, all new construction is required to comply with the UCC for flood zone construction. In the shore communities, older at grade structures have been routinely razed and replaced with new and often larger structures, all now conforming to the NFIP's requirements for A-zone and V-zone construction. Thus, through the building boom of the 1990's and into the new millennium, there have been thousands of structures modified to FEMA's more stringent requirements or newly constructed to the up-to-date Building Subcodes of the Uniform Construction Code, especially with respect to homes built on piling at or above the base flood elevation for that zone. This in itself is a form of mitigation. However, there are still thousands of older homes still at grade that remain vulnerable to the ravages of coastal storms and hurricanes.
Applicability	NJ State Law requires that all municipalities adopt ordinances that follow the UCC.
Effectiveness	Considered among the most effective elements in a mitigation program, because building codes mandate best practices and technology, much of which is designed to reduce or prevent damage from occurring when structures are under stress.
<b>Policy Growth Management</b>	
Description	Land preservation and recreation comprise one of the cornerstones of NJ's smart growth policy. The NJ Statewide Comprehensive Outdoor Recreation Plan (SCORP), provides statewide policy direction to the State, local governments and conservation organizations in the preservation of open space and the provision of public recreation opportunities. The State Plan was prepared and adopted by the State Planning Commission according to the requirements of the State Planning Act of 1985 as amended (N.J.S.A. 52:18A-196 et seq.) to serve as an instrument of state policy to guide state agencies and local government in the exercise of governmental powers regarding planning, infrastructure investment and other public actions and initiatives that affect and support economic growth and development in the State.
Applicability	Green Acres Program, Open Space Tax Program and Development and Redevelopment Plan The State Planning Act has enhanced the traditionally limited role of county land-use planning and control. Also provides tools for Municipalities when preparing their master land use plans and better opportunity for a comprehensive approach to planning so not to harm or be in conflict with neighboring Municipalities' plans.
Effectiveness	NJ residents have consistently voted for open space and recreation referendums at the State and local levels. In 2007 all 21 Counties and 231 Municipalities assessed a special tax for land preservation and recreation purposes.
<b>Policy Shoreline Management</b>	



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Description	Coastal Area Facility Review Act (N.J.S.A. 13:19). The CAFRA Law regulates almost all development along the coast for activities including construction, relocation, and enlargement of buildings or structures; and all related work, such as excavation, grading, shore protection structures, and site preparation.
Applicability	CAFRA applies to projects near coastal waters in the southern part of the State. The law divides the CAFRA area into pieces or zones, and regulates different types of development in each zone. Generally, the closer you are to the water, the more likely it is that your development will be regulated. The CAFRA law regulates almost all development activities involved in residential, commercial, or industrial development, including construction, relocation, and enlargement of buildings or structures; and all related work, such as excavation, grading, shore protection structures, and site preparation.
Effectiveness	This Law helps local communities strengthen local shoreline ordinances to provide for sufficient shoreline buffers, setbacks and appropriated design to avoid or limit development on unstable shoreline slopes and infrequently flooded areas. However, many communities have not passed these types of ordinances due to intense political pressure to build along their coastal boundaries. This law is implemented through New Jersey's Coastal Zone Management Rules N.J.A.C. 7:7E-1.1 <u>et seq.</u> Since they were finalized in September 1980 these rules have effectively regulated larger developments (25 residential units or more, 300 commercial parking spaces or more) in coastal high hazard areas, erosion hazard areas, flood hazard areas and permits issued required construction in accordance with the NFIP requirements in A and V zones. Effective July 1994 the CAFRA jurisdiction was expanded to include every single family residential development within 150' of the mean high water line, beach or dune. The threshold for regulation over commercial development was lowered to capture smaller commercial developments and the DEP gained authority over any disturbance to a beach or dune area or the placement of a structure in these areas. Effective November 5, 2007 the CZM rules incorporate the new and more stringent Flood Hazard Area Control Act rules standards, including protection of riparian buffers along tidal water courses that can be 50', 150' and 300' along environmentally sensitive (Category-1) waterways.
<b>Policy Critical Area Protection</b>	
Description	Green Acres Program; Blue Acres Program; Historical Preservation Program; Farmland Preservation
Applicability	These programs provide the funding necessary for Municipalities and Counties to purchase land for open space preservation and recreation.
Effectiveness	\$3.3 billion public investment in open space preservation and recreation by the State since 1961.

The SHMT also works with Counties and Municipalities that are interested in adopting policies or programs to positively impact hazard Mitigation. Model ordinances or information and potential funding sources have been provided to interested jurisdictions in the areas of property acquisition programs, CRS programs, incorporating Mitigation into Capital Improvement Processes and Plans, tree pruning programs, stream maintenance programs, using GIS and updating Floodplain maps and studies.

### Project Awards and Implementation

From the county to the municipal entities, the ability to efficiently meet hazard mitigation requirements is mixed. New Jersey is completely incorporated into 566 municipalities, so overall County control of mitigation planning is sometimes problematic. Coordination of overall emergency management planning is more efficient and streamlined. In the development of local, multi-jurisdictional Hazard Mitigation Plans, where



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municipal activity is critical to build larger multi-jurisdictional plans, disparities in available resources become evident and support for obtaining best available data and information can be problematic due to the many Municipalities and their limited resources that are integral to the planning processes.

In order to further facilitate hazard mitigation planning efforts, the New Jersey Office of Emergency Management works in cooperation with the Governor's Office and through the New Jersey State League of Municipalities to provide direction and technical assistance in the development of local and multi-jurisdictional plans and projects.

