4.1 STATE RISK ASSESSMENT

SECTION 4.1 RISK ASSESSMENT OVERVIEW

4.1-1 OVERVIEW

The 2024 State HMP planning process identified 22 hazards of concern: 11 natural and 11 human-caused hazards. Each hazard of concern has its own chapter of the Plan, which includes a hazard profile and a vulnerability assessment.

The hazard profile includes:
- General background information, including a definition and description of each hazard.
- Information on where hazards have occurred or could occur, including detailed maps where possible.
- Previous occurrence of past significant events that occurred in the state before 2023.
- Discussions and analyses of each hazard's probability for future occurrence.
- Considerations of changing future conditions. This includes discussion of the potential effects of climate change.

The vulnerability assessment includes:
- Built Environment
- Population and Economy
- Natural Environment

4.1-2 CHANGES FROM THE 2019 PLAN

Most of the hazards included in the 2024 SHMP have been included in previous plan updates. Radon exposure and salt-water intrusion were added to the Geological Hazards section. Harmful Algal Blooms was added as a human-caused hazard. Additional changes from 2019 include restructuring the categorization of the hazards within the SHMP. Table 4.1-1 details the reorganization of the identified hazards of concern from 2019 to the 2024 SHMP.

Changes to Vulnerability Assessment

The vulnerability assessment methodology is framed to discuss risks to the built environment, populations and economy, and natural environment. The new methodology includes a new emphasis on FEMA's community lifelines and socially vulnerable populations and underserved communities.

4.1-3 HAZARDS OF CONCERN IN NEW JERSEY

During the profiling process for hazard events, planners considered historical records, information regarding the geographic area, and the probability of future occurrences. During their meeting held on January 24, 2023, the hazards list was distributed and approved by the SHMT. The planning team also coordinated with NJOEM, Rutgers University, and NJDEP for concurrence on the best available science on coastal erosion, sea-level rise, flood, and wildfire. Details on the sources of information used to inform the hazard identification is available in Appendix B - Risk Assessment.

Key changes to the identified hazards include moving all flood-related information into the flood section. The 2024 plan created a section for Extreme Temperature as its own hazard instead of a concern under Severe Weather. This change in approach reflects New Jersey's increased response and planning for extreme heat through the Interagency Council on Climate Resilience. Geological Hazards were expanded to also include radon exposure and saltwater intrusion. Nor'easters are included with Hurricanes and Tropical Storms. This profile focuses on hurricane winds and power failure events.

Changes to the man-made hazards include profiling Harmful Algal Blooms (HABs) for the first time. Also, Power Failure is no longer a separate profile; it is discussed as a secondary hazard under relevant natural and human-caused hazards. Although some power failure events may be caused by accident, sabotage, or equipment failure, the vast majority of previous occurrences have been caused by natural hazards. Power failure is discussed as a cascading impact in Extreme Temperature, Hurricanes, Nor'easters, Tropical Storms, Severe Weather, Severe Winter Weather, Cyber Attacks, and Terrorism. This change better

communicates the impacts of these natural hazards. The impacts of grid outages on socially vulnerable populations and disadvantaged communities are also discussed.

Table 4.1-1 State Hazards of Concern

2019 State HMP	2024 State HMP
Natural Hazards	
Coastal Erosion (beach protection and sea-level rise)	Coastal Erosion
Dam/Levee Failure	Dam/Levee Failure
Drought	Drought
Earthquakes	Earthquakes
--	Extreme Temperature
Flood	Flood (riverine, coastal, storm surge, flooding caused by sea-level rise, and stormwater flooding caused by local drainage and high groundwater levels)
Geological Hazards (landslide and subsidence/sinkholes)	Geological Hazards (landslide, subsidence/sinkholes, radon exposure, and saltwater intrusion)
Hurricanes and Tropical Storms	Hurricanes , Nor'easters, Tropical Storms (wind only, includes power failure)
Nor'easters	--
Severe Weather (high winds, tornadoes, thunderstorms, hail, and extreme temperature)	Severe Weather (high winds, tornadoes, thunderstorms, and hail including power failure from high winds/tornados)
Wildfire	Severe Winter Weather (snow, blizzards, and ice storms, includes power failure)
Winter Storms (snow, blizzards, and ice storms)	Wildfire
Human – Caused Hazards	
Animal Disease Events	Animal Disease
Civil Unrest	Civil Unrest
Cyber Attack	Cyber Attack (Including power failure from cyber-attack)
Crop Failure	Crop Failure
Economic Collapse	Economic Collapse
Fishing Failure	Fishing Failure
--	Harmful Algal Blooms (HABs)
Hazardous Substances – (Fixed Sites, In-Transit, Offshore)	Hazardous Substances (fixed sites, in-transit, offshore)
Nuclear Hazard	Nuclear Hazards
Pandemic (including disease outbreak)	Pandemic (emphasis on influenza and COVID-19)
Power Outages	--
Terrorism	Terrorism (Including enhanced discussion of power failure from terrorism)

Hazards of Concern in County Hazard Mitigation Plans

In New Jersey, jurisdictions identify which natural hazards to profile in their local hazard mitigation plans. Table 4.1-2 summarizes the rankings contained in the most recent county hazard mitigation plans as of June 2023. Bergen did not rank the hazards, therefore "NR" or *not ranked* is used to identify which of the hazards are included in their 2019 update. Every hazard identified as a high concern in a county plan is identified.

Table 4.1-2 Risk Rankings for Hazards of Concern

Hazard of Concern	Atlantic	Bergen	Burlington	Camden	Cape May	Cumberland	Essex	Gloucester	Hudson	Hunterdon	Mercer	Middlesex	Monmouth	Morris	Ocean	Passaic	Salem	Somerset	Sussex	Union	Warren	Total High (H)	Total Medium (M)	Total Low (L)	Total
Climate Change					L																	0	0	1	1
Coastal Erosion and/or Sea Level Rise	M	NR	L	H	L	M	H	L	H		H	H	H		M		M			M		6	5	3	15
Dam/Levee Failure	L	NR		L		M/L	H	M	TBD	L	L	H	L	L		L	H/M	H	L	M	M	3	3	8	18
Drought	L	NR	M	L	L	L	L	M	L	L	L	M	L	L	M	L	L	M	L	M	M	0	7	13	21
Earthquake	L	NR	M	H		L	L	L	H	H	H	L	L	H	L	H	L	L	H	L	M	7	2	10	20
Extreme Temperatures	M	NR	H	L	L	M	L	M	L	L	L	M	M	L	M	L	M	M		H	H	3	8	8	20
Extreme/High Winds	M	NR	H	H		H		H	L	H	L	M	M	H	L	L	H	H		H	H	10	3	4	19
Flood	H	NR	M	H	H	H	H	M	H	H	H	H	H	H	H	H	H	H	H	H	M	17	3	0	21
Geological Hazards		NR		M			L	M	L	M	M	M	L		M	L	M		M	L	H	1	8	5	15
Hailstorm	L	NR	H	L	L		L	H	L	L	L	M		H		L		H			H	5	1	8	15
Hurricane and Tropical Storm	H	NR	H	H	H		H	M	H	H	H	H	H	H	H	H		H	H	H	H	17	1	0	19
Infestation				L				M		L				L		L			L			0	1	5	6
Ice Storm		NR	H				L	M	L	L	L	M		L		L		M		H	H	3	3	6	13
Landslide		NR	H	M				L	M	M	M	L	M	M		M			M	L	H	2	8	3	14
Land Subsidence		NR		M				L	M	M	M	L		M	L	M			M		H	1	7	3	12
Lightning	L			L	L			H	L		L			H				H		L	H	4	0	6	10
Nor'Easter	M	NR	H	H	H		H	M	H	H	H	H	H		H	H		H	H	H	H	15	2	0	18
Severe Weather		NR	H	L	L	H	L	H	L	L	L	M		H		L					H	4	1	7	13
Severe Winter Weather			H	L	L	H	L	M	L	L	L			L		L	H	M	L	H	H	5	2	9	16
Storm Surge	H	NR		H			H		H			H	H		H				H			8	0	0	9
Thunderstorms		NR	H			L		L	H	L	L	L		H		L		H			H	5	0	6	12
Tornado	M	NR	H	H	L		L	H	L	L	L	M	M	H	L	L		H		M	H	6	4	7	18
Tsunami	L	NR			L								L									0	0	3	4
Wave Action	M				H								H									2	1	0	3
Wildfire	M	NR	M	M	M	M	M	M	M	M	M	M	M	M	H	M	L	M	M	L	M	1	17	2	21
Winter Storm	M	NR	H	L	L		L	M	L	L	L	M	M	L	H	L		M			H	3	5	8	17