With the assistance of NJOEM a number of New Jersey local jurisdictions have been successful in obtaining funds for mitigation projects. As these success stories continue, more jurisdictions will recognize the potential for mitigating hazards in their communities. Tables 5.9-2 and 5.9-3 list mitigation projects awarded to New Jersey Communities in 2006 and 2007, respectively.

**Table 5.9.2  
2006 Hazard Mitigation Project Grants**

2006 Mitigation Project Grants				
Project	Funding Source	FEMA Funds	Other Funds	Total
Harmony Acquisitions	FMA	\$674,640	\$224,880	<b>\$899,520</b>
Wayne Acquisitions	FMA	\$5,749,500	\$1,016,500	<b>\$7,666,000</b>
Harmony Acquisitions	HMGP	\$858,900	\$286,300	<b>\$1,145,200</b>
Harmony Elevations	HMGP	\$372,300	\$124,100	<b>\$496,400</b>
Pohatcong Acquisitions	HMGP	\$366,550	\$121,850	<b>\$487,400</b>
Fairfield Elevations	HMGP	\$103,073	\$64,358	<b>\$257,431</b>
Carneys Point Flood Control	PDM	\$1,221,069	\$407,023	<b>\$1,628,092</b>
Little Falls Acquisition	RFC	\$1,900,000	0	<b>\$1,900,000</b>
<b>Total</b>		<b>\$11,246,032</b>	<b>\$2,245,011</b>	<b>\$14,480,043</b>

**Table 5.9-3  
2007 Hazard Mitigation Project Grants**

Government	Funding Source	FEMA Funds	Other Funds	Total
Brigantine City Pump Station	FMA	\$750,000	\$250,000	<b>\$1,000,000</b>
Harmony Township Acquisitions	FMA	\$2,200,000	\$733,000	<b>\$2,933,000</b>
Little Falls Acquisitions	RFC	\$1,500,000	0	<b>\$1,500,000</b>
Frenchtown Acquisitions	RFC	\$1,000,000	0	<b>\$1,000,000</b>
Lambertville Flood Control	HMGP	\$150,000	\$50,000	<b>\$200,00</b>
<b>Total</b>		<b>\$5,600,000</b>	<b>\$1,033,000</b>	<b>\$6,433,200</b>



## Section 6 Coordinating Local Planning

### Contents of this Section

- 6.1 IFR Requirement
- 6.2 State Process for Developing Local Plans
- 6.3 Local Plan Review, Coordination and Linkages
- 6.4 Criteria for Prioritizing Mitigation Planning and Project Grants

### 6.1 IFR Requirement for Coordinating Local Planning

“[The State Hazard Mitigation Plan shall include a] section on the *Coordination of Local Mitigation Planning* that includes the following:

- [i] A description of the State process to support, through funding and technical assistance, the development of local mitigation plans.
- [ii] A description of the State process and timeframe by which local plans will be reviewed, coordinated and linked to the State Mitigation Plan.
- [iii] Criteria for prioritizing communities and local jurisdictions that would receive planning and project grants under available funding programs, which should include consideration for communities with the highest risk, repetitive loss properties, and most intense development pressures. Further, that for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs.”

### 6.2 State Process for Developing Local Plans

This section describes the process used by the New Jersey Office of Emergency Management (NJOEM) to support the development of local mitigation plans through funding and technical assistance. This section of the HMP has been updated to reflect how the State (primarily through the efforts of NJOEM) has developed processes to help local jurisdictions obtain funding and technical assistance for mitigation planning. As noted elsewhere in this plan, as of the beginning of 2008 only a few mitigation plans have been approved in New Jersey (Atlantic City and Wayne Township), although two are under FEMA review (Lambertville and the City of Trenton). However, all 21 Counties are beginning the process, thanks to a series of FEMA grants. Table 6.2-1 shows the status of Statewide mitigation planning grants, as of December 2007.



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**Table 6.2-1  
Status of New Jersey County Hazard Mitigation Plans, as of December 2007**

County	Hazard Mitigation Plan Status
<b>Atlantic</b>	Beginning phases on planning, tentative scheduled completed 12/2009
<b>Bergen</b>	Working on a multi-jurisdiction draft plan in conjunction with the Meadowlands Commission
<b>Burlington</b>	Draft Plan submitted to FEMA for review on 7/2007
<b>Camden</b>	Working with Cumberland, Gloucester, and Salem on a multi-jurisdiction plan and at beginning phases of drafting. Tentative scheduled completion 12/2009
<b>Cape May</b>	Beginning phases on planning, tentative scheduled completed 10/2009
<b>Cumberland</b>	Working with Camden, Gloucester, and Salem on a multi-jurisdiction and are at the beginning phases of planning. Tentative scheduled completion December, 2009
<b>Essex</b>	Draft Plan submitted to NJOEM for review, 11/2007
<b>Gloucester</b>	Working with Camden, Cumberland, and Salem on a multi-jurisdiction plan are at the beginning phases of planning. Tentative scheduled completion December, 2009
<b>Hudson</b>	Draft Plan scheduled to completed for NJOEM review by 5/2008
<b>Hunterdon</b>	NJOEM working with Mercer, Sussex and Warrant Counties to utilize work done on existing FMA plan to expand into an All Hazard Mitigation Plan
<b>Mercer</b>	NJOEM working with Hunterdon, Sussex and Warren Counties to utilize work done on existing FMA plan to expand into an All Hazard Mitigation Plan
<b>Middlesex</b>	Beginning phases to be completed by November, 2009
<b>Monmouth</b>	Draft plan scheduled to be completed for NJOEM review by 3/2008
<b>Morris</b>	Draft plan scheduled to be completed for NJOEM review by 3/2010
<b>Ocean</b>	Working on a draft plan
<b>Passaic</b>	Draft plan scheduled to be completed for NJOEM review by 7/2009
<b>Salem</b>	Working with Cumberland, Gloucester, and Salem on a multi-jurisdiction. At beginning phases of planning. Tentative scheduled completion 12/2009
<b>Somerset</b>	Draft plan scheduled to be completed for NJOEM review by 8/2008
<b>Sussex</b>	NJOEM working with Hunterdon, Mercer and Warren counties to utilize work done on existing FMA plan to expand into an All Hazard Mitigation Plan
<b>Union</b>	Beginning phases of planning to be completed for review 5/2009
<b>Warren</b>	NJOEM working with Hunterdon, Mercer and Sussex Counties to utilize work done on existing FMA plan to expand into an All Hazard Mitigation Plan