Source: County HMPs (accessed June 2023)

4.1-4 VULNERABILITY ASSESSMENT

For the 2024 Plan update, the vulnerability assessment for each hazard follows its hazard profile, so that all information about a particular hazard is found in one section. A statewide risk assessment was conducted with results summarized at the county level. The draft methodology for the 2024 vulnerability assessment was reviewed by the SHMT, FEMA, and Rutgers University.

Vulnerable Jurisdictions

For the purpose of this Plan, the State of New Jersey has defined "jurisdiction" as its counties. Each county HMP was consulted, and the identification process for the hazards of concern and risk ranking (if any) were reviewed for each hazard. Table 4.1-2 summarizes the hazards of concern identified in each local plan.

The evaluation and roll-up of local HMP risk assessments into the State Plan proved challenging due to inconsistent hazard data, population and building data and overall methodologies being used at the local level. The State recognizes these challenges and has proposed annual technical updates to the SHMP as outlined in the updated Section 9.0 Plan Maintenance. NJOEM has identified a new mitigation action to provide technical assistance regarding hazard mitigation plan updates to ensure consistency for reporting risk ranking and other elements in local HMPs.

Therefore, for the purposes of the 2024 Plan, a statewide vulnerability assessment was conducted to ensure consistent asset data (population and buildings) and hazard areas were used. The planning consultant collaborated with the subject-matter experts listed in Section 2.0 Planning Process to identify the most appropriate risk assessment methodology and best available data for the State.

Built Environment

To assess the risks that natural hazards pose to New Jersey's built environment, the State assessed the vulnerability of the following major asset groups:
- State-Owned or -Leased Facilities
- Total Buildings
- Critical Facilities, Infrastructure, and Community Lifelines (publicly- and privately-owned) (collectively known as lifeline impacts)

State-Owned or Leased Facilities

To address the requirements of 44 CFR 201.4 and assess the vulnerability of state facilities, the best available data were gathered and used for the 2024 update. A detailed description of the state building and critical facility/infrastructure data used is described below, followed by a general description of the methodology used. More detailed information on the methodology used to assess vulnerability is included in the vulnerability assessment portion of each hazard section (Sections 4.2 through 4.23). This section discusses the vulnerability assessments of state-owned or leased buildings within the State.

The State of New Jersey maintains a comprehensive GIS mapping database of State-owned and leased facilities. The Department of Treasury, coordinating its efforts with the centralized statewide GIS office in the Department of Environmental Protection, is continually updating its GIS mapping of state-owned and leased facilities. The Office of Management and Budget (OMB) within the Department of Treasury has developed a centralized statewide Land and Building Asset Management (LBAM) database that is currently being populated with an updated and expanded inventory of land, building improvements, infrastructure, and inspections data. All State agencies maintaining facilities are included in the LBAM database.

LBAM includes purchased, leased, and licensed buildings. The licensed buildings are those that the State does not own but is responsible for maintenance and repairs (such as federally constructed buildings or buildings where ownership is unclear). For the purposes of this Plan, the OMB advised that the licensed buildings be classified as owned. Types of state-owned and -leased facilities contained in LBAM include, but are not limited to, administrative/office buildings, housing, armories, barns/garages/sheds, communication centers, dispensaries, correctional facilities, special-needs housing, hospitals, law enforcement buildings, schools, water and sewer facilities, fuel service stations, utility buildings, and warehouses.

Many state buildings and their attributes and locations are considered sensitive in nature. Therefore, all buildings reported in the 2024 Plan will be presented at the aggregate level (by agency or county). Individual facilities will not be specifically identified.