The State has established the basic processes for assisting local and regional jurisdictions with mitigation planning, and these will be further developed and refined as all the Counties write their HMPs. NJOEM is the lead agency responsible for hazard mitigation activities in the State. The Office established three general subject areas in carrying out its responsibilities with regard to mitigation at the local and regional levels:



- Planning awareness and education
- Funding support
- Technical assistance

These subject areas are discussed in the paragraphs below.

➤ Planning Awareness and Education

NJOEM provides software, materials and workshops to help municipalities and counties as they draft their plans. NJOEM distributes the FEMA 363 series of “how to” guides, Benefit-Cost Analysis software, and the FEMA Region II planning toolkit (located at <http://www.fema.gov/about/regions/regionii/toolkit.shtm>) to help jurisdictions as they draft plans. NJOEM also holds workshops on various subjects, many with FEMA experts to help with the training. These workshops include:

- Repetitive flood loss severe repetitive flood loss
- Benefit-cost analysis
- Hazard mitigation planning
- Coastal mitigation plans
- Mapping
- HAZUS
- Program roll-out
- Application development roll –out
- Planning software

Workshops are planned and scheduled based on the grant cycles, to ensure that communities who plan to apply for specific grants have the most up-to-date information. NJOEM also schedules workshops at the request of jurisdictions.

NJOEM also provides jurisdictions with Interim Final Rule (44 CFR) and FEMA’s plan review crosswalk. For each on-going plan development effort, NJOEM attends at least one mitigation core team meeting, one stakeholder meeting, and one public meeting to be a resource to the municipality or County, to answer any questions and to direct planners to State resources or tools. NJOEM staff also is available during the draft plan development to answer any questions or provide guidance and assistance.

## Funding Support

In the 2005 HMP, the State focused on eight New Jersey counties experiencing the highest frequency and dollar amounts of repetitive flood losses. These Counties received priority technical assistance in developing local multi-jurisdictional hazard mitigation plans to meet the requirements of the Stafford Act, as amended by the Disaster Mitigation Act of 2000. These eight Counties included four coastal and four riverine Counties. These comprise 270 (48 percent) of the 566 municipalities in New Jersey, and account for approximately 70 percent of all the repetitive loss flood damage reported since 1978.

Since approval of the previous plan, NJOEM has made funding for local and regional mitigation plans a top priority. NJOEM has worked closely with Counties to obtain the funding to develop mitigation plans or Flood Mitigation Assistance (FMA) plans. The result has been that NJOEM has assisted 19 Counties in securing funds for mitigation planning. Table 6.2-2 provides the breakdown by County of the source and funds awarded.



**Table 6.2-2  
Mitigation Planning Grants in New Jersey 2005-2007**

<b>2005- 2007 Mitigation Planning Grants</b>				
<b>Government</b>	<b>Funding Source</b>	<b>FEMA Funds</b>	<b>Other Funds</b>	<b>Total</b>
Delaware River Basin Commission for Mercer, Hunterdon, Warren and Sussex Counties	FMA	\$97,000	\$32,858 (NJDEP)	\$129,858
Burlington County	FMA	\$63,700	\$21,233	\$84,933
Burlington County	HMGP	\$71,899	\$23,966	\$95,865
Essex County	PDM	\$1,176,187	\$392,062	\$1,568,250
Hudson County	PDM	\$879,999	\$303,600	\$1,183,600
Monmouth County	PDM	\$345,375	\$103,615	\$448,990
Somerset County	PDM	\$199,000	\$59,700	\$258,700
Joint Plan: Camden, Cumberland, Salem, Gloucester Counties	PDM	\$463,000	\$155,000	\$618,000
Atlantic County	PDM	\$165,000	\$55,000	\$220,000
Cape May County	PDM	\$474,000	\$158,000	\$632,000
Middlesex County	PDM	\$200,000	\$66,000	\$266,000
Morris County	PDM	\$300,000	\$100,000	\$400,000
Passaic County	PDM	\$225,000	\$75,000	\$300,000
Union County	HMGP	\$375,000	\$125,000	\$500,000
<b>Total</b>		<b>\$5,035,160</b>	<b>\$1,671,034</b>	<b>\$6,076,196</b>

NJOEM will continue its role in helping jurisdictions obtain grants (usually through FEMA) to develop new plans, and to update their plans on the required five-year cycle. As noted in various other places in this plan, the State will remain actively engaged with these jurisdictions as they develop their HMPs.

➤ **Technical Assistance**

New Jersey State agencies increasingly maintain the best, readily available, documented information that can meet FEMA's requirements for local mitigation planning. This information includes digital data - online and digital maps for flood frequency (Q3 and DFIRMs), landslide susceptibility, peak ground acceleration, and HAZUS loss estimation information. The New Jersey Office of Emergency Management, the New Jersey Office of Information Technology, the Department of Environmental Protection and other State agencies involved in the development and use of natural hazards digital data are active members in the New Jersey Geospatial Forum (<http://njgin.nj.gov/>), and the Urban and Regional Information Systems Association (URISA). URISA is a nonprofit association of professionals using Geographic Information Systems (GIS) and other information technologies to solve challenges in state/provincial and local government agencies and departments. URISA ([www.urisa.org](http://www.urisa.org)) and its Mid-Atlantic chapter serving New Jersey, and other organizations serving GIS professionals as well as the larger planning, scientific, engineering and academic communities. These organizations are constantly improving their spatial capabilities and sharing it with the larger organizations. To help get this information out to the Counties, NJOEM routinely shares digital data with County Emergency Management Coordinators and through these County Coordinators to municipal emergency management agencies.

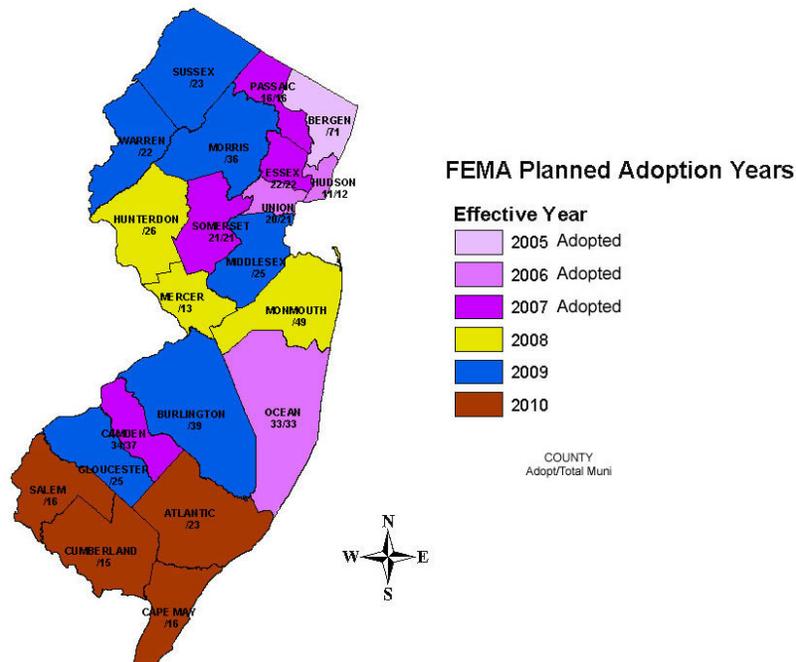


In addition to hazard data, accurate and updated flood maps and data are critical tools to help communities manage land use and floodplains and to help the communities recognize where potential flooding could occur so mitigation plans can be made. There are both State and Federal Mapping Improvement Initiatives going on simultaneously. New Jersey has suffered significantly from flooding events and because of these events, the State Legislature mandated that the design flood discharge used to delineate the limits of the flood hazard areas will be computed using the 100-year discharge plus 25%; this NJ Flood Hazard Area standard (NJFHA standard) is a higher standard than FEMA's Digital Flood Insurance Map (DFIRM) standard. In addition, the State Legislature has mandated that floodway delineations should be based on the principle that the area chosen for the floodway must be designed to carry the waters of the 100-year flood without increasing the water surface elevation of the 100-year flood by more than two tenths of a foot (0.2 ft.) at any point; this NJ floodway standard is above FEMA's federal standard of a 1 foot rise but has also been adopted in NJ for FEMA DFIRMs.

FEMA has moved in the direction of a five-year digital map modernization program based on the process for developing the data necessary for updating the maps on countywide studies rather than municipal studies. The Countywide studies provide a digital environment to allow for easier revisions and updates, and include original delineations with more recent updated delineations. The New Jersey Department of Environmental Protection, National Flood Insurance Program (NFIP) State Coordinator for New Jersey has been working with FEMA and the New Jersey Office of Information Technology (NJOIT) to develop spatial data needed to support the development of highly accurate flood hazard data. The State has completed its statewide orthrophotography. When coupled with the collection of elevation data that will reduce the cost of developing hydraulic analysis, this information will help provide the necessary data for FEMA digital mapping.

New Jersey seeks to integrate its mapping program with the FEMA program. This integration hinges on creating FEMA DFIRMs for New Jersey, which delineates the New Jersey Flood Hazard Area (NJFHA). By including the NJFHA on the DFIRM, the state would be able to use the FEMA DFIRMs as the single source for both Federal and state flood plain management, freeing up staff resources and increasing efficiency.

**Figure 6.2-1**  
**Anticipated Years for DFIRM Adoption in New Jersey**





The State also has access to digital elevation for use in updating the flood maps for the Counties, in the form of LIDAR. LIDAR (Light Detection and Ranging) is a high-accuracy, high-resolution digital mapping of the Atlantic coastline using technology from the United States Army Corps of Engineers. The surveys include:

- Topographic LIDAR from the water line landward 500 meters, with one meter posting between elevation measurements
- Hydrographic LIDAR from the water line seaward 1,000 meters (or to a depth the LIDAR can no longer detect bottom due to turbidity) with five meter posting between elevation measurements
- Digital imagery with 20 centimeter (approximately 8 inch) pixel resolution.

FEMA has set specifications on how to collect LIDAR data for flood hazard mapping. As of this report, NJOEM is assisting NJDEP in funding a LIDAR project in Cape May, Cumberland, and Salem Counties. These data will be used by FEMA for its Flood Map Modernization Program.