The 2011 SHMP outlined a three-phase program regarding the LBAM database and its use in future mitigation planning efforts. Much progress has been made to the development and use of the database. Attributes have been added to the database to enable the capture of flood hazard areas, history of vulnerability, and mitigation actions. In addition, the critical state buildings have been identified in the database as an attribute. In May 2012, the Department of Treasury, the OMB, initiated a continuous effort to collect of GIS coordinates and photographs of all State-occupied buildings.

The LBAM database is always being updated, changed, and corrected as agencies change or modify their ownership. The LBAM data available as of January 2023 was used for the purposes of this plan update and included 5,690 State-owned and leased buildings, each matched to a geographic location. All statistics reported in this Plan on state facilities are based on these 5,690 buildings. Table 4.1-3 summarizes the number of buildings by agency.

Table 4.1-3 State Facilities by Agency

Agency	Number of Facilities
Agriculture	10
Banking And Insurance	1
Chief Executive	2
Children and Families	154
Community Affairs	13
Corrections	802
Education	63
Environmental Protection	2,120
Health	280
Higher Education	1
Human Services	366
Inter-Departmental	2
Judiciary	97
Juvenile Justice Commission	198
Labor and Work Force Development	53
Law And Public Safety	30
Legislature	6
Military And Veterans Affairs	246
Miscellaneous Commissions	1
Motor Vehicles Commission	147
Personnel	2
State	20
State Police	161
Transportation	650
Treasury	265

Source: NJOMB, 2023

The OMB has implemented procedures (new Records Management/OMB Circular Loss Reporting) that require the agencies to immediately report losses via LBAM database.

Lifeline Impacts
FEMA created the eight Community Lifelines to contextualize information from incidents, communicate impacts in plain language, and promote a more unified effort across a community that focuses on stabilization of these lifelines during response. The 8 categories of community lifelines are:
- Safety and Security
- Food, Hydration, Shelter
- Health and Medical
- Energy

- Communications
- Transportation
- Hazardous Materials
- Water Systems

The vulnerability assessment of each natural hazard summarizes the notable impacts of each natural hazard on each community lifeline category.

Critical Facilities
For this 2024 Plan update, critical facilities and infrastructure are structures and infrastructures that NJOEM and the SHMT have determined must continue to operate before, during, and after an emergency and/or hazard event and/or are vital to health and safety. Community lifelines have been identified by NJOEM and the SHMT as the most fundamental services in the State of New Jersey that, when stabilized, enable all other aspects of society to function.

To create a database of critical facilities, critical infrastructure, and community lifelines across the State, the planning team leveraged Rutgers' NJ HazAdapt - A Hazard Mitigation Planning Tool. Rutgers collaborated with NJOEM to compile US Department of Homeland Security, Homeland Infrastructure Foundation-Level Data (HIFLD) by community lifeline. The most recent original source data from HIFLD was downloaded and included in the database. These data were supplemented with additional data from NJDEP, NJDOT, and NJTRANSIT to include statewide roadways, an expanded list of NJTRANSIT assets, and major historical and cultural resources.

In addition to these categories, the State has also determined that essential banking infrastructure (i.e. banks, government financial processing centers, credit unions, and the Federal Reserve System) and cultural resources are also valuable state assets that deserve vulnerability assessment.

A total of 12,096 lifelines were used for the 2024 Plan update. The critical facilities, infrastructure and community lifelines spatial inventory includes assets that, although not owned by the State, have been defined as critical in accordance with the above definitions. They are summarized by FEMA community lifeline category. Please note that duplicate assets may be included in this analysis. For example, some schools may be considered shelters and therefore were included in the analysis for both asset types. Note that the eighth community lifeline (Water Systems) was added subsequent to the analysis for the 2024 Plan update; non-State-owned potable water infrastructure and wastewater management will be integrated into the next plan update. State-owned water systems were analyzed as part of the State Facilities analysis.

Table 4.1-4 summarizes the critical facilities, infrastructure, and community lifeline data sources used for this planning effort. Table 4.1-5 summarizes the number of critical facilities, infrastructure, and community lifelines by type per county.