In addition to technical assistance, materials and workshops, The State provides links to web sites of State or national resources which include interactive mapping, geology and other useful information. Table 6.2-3 provides the link information

**Table 6.2-3  
New Jersey Hazard Mitigation Resources**

Information	Website
Geological Survey	<a href="http://www.State.nj.us/dep/njgs/">http://www.State.nj.us/dep/njgs/</a>
Mitigation Planning	<a href="http://www.fema.gov/about/regions/regionii/toolkit.shtm">http://www.fema.gov/about/regions/regionii/toolkit.shtm</a>
Weather Related Incidents	<a href="http://www.noaa.gov/">http://www.noaa.gov/</a>
Population	<a href="http://www.uscensus.gov">http://www.uscensus.gov</a>
NJ State All Hazard Plan	<a href="http://www.State.nj.us/njoem/">http://www.State.nj.us/njoem/</a>
Funding Information	<a href="http://www.State.nj.us/dep/grantandloanprograms/">http://www.State.nj.us/dep/grantandloanprograms/</a> <a href="http://www.State.nj.us/dca/grants/">http://www.State.nj.us/dca/grants/</a> <a href="http://www.State.nj.us/njoem/opb_mitigation.html">http://www.State.nj.us/njoem/opb_mitigation.html</a> <a href="http://www.fema.gov/government/grant/index.shtm">http://www.fema.gov/government/grant/index.shtm</a> <a href="http://www.njeit.org">http://www.njeit.org</a> (New Jersey Environmental Infrastructure Trust)
Digital data collections and mapping	NJGIN Explorer information about a diversity of digital geospatial data available for use with Geographic Information Systems software: <a href="https://njgin.State.nj.us/NJ_NJGINExplorer/index.jsp">https://njgin.State.nj.us/NJ_NJGINExplorer/index.jsp</a>  I-MAP NJDEP, an online interactive mapping system <a href="http://www.nj.gov/dep/gis/index.html">http://www.nj.gov/dep/gis/index.html</a>



Information	Website
	<p>New Jersey Department of Community Affairs, Office of Smart Growth, online GIS maps and digital data:</p> <p><a href="http://www.nj.gov/dca/osg/resources/maps/index.shtml">http://www.nj.gov/dca/osg/resources/maps/index.shtml</a></p> <p>New Jersey Department of Transportation, State and County GIS maps</p> <p><a href="http://www.State.nj.us/transportation/gis/map.shtm">http://www.State.nj.us/transportation/gis/map.shtm</a></p> <p>National Geodata One-Stop</p> <p><a href="http://www.geodata.gov/">http://www.geodata.gov/</a></p> <p>NSDI Geospatial Data Clearinghouse</p> <p><a href="http://www.fgdc.gov/clearinghouse/">http://www.fgdc.gov/clearinghouse/</a></p>

### 6.3 Local Plan Review, Coordination and Linkages

Local mitigation plans represent commitments to reduce risks from natural hazards, and serve as the basis for the State to provide technical assistance and prioritize project funding. As of November 1, 2004, a local government must have a FEMA-approved mitigation plan to receive HMGP and PDM project grants. This requirement can be satisfied when a jurisdiction is included in a regional or county-wide plan. The requirement to have a FEMA-approved plan also applies to the SRL and RFC programs. FEMA requirements for local plans were established at 44 CFR 201.6(d). They require that "plans must be submitted to the State Hazard Mitigation Officer for initial review and coordination. The State will then send the plan to the appropriate FEMA Regional Office for formal review and approval." While the local hazard mitigation plans in effect become extensions of the State Hazard Mitigation Plan, there is no explicit authority in EO #115 (Florio) for the SHMO to review or approve local mitigation plans. Therefore, the State Hazard Mitigation Officer's role is interpreted to include:

1. A finding that the local plan includes all of the elements required by FEMA at 44 CFR 201.6(b) and (c)
2. A finding that the local plan adequately addresses all of the required elements in accordance with FEMA guidance documents and planning requirements; and
3. A finding that the local plan does not conflict with provisions of the SHMP, or defines reasonable measures by which to be reconciled with the SHMP at the next SHMP update.

NJOEM provides jurisdictions with a timetable and requirements necessary for NJOEM to review the plan. NJOEM staff requests two hard copies and a CD of the draft plan and any appendices. NJOEM staff uses



the FEMA All Hazards Mitigation Plan Crosswalk in its review, to ensure that all requirements are met. State staff has 60 days to review the Plan. After its review, the State either...

1. Returns the draft plan to the jurisdiction, with required revisions, or
2. Informs the municipality or county that it satisfied the FEMA crosswalk requirements and will be forwarded to FEMA Region II for review

If substantial improvements are required, the timeframe is re-initiated. If there are minor improvements, the Staff will review in 20 days. Table 6.3-1 shows the normal review timeframes. As discussed elsewhere, as of the 2008 State Hazard Mitigation Plan update, the State has reviewed very few plans, so these timelines and procedures are subject to change after NJOEM has tested them for some period of time.

**Table 6.3-1  
NJOEM Schedule of Review for Local Hazard Mitigation Plans**

Element	Normal Schedule
Draft Plan Delivered to NJ OEM (2 hard copies and 2 CDs)	NJOEM has 60 days to review. NJOEM provides an end date to municipality.
Plan Review – Requirements Not Met	NJOEM reviews draft and requirements are not met. Once the municipality submits the revised plan to NJOEM, the 60 day review begins and NJOEM provides an end date to municipality.
Plan Review – Minor changes	NJOEM reviews revised draft within 20 days of receipt.
Plan Review – Requirements Met	NJOEM informs the municipality the State review is complete and forwards the draft for FEMA Region II review.
Plan Review – Requirements Not Met	FEMA has 60 days from receipt of draft to review the draft. If requirements are not met, FEMA provides NJOEM with a detailed explanation and provides recommended revisions. NJOEM has 45 day to inform the municipality in writing about the plan and the State review process starts again.
Plan Review – Minor changes	FEMA has 60 days from receipt of draft to review the draft. FEMA will notify NJOEM that requirements are not met. Once the municipality submits the revised draft, NJOEM reviews the draft within 20 days of review.
Plan Review – Requirements Met	FEMA has generally 60 days from receipt of draft to review draft. If requirements are met, FEMA approves the plan and informs NJOEM. NJOEM informs the municipality in writing that the plan is approved.

Support does not stop once a plan is approved. NJOEM has an annual review with the approved Counties and municipalities to review the monitoring and implementation of plans and to help with implementing and applying for projects that were outlined in them. The State also incorporates the actions identified in the approved plans into the State’s plan.

Within sixty (60) days of receipt of formal notification of approval of the local hazard mitigation plan by FEMA, the SHMO will notify the State Hazard Mitigation Team (SHMT) of the approval, provide copies of the approved local hazard mitigation plan (in print or digital format) to members of the SHMT, and convene the SHMT to consider an amendment to the State Hazard Mitigation Plan that:

1. Incorporates the local hazard mitigation plan into the State Hazard Mitigation Plan by reference; and
2. Modifies any provision of the State Hazard Mitigation Plan, including its State Hazard and Vulnerability Analysis, as applicable and appropriate.



Each sixty day clock may be suspended or extended at the discretion of the SHMO in response to staff limitations resulting from activations of the State Emergency Operations Center, needs to divert staff resources to disaster recovery efforts, or insufficient staff to process multiple reviews of local hazard mitigation plans.

## 6.4 Criteria for Prioritizing Mitigation Planning and Project Grants

### Prioritizing Mitigation Planning Funds

In 2004, The New Jersey Office of Emergency Management prioritized the eight counties with the highest repetitive loss flood damages for technical assistance from the Stevens Institute of Technology in preparing local, multi-jurisdictional hazard mitigation plans. As it had done with the 2005 plan, the State continues to use severe/repetitive loss as the top priority for prioritizing mitigation planning support. In addition to severe/repetitive loss, the State also uses the following criteria for prioritizing local planning assistance to Counties and Municipalities for natural hazard mitigation:

1. Communities experiencing the greatest severe repetitive loss and repetitive loss damages (see Appendix G, Severe Repetitive Loss Mitigation Strategy).
2. Communities recovering declared natural disasters.
3. Communities identified as having higher vulnerability through local and State hazard mitigation plans.
4. Communities that are best organized to prepare, update and implement local hazard mitigation plans.
5. Communities of unique or special interest as defined by research objectives and special projects of NJOEM, other State agencies, or Federal agency initiatives.
6. Communities adjacent to communities with approved and current local hazard mitigation plans with a potential to impact, favorably or negatively, the vulnerability of their neighboring communities to one or more natural hazards.
7. Communities adjacent to communities with approved and current local hazard mitigation plans and sharing similar natural hazards.
8. Communities in which the State maintains high levels of investment as defined by the value of State facilities and the amount of State aid (including intergovernmental transfers, Urban Enterprise Zones and other tax abatements programs, payments in lieu of taxes) for all purposes.
9. Communities with Endorsed Plans or actively participating in the process of Plan Endorsement with the New Jersey State Planning Commission.
10. Communities with the highest pressures for future development or redevelopment determined in consultation with the New Jersey Office of Smart Growth and the appropriate and relevant provisions of the current New Jersey State Development and Redevelopment Plan.
11. All other communities.

The overall effort of the State to encourage and support applications for planning grants has been very successful with all 21 Counties in the State either starting, in the process of drafting or near completion with the Multi-jurisdiction All Hazard Mitigation Plans.



➤ **Prioritizing Mitigation Project Funds**

Projects to implement natural hazard mitigation measures, ranging from providing field services to data development to capital-intensive construction and property acquisition, require an evaluation in which the costs to implement projects are compared to the benefits of each project, or group of projects, in reducing risks (expressed as costs avoided) of damages associated with potential natural hazards. In some cases, such as data development, it is difficult to precisely ascertain costs and benefits. Therefore, somewhat different criteria must exist for project prioritization. To the extent that discretion exists to establish priorities within the statutory and regulatory requirements of project implementation programs associated with natural hazard mitigation, NJOEM will give priority in providing local project implementation assistance to communities (municipalities and groups of neighboring municipalities) for natural hazard mitigation in accordance with the project priority scoring methodology shown in the table below. This methodology is adopted by the State as part of the 2008 Plan update process.

**Figure 6.4-1  
 Sample New Jersey State Mitigation Project Priority Score Sheet**

Reviewer \_\_\_\_\_ Final score \_\_\_\_\_  
 County \_\_\_\_\_ Final ranking \_\_\_\_\_

Criterion (max 85 )	Points	Score
<b>GENERAL</b>		
Is this project specifically identified in the State/Local Plan?	35	
OR - Is this <i>type</i> of project identified in the applicants State/Local Plan?	20	
Was local plan FEMA approved prior to the declaration (HMGP)	10	
Is this project in the declared area?	20	
Is this project in a CRS community?	20	
<b>ENVIRONMENTAL (max 5)</b>		
CATEX eligible?	5	
Assessment required?	3	
Requires Full Environmental Impact Statement	1	
<b>COST EFFECTIVE (max 15)</b>		
Good BC study provided	5	
Plan update project (no BC required)	5	
Planning project - updates (no BC required)	5	
Weak BC study provided – no back up documentation	-5	
BC analysis required but not provided	-10	
Engineering feasibility score (1-20)		
<b>STATE STRATEGY POINTS (max 65)</b>		
Is the property on the SRL list	50	
Is the structure a repetitive loss structure	30	
Is the structure within a floodplain	5	
Is the structure required to have NFIP coverage but does NOT	YES	
Residential elevation	10	



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Criterion (max 85 )	Points	Score
Residential acquisition	10	
Flood water management	7	
Retrofit projects	5	
Warning and Public Information Systems	5	

The State Hazard Mitigation Team will annually review and update, as necessary, these criteria for prioritizing communities and local jurisdictions for receiving future planning and project grants under available funding programs. This prioritization process includes priority consideration for communities and neighborhoods with the highest risks, the highest number and value of severe repetitive loss and repetitive loss properties, and the most intense pressures for future development or redevelopment. The latter determination, with regard to development pressure, will be made in consultation with the appropriate and relevant provisions of the current New Jersey State Development and Redevelopment Plan.