Table 4.1-4 Critical Facilities, Critical Infrastructure, and Community Lifelines Inventory

Communications

Antenna Structures - Tall and Near Airports
Cellular Towers
Communication Centers
FM Transmission Towers

Land Mobile Broadcast Towers

Land Mobile Commercial Transmission Towers
Land Mobile Private Transmission Towers
Microwave Service Towers
Paging Transmission Towers
TV Analog Station Transmitters
TV Digital Station Transmitters

Cultural

Convention Centers and State Fairgrounds
Historic Property Features of New Jersey
Major Sport Venues
Places of Worship

Energy

Biodiesel Plants

Electric Substations

EPA FRS Power Plants
Ethanol Transloading Facilities

Natural Gas Compressor Stations

Food, Hydration, Shelter

American Red Cross Chapter Facilities
National Shelter System Facilities
Public Refrigerated Warehouses

Financial

FDIC Insured Banks

Gov Financial Processing Center

NCUA Insured Credit Unions
US Federal Reserve System

Hazardous Material

EPA CERCLIS Facilities
EPA ER RMP Facilities

EPA ER TSCA Facilities

Known Contaminated Sites List for New Jersey
Solid Waste Landfill Facilities
Stormwater Pump Stations

Health and Medical

EMS Stations
Federally Qualified Health Centers
Hospice Care
Hospitals
Nursing Homes
Pharmacies
Public Health Departments
Urgent Care Facilities
VHA Medical Facilities

Safety and Security

Child Care Centers

Colleges and Universities
Courthouses
EPA Facilities

FBI Field Offices

FDA Office Facilities

Fire Stations

IRM Property Point
Local EOCs
Local Law Enforcement
Prison Boundaries
Private Schools
Public Schools

Supplemental Colleges

Truck Driving Schools

USACE Offices
Weather Radar Stations

Transportation

Aviation Facilities

Bus Terminals
Ferry Terminal
Hurricane Evacuation Routes
Intermodal Freight Air to Truck
Intermodal Freight Marine Roll On Roll Off
Intermodal Freight Rail TOFC/COTFC
Navigable Waterway Nodes
NJDOT Facilities
NJ Transit Facilities
Port Facilities
Public Transit Stations

Table 4.1-5 Number of Critical Facilities by County

County	Communi-cations	Energy	Food, Hydration, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transport-ation	Bridges and Tunnels	Financial	Cultural
Atlantic	193	22	85	555	150	301	46	205	42	5,276
Bergen	257	31	337	1826	396	1061	56	576	238	12,246
Burlington	204	32	122	669	221	455	53	356	66	19,552
Camden	175	27	187	793	267	572	90	260	64	10,598
Cape May	109	18	61	173	78	128	29	74	31	7,551
Cumberland	85	14	72	267	89	182	31	103	27	6,901
Essex	251	44	117	1852	323	910	178	499	146	13,440
Gloucester	67	23	42	461	132	321	38	243	52	3,188
Hudson	230	29	107	1775	236	646	187	199	101	7,710
Hunterdon	82	19	57	261	73	182	27	373	31	7,366
Mercer	193	30	20	660	175	425	33	410	78	7,830
Middlesex	269	62	89	1624	346	779	94	562	185	3,379
Monmouth	216	21	172	964	357	709	56	505	142	5,491
Morris	170	36	146	880	288	628	35	505	122	6,735
Ocean	230	25	189	361	288	488	50	242	69	6,684
Passaic	115	17	59	901	213	531	28	332	85	3,055
Salem	41	22	47	183	42	98	23	114	21	2,993
Somerset	117	25	107	557	172	391	35	396	79	4,511
Sussex	92	12	67	235	78	183	10	176	30	1,530
Union	86	37	102	1216	229	606	125	408	130	5,366
Warren	98	24	17	218	72	148	20	267	22	4,162
Total	3,280	570	2,202	16,431	4,225	9,744	1,244	6, 805	1,761	145,577

Source: HIFLD, 2006, 2007, 2012, 2014, 2017, 2018, 2019, 2020, 2021, 2022; NJOGIS, 2019, 2020; NJ TRANSIT, 2021; PANYNJ, 2023; USDOT, 2022; NOAA, 2022.