When municipalities submit letters of intent to the SHMO for project grants, NJOEM staff sends written notification of receipt and attaches the Application Package for the respective grant and the system evaluation criteria. The package provides instructions, sample narratives, graphics and a variety of forms to illustrate the type of information that needs to be included in an application. It is also important for them to understand what elements they need to satisfy and how each element will be weighted prior to drafting the application. NJOEM provides each municipality with the systematic evaluation criteria that the SHMT will use for each application.

To this point, the State's system for prioritizing mitigation project grants has been successful, as evidenced by types of projects that have been funded. As this HMP is implemented, and existing processes are further refined, NJOEM is confident that the project and planning grant prioritization systems will continue to be



## Section 7 Plan Maintenance

### Contents of this Section

- 7.1 Interim Final Rule Requirements for Plan Maintenance
- 7.2 Method for Monitoring, Evaluating and Updating the Plan
- 7.3 System for Monitoring Mitigation Measures and Project Closeouts
- 7.4 System for Reviewing Progress on Goals, Activities and Projects
- 7.5 Discussion of Successes and Challenges in Project Implementation and Closeout

### 7.1 Interim Final Rule for Plan Maintenance

The Interim Final Rule (IFR) Subsection 201.4 [c] [5] requires the State Hazard Mitigation Plan to include a section that describes the Plan Maintenance Process. “(The State Hazard Mitigation Plan shall include a) section on the *Plan Maintenance Process* that includes:

- (i) An established method and schedule for monitoring, evaluating and updating the plan.
- (ii) A system for monitoring implementation of mitigation measures and project closeouts.
- (iii) A system for reviewing progress on achieving goals as well as activities and projects identified in the mitigation strategy.”

The IFR Subsection 201.4[d] requires the State Hazard Mitigation Plan to be revised and updated every three years.

“The Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities and resubmitted for approval to the appropriate Regional Director every three years. The Regional review will be completed within 45 days after receipt from the State, whenever possible. We also encourage a State to review its plan in the post-disaster timeframe to reflect changing priorities, but it is not required.”

2008 Update Note: This section of the 2005 version of the Plan received a satisfactory rating in the FEMA Region II crosswalk, so there are minimal changes in the 2008 Update. As noted in text, the Mitigation Strategies section of this Plan includes a discussion of progress on various actions that were included in the 2005 version, and there is a new Subsection 7.7 that includes discussion of the Plan maintenance process since 2005. The sections in blue font are retained from the original 2005 version of the Plan. Edits to the original text (except those required for clarity or consistency with the rest of the Plan) are in black font. New text is shown in standard font with no highlighting.



## 7.2 Method for Monitoring, Evaluating and Updating the Plan

To be effective, the State Hazard Mitigation Plan must be kept current. For example, a supplemental section may be needed in the SHMP to address new hazard mitigation needs or issues, re-prioritize existing recommendations, or expand the SHMP to address additional hazards. In the long term, changes in policy and administration may affect the usefulness of the SHMP and the relevance of issues addressed by it.

Following approval by FEMA, the New Jersey State Hazard Mitigation Plan will be updated at least every three years. The SHMP may also be updated following any future Presidential disaster declaration, in which case the State shall review, update (if necessary), and submit the SHMP to FEMA for review and approval following the 15 day period established by 44 C.F.R. 404(c) for preparation and distribution of the Hazard Mitigation Survey Team Report, but no later than 180 days following the date of the declaration unless the State seeks and is granted an extension in accordance with 44 C.F.R. 206.405(d).

If the State Hazard Mitigation Team determines, based on this review, that an amendment to the Plan is warranted, a planning subcommittee will be appointed to develop the changes for consideration by the State Hazard Mitigation Team. Upon approval of the changes and amended plan, FEMA review and approval will be sought. In order to facilitate future planning efficiency and effectiveness, the State Office of Emergency Management, in cooperation with the other Team members, will utilize GIS and other available technologies to track hazards and hazard events.

The State Hazard Mitigation Plan will also be updated by incorporating approved local hazard mitigation plans, as described in subsection 3.6 of this plan.

In addition to the review and submission procedures set forth above, the State will annually review and update as needed the SHMP in conjunction with the annual review and updating of the State's HMGP Administrative Plan. The results of the annual review and updating shall be submitted to FEMA by September 30 of each year.

The State Hazard Mitigation Officer (SHMO) and the State Hazard Mitigation Team (SHMT) are responsible for monitoring and evaluating implementation of the State Hazard Mitigation Plan and for submitting annual progress reports to FEMA. The progress reports will indicate the status of implementation of the mitigation actions contained within this Plan, and (where appropriate) will include documentation relating to measures that have been implemented.

Designated representatives of the SHMT will be responsible for the monitoring, evaluation and reporting of mitigation activities and related programs to the Chair and Deputy Chair of the SHMT. In support of these activities, NJOEM will do the following for projects funded under FMA, HMGP, SRL, and PDM:

- Establish a tracking and reporting system
- Implement a record keeping and financial management system
- Maintain a file for each project
- Prepare a quarterly progress report

The State Hazard Mitigation Officer is responsible for the continued management and maintenance of the monitoring system, including the time frame for carrying out future reviews.