The State recognizes transit and infrastructure system vulnerability to hazard events. As previously noted, NJ Transit Rail and Light Rail Stations, Port Authority Trans-Hudson (PATH) Stations, and Port Authority Transit Corporation (PATCO) stations were included in the critical facilities, infrastructure, and community lifeline data and were used to inform the 2024 Plan risk assessment analysis. For future plan updates, the SHMT will re-examine the critical facility, infrastructure, and community lifeline types and consider including additional facilities/infrastructure in future plan updates (e.g., bus terminals and NJ DOT-owned weight stations, maintenance yards, rest areas, and barges).

Information regarding critical facilities, infrastructure, and the attributes and locations of community lifelines are considered sensitive in nature. Therefore, all assets reported in the State HMP Update will be at the aggregate level (by type or county). Individual assets will not be specifically identified.

To determine vulnerability, a spatial analysis was conducted in GIS using the best available hazard data for the prioritized assets. When the exposure analysis determined the hazard area could potentially impact the location of prioritized assets, they were deemed vulnerable to the hazard. Additional details regarding the methodology used to assess vulnerability are discussed in each hazard section (Sections 4.2 through 4.23).

Hazards U.S. – Multi-Hazard (Hazus-MH)

In 1997, FEMA developed a standardized model for estimating losses caused by earthquakes, known as Hazards U.S. or HAZUS. HAZUS was developed in response to the need for more effective national-, state-, and community-level planning, and the need to identify areas that face the highest risk and potential for loss. HAZUS was expanded into a multi-hazard tool (HAZUS-MH) with new models for estimating potential losses from wind (hurricanes) and flood (riverine and coastal) hazards. HAZUS-MH is

a GIS-based software tool that applies engineering and scientific risk calculations that have been developed by hazard and information technology experts, to provide defensible damage and loss estimates. These methodologies are accepted by FEMA and provide a consistent framework for assessing risk across a variety of hazards. The GIS framework also supports the evaluation of hazards and assessment of inventory and loss estimates for these hazards.

HAZUS-MH uses GIS technology to produce detailed maps and analytical reports that estimate a community's direct physical damage to building stock, critical facilities, transportation systems, and utility systems. To generate this information, HAZUS-MH uses default data provided by HAZUS-MH for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. Damage reports can include induced damage (inundation, fire, and threats posed by hazardous materials and debris) and direct economic and social losses (casualties, shelter requirements, and economic impact) depending on the hazard and available local data.

HAZUS MH's open data architecture can be used to manage community GIS data in a central location. The use of this of this software also promotes consistency of data output now and in the future and standardization of data collection and storage. The guidance "Using HAZUS- MH for Risk Assessment: How-to Guide (FEMA 433)" was used to support the application of HAZUS-MH for this risk assessment and Plan. More information on HAZUS-MH is available at https://www.fema.gov/hazus.

Probabilistic analyses were performed to estimate losses (mean return period losses) for the earthquake, flood, and wind hazards. The probabilistic hazard analysis generates estimates of damage and loss for specified return periods (such as a 100-year or one-percent annual chance event). For annualized losses, HAZUS-MH version 6.0 calculates the maximum potential annual dollar loss resulting from various return periods averaged on a per-year basis. It is the summation of all HAZUS-supplied return periods (such as 10-, 50-, 100-, 200-, and 500-year periods) multiplied by the return period probability (as a weighted calculation). In summary, the estimated cost of a hazard each year is calculated.

HAZUS-MH was updated with the state buildings provided in LBAM and the critical facilities, critical infrastructure and community lifeline inventory. The default building stock data in HAZUS-MH version 6.0 was not updated to estimate potential losses. The default aggregate building inventory is based on United States Census data for residential occupancies and Dun & Bradstreet for non- residential occupancies. As discussed earlier, the 2020 Census block population data was used to evaluate population exposure.