### 7.3 System for Monitoring Mitigation Measures and Project Closeouts

Mitigation Projects funded by one of the programs administered through the NJOEM are tracked from their initiation. Municipalities that receive grant awards are required to submit a monthly progress report on the status of their project(s). Site visits are conducted to inspect the work that is being performed and to maintain a close association with the municipality. A final site visit is made after project completion to ensure all requirements of the program have been met.

In the future, NJOEM will request that municipalities that have been involved in elevation projects report the success or lack of success of their project when they are affected by a flooding incident.

NJOEM will report to the SHMT on an annual basis the State's progress in meeting the Hazard Mitigation Goals defined in Section 5 of the State Hazard Mitigation Plan.

### 7.4 System for Reviewing Progress on Achieving Goals, Activities and Projects in the State Mitigation Strategy

Executive Order 115 (Florio) requires the State Hazard Mitigation Team to meet "at the call of the Chair, but not less frequently than twice a year." The State Hazard Mitigation Team will attempt to meet at least quarterly and at other times determined by the Chair or Deputy Chair. At these meetings, the State Hazard Mitigation team will review the following factors potentially affecting the State Hazard Mitigation Plan:

- New Presidential Disaster or Emergency Declarations
- Progress in completing tasks listed in the Mitigation Strategies section of the Plan Changes in development
- Progress in Statewide mitigation activities, including meeting State Mitigation Goals
- Changes in priorities
- Changes in available funding sources and programs
- Advances in GIS, data acquisition and other technologies
- Increases in available information
- Changes in State or Federal laws, including amendments to FEMA rules and guidance; and
- Other factors affecting the Plan, including:
  - Do goals and objectives still address current and expected conditions
  - Have the nature and magnitude of hazard risks and/or development changed
  - Are the current resources appropriate for implementing the plan
  - Have outcomes of actions been as expected, and
  - Have agencies and other partners participated as originally proposed

### 7.5 Discussion of Successes and Challenges in Project Implementation and Closeout

NJOEM is presently developing this discussion based on a review of project implementation record. The task and a report have been added to the mitigation action items in Section 5.



## Section 8 Approval and Adoption

### Contents of this Section

- 8.1 Interim Final Rule for Risk Assessments
- 8.2 Plan Adoption by the State of New Jersey
- 8.3 Authorities and References

### 8.1 Interim Final Rule Requirement for Plan Adoption

The Interim Final Rule (201.4 (c) (6)) requires the State Hazard Mitigation Plan to include the following elements

- i. *"A Plan Adoption Process.* The plan must be formally adopted by the State prior to submittal to FEMA for final review and approval. "
- ii. *"Assurances.* The plan must include assurances that the State will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c). The State will amend it plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 13.11(d)."

### 8.2 Plan Adoption by the State of New Jersey

The State Hazard Mitigation plan update was prepared and approved by the State Hazard Mitigation Team, forwarded to and approved by the State Director of Emergency Management and then approved by the Governor. Pursuant to Executive Order 115 (Florio), this plan is the State's "comprehensive plan for the reduction of natural hazards."

The State of New Jersey hereby assures and certifies that it will comply with the FEMA regulations, policies, guidelines and requirements including OMB's Circulars No. A-95 and A-102, and 44 Code of Federal Regulations, Part 13, as they relate to any approved projects or grants, acceptance and use of Federal funds for any Federally-assisted project.

### 8.3 Authorities and References

#### Authorities

The following statutes and Executive Orders establish and define the authority of this State Hazard Mitigation Plan:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended
- New Jersey Civil Defense and Disaster Control Act
- Executive Order #39 (Meyner), Governor Meyner, January 14, 1954



- Executive Order #12 (Cahill), Development of Department Emergency Plans, Governor Cahill, December 3, 1970.
- Executive Order #101 (Byrne), Establishment of Office of Emergency Management, Governor Byrne, December 17, 1980.
- Executive Order #115 (Florio), Establishment of Interagency State Mitigation Team, Governor Florio, January 14, 1994.

## References

The State Hazard Mitigation Plan draws extensively on the following sources of data and other information:

- FEMA Multi-Hazard Mitigation Planning Guidance under the Disaster Mitigation Act of 2000, March 2004
- FEMA State and Local Mitigation Planning How-To Guide #1: Getting Started: Building Support For Mitigation Planning (FEMA 386-1)
- FEMA State and Local Mitigation Planning How-To Guide #2 - Understanding Your Risks: identifying hazards and estimating losses (FEMA 386-2)
- FEMA State and Local Mitigation Planning How-To Guide #3: Developing The Mitigation Plan; Identifying Mitigation Actions And Implementing Strategies (FEMA 386-3)
- FEMA State and Local Mitigation Planning How-To Guide #4: Bringing the Plan to Life: Implementing the Hazard Mitigation Plan (FEMA 386-4)
- HAZUS MH, version 1.0, January 2004.
- State of New Jersey Hazard Mitigation Plans for DR-1337/1295/1145/1189/1206-NJ
- State of New Jersey Emergency Operations Plan
- Insurance Services Offices, Inc., March 2000
- National Weather Service, Mt. Holly, NJ Forecast Office, March 2000 and March 2004.
- The American Red Cross, Bergen County Chapter, NJ, March 2000, March 2001.

## 8.4 Assurances

As part of its formal adoption of this Plan update, the State of New Jersey asserts that it will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c). The State also asserts that it will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 13.11(d).

## 8.5 Adoption Documents

By agreement between FEMA Region II and NJOEM the official adoption documents will be provided after FEMA's final review and conditional approval of the Plan. The documents will be in Plan Appendix Q.