Potential Losses from Buildings
For each natural hazard, the 2024 Plan Update shows the estimated potential annual losses (EAL) by county in New Jersey. Total building EAL was derived from FEMA's National Risk Index. FEMA's National Risk Index dataset and online tool leverages data on natural hazards and community risk factors to develop a baseline risk measurement for 18 natural hazards by county and Census tract (FEMA, n.d.). EAL is the natural hazards component of the National Risk Index; the EAL score and rating represent the average economic loss in dollars resulting from natural hazards each year for a community when compared to all other communities at the same level. The following formula was used to calculate the EAL:

$$Exposure * Annualized\ Frequncy * Historic\ Loss\ Ratio = Estimated\ Potential\ Annual\ Loss$$

Exposure is the representative value of buildings, population, or agriculture potentially exposed to a natural hazard consequence. Annualized frequency is the expected frequency or probability of a natural hazard occurrence per year. Historic loss ratio is the estimated percentage of the exposed building value, population, or agriculture value expected to be lost due to a natural hazard occurrence (FEMA, n.d.).

EAL for state-owned assets was calculated using Replacement Cost Value for state owned facilities per county derived from LBAM data. Replacement Cost Value of state-owned assets was estimated using a combination of parcel and tax assessment data. The LBAM was joined to the "Parcels and MOD-IV Composite of New Jersey" data provided by the NJ Office of Information Technology, Office of GIS (NJOGIS). The Effective Tax Rate for each parcel, provided by the NJ Department of the Treasury, was also joined to this data. The replacement cost of each structure was calculated based on the assessed improvement value of the

property to approximate the value of the structure. The effective tax rate was used to normalize property assessment values across the state. The following formula was used to calculate replacement cost of each structure:

$$\frac{Assessed\ Improvement\ Value\ of\ Property}{Total\ Assessed\ Value\ of\ Property}\ x\ \frac{Property\ Taxes}{Effective\ Tax\ Rate}$$

The Replacement Cost Value of state-owned assets was summarized by county and then multiplied by the Expected Annual Loss Rate for Buildings by county provided by FEMA's National Risk Index (NR)I to determine the EAL for state-owned assets. The Expected Annual Loss Rate for Buildings is the proportion of the total value of buildings expected to be lost annually for a given community (FEMA, n.d.).

For more information on the methodology behind the FEMA National Risk Index, visit https://hazards.fema.gov/nri/.

Population and Economy

To assess the risks that natural hazards pose to New Jersey's population and economy, the State assessed the vulnerability of the following major asset groups:

- General Population
- Socially Vulnerable, Disadvantaged and Overburdened Communities
- Economy

General Population

To determine exposure for general population, a spatial analysis was conducted in GIS using the best available defined hazard boundaries and 2020 Census tract data. When the analysis determined that a hazard could impact the area in a jurisdiction, these locations were deemed potentially vulnerable to the hazard. The estimated general population located within defined hazard boundaries is reported.

The limitations of the analysis conducted at a Census-tract level are recognized and the results presented should only be viewed as estimates. The population exposure analyses do not account for the increase in population (of both residents and tourists) during the summer months, or the changes in occupancy of homes seasonally. Additional details regarding the methodology and hazard data used are included in each hazard section (Sections 4.2 through 4.23) within the Vulnerability Assessment subsection.

Socially Vulnerable, Disadvantaged, and Overburdened Communities

Social vulnerability refers to factors that weaken a community's ability to prevent human suffering and financial loss in a disaster (CDC, 2023). While every community and/or individual may face exposure to a hazard, some factors such as income or wealth, access to transportation, and age may impact the individual or communities options to reduce the potential damage, disruption, or loss of life to a hazard. Additionally, some factors make it difficult for communities to recover to a similar quality of life after an event. Considering social vulnerability, or the factors that make it more difficult to address risk to hazards, is a growing capability for New Jersey.

The 2024 Plan update identifies where socially vulnerable, disadvantaged, and overburdened communities intersected with natural hazard areas when available. The planning team then calculated the proportion of the population within the Census tract area that overlaps with each applicable natural hazard area to approximate the population within socially vulnerable, disadvantaged, and overburdened communities that are also within flood, sea-level rise, storm surge, landslide, wildfire, and nuclear hazard areas.

To determine exposure for socially vulnerable populations, a spatial analysis was conducted in GIS using the data from three indices: the Centers for Disease Control and Prevention (CDC) and Agency for Toxic Substances and Disease (ATSDR) Registry Social Vulnerability Index (CDC/ATSDR SVI or simply SVI) 2020 update, released in October 2022; the White House Council on Environmental Quality Climate and Economic Justice Tool Version 1.0, released November 2022; and New Jersey's

Overburdened Communities under the New Jersey Environmental Justice Law 2021. Three indices were chosen, two federal and one state, to account for variation among indices and align this plan with both federal and state priorities.

CDC/ATSDR SVI is the source data for the Social Vulnerability score in FEMA's NRI. SVI uses 16 variables from the U.S. Census Bureau American Community Survey (ACS), 2016-2020 (5-year) estimates to compile an index of overall vulnerability. The specific variables included in the 2020 SVI are as follows:

Socioeconomic Status	Household Characteristics
Below 150% Poverty	Aged 65 & Older
Unemployed	Aged 17 & Younger
Housing Cost Burden	Civilian with a Disability
No High School Diploma	Single-Parent Households
No Health Insurance	English Language Proficiency
Housing Type & Transportation	**Racial & Ethnic Minority Status**
Mobile Homes	Hispanic or Latino (of any race); Black and African American, Not Hispanic or Latino; American Indian and Alaska Native, Not Hispanic or Latino; Asian, Not Hispanic or Latino; Native Hawaiian and Other Pacific Islander, Not Hispanic or Latino; Two or More Races, Not Hispanic or Latino; Other Races, Not Hispanic or Latino.
No Vehicle	
Multi-Unit Structures	
Crowding	
Group Quarters	

SVI ranks Census tracts based on percentiles. Percentile ranking values range from 0 to 1, with higher values indicating greater vulnerability:
- Low: 0.0 – 0.25
- Low-Medium: 0.2501-0.50
- Medium-High: 0.5001-0.75
- High: 0.7501-1.0

For the purposes of this plan update, Census tracts with an overall vulnerability percentile ranking greater than 0.6 are designated as socially vulnerable communities.

The White House Council on Environmental Quality created the Climate and Economic Justice Screening Tool to identify disadvantaged communities that have been socially marginalized, overburdened by pollution and underserved by basic services. This tool will be used by federal agencies, including FEMA, to identify disadvantaged communities that should benefit for the Justice 40 initiative. Justice40 seeks to deliver 40% of chosen Federal investments to disadvantaged communities (White House Council on Environmental Quality, 2022).

Communities are considered disadvantaged if they are in census tracts that meet the thresholds for at least one of the tool's categories of burden, or if they are on land within the boundaries of Federally Recognized Tribes. In addition, a census tract that is completely surrounded by disadvantaged communities and is at or above the 50% percentile for low income is also considered disadvantaged. The categories of burden identify census tracts center around climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development.

The Risk Assessment was conducted before FEMA announced its designated Community Disaster Resilience Zones in September 2023. In response to the Community Disaster Resilience Zone Act, FEMA identified resilience zones by using NRI to identify the most at-risk and in-need communities. FEMA also used the Climate and Economic Justice Screening Tool to further focus the designations of disadvantaged communities. This Risk Assessment used both the CDC/ATSDR SVI (the source data for the Social Vulnerability score in FEMA's NRI) and the Climate and Economic Justice Screening Tool to identify socially vulnerable populations. As a result, populations in FEMA's Community Disaster Resilience Zones are included in this assessment.

The State of New Jersey's Environmental Justice Law requires NJDEP to evaluate environmental and public health impacts of certain facilities on overburdened communities (OBCs) when reviewing certain applications. OBCs are Census block groups with

at least 35 percent low-income households; or at least 40 percent of the residents identify as minority or as members of a State recognized tribal community; or at least 40 percent of the households have limited English proficiency (NJDEP, 2023).

Economy
A qualitative assessment of the economic impacts of each hazard can be found in each vulnerability assessment.

Natural Environment
A qualitative assessment of the impacts of each hazard on important natural assets, including freshwater wetlands, coastal dunes and beaches, forests, wildlife, and water resources can be found in each vulnerability assessment.

Hazard-Specific Methodologies
The vulnerability assessment section in each hazard section (Sections 4.2 through 4.23) summarizes the detailed methodology used for that particular hazard of concern. For hazards in which HAZUS-MH could not be used, an exposure-based methodology was applied using the best available spatial data gathered from the State's subject-matter experts (SME), state buildings as provided by LBAM and critical facilities, critical infrastructure, and community lifelines database.