SOMERSET COUNTY
HAZARD
MITIGATION PLAN

SOMERSET COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

FINAL PLAN UPDATE
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Section 5.1: RISK ASSESSMENT-METHODOLOGY AND TOOLS

Prepared by the Somerset County Mitigation Planning Committee

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5.1 METHODOLOGY AND TOOLS

This section describes the methodology and tools used to support the risk assessment process.

Methodology

The risk assessment process used for this Plan is consistent with the process and steps presented in FEMA 386-2, State and Local Mitigation Planning How-to-Guide, Understanding Your Risks – Identifying Hazards and Estimating Losses (FEMA, 2001). This process identifies and profiles the hazards of concern and assesses the vulnerability of assets (population, structures, critical facilities and the economy) at risk in the community. A risk assessment provides a foundation for the community's decision makers to evaluate mitigation measures that can help reduce the impacts of a hazard when one occurs (Section 9 of this plan).

Step 1: The first step of the risk assessment process is to identify the hazards of concern. FEMA's current regulations only require an evaluation of natural hazards. Natural hazards are natural events that threaten lives, property, and many other assets. Often, natural hazards can be predicted, where they tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area.

Step 2: The next step of the risk assessment is to prepare a profile for each hazard of concern. These profiles assist communities in evaluating and comparing the hazards that can impact their area. Each type of hazard has unique characteristics that vary from event to event. That is, the impacts associated with a specific hazard can vary depending on the magnitude and location of each event (a hazard event is a specific, uninterrupted occurrence of a particular type of hazard). Further, the probability of occurrence of a hazard in a given location impacts the priority assigned to that hazard. Finally, each hazard will impact different communities in different ways, based on geography, local development, population distribution, age of buildings, and mitigation measures already implemented.

Steps 3 and 4: To understand risk, a community must evaluate what assets it possesses and which assets are exposed or vulnerable to the identified hazards of concern. Hazard profile information combined with data regarding population, demographics, general building stock, and critical facilities at risk, located in Section 4, prepares the community to develop risk scenarios and estimate potential damages and losses for each hazard.

Tools

To address the requirements of DMA 2000 and better understand potential vulnerability and losses associated with hazards of concern, Somerset County used standardized tools, combined with local, state, and federal data and expertise to conduct the risk assessment. Our standardized tools used to support the risk assessment are described below.

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 methodology, HAZUS-MH with new models for estimating potential losses from wind (hurricanes) and flood (riverine and coastal) hazards. HAZUS-MH is a Geographic Information System (GIS)-based software tool that applies engineering and scientific risk

calculations, which 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 HAZUS-MH provided data 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, 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 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/.

In general, probabilistic analyses were performed to develop expected/estimated distribution of losses (mean return period losses) for the flood and wind hazards. The probabilistic hazard generates estimates of damage and loss for specified return periods (e.g., 100- and 500-year). For annualized losses, HAZUS-MH version 4.0 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 (e.g., 10, 50, 100, 200, 500) multiplied by the return period probability (as a weighted calculation). In summary, the estimated cost of a hazard each year is calculated.

Custom methodologies in HAZUS-MH version 4.0 (HAZUS-MH) were used to assess potential exposure and losses associated with hazards of concern for Somerset County:

- Inventory: The 2014 HMP used a building inventory consisting of the full Census block shapefile from HAZUS-MH 2.1 (Census 2000) updated with local parcel data using the 2007 building footprints and 2012 parcel spatial files provided by the Somerset County Geographic Information Systems, and replacement cost values that were estimated using 2012 RSMeans values. This process had overestimated exposure and, in turn, the losses that were estimated in the last version of the plan in 2014. This latest plan update was improved by using HAZUS-MH 4.0, where the newer and more accurate 2010 U.S. Census dasymetric block-level data, was used to estimate hazard exposure at the municipal level and replacement cost values were estimated using more recent 2014 RSMeans values. For this plan update, the default demographic and Census-block level data in HAZUS-MH 4.0, which is based on the 2010 U.S. Census, was used to estimate hazard exposure at the municipal level as well as estimate potential sheltering and injuries for this analysis. Replacement cost values were estimated using 2014 RSMeans values. There were no changes to the critical facility inventory (essential facilities, utilities, transportation features, and user-defined facilities since the last plan update. Both the critical facility and building inventories were formatted to be compatible with HAZUS-MH and its Comprehensive Data Management System (CDMS).

- Flood: For this plan update, the depth grids from the 2014 plan were updated to include small changes to the effective data in the National Flood Hazard Layer. Where 0.2-percent annual chance flood elevation data was not available in FIS, estimates based upon upstream and downstream elevations were used. The depth grids were integrated into the most current version of HAZUS-MH (4.0) and the model was run to estimate potential losses at the census block level utilizing the default

building inventory. The HAZUS-MH riverine flood model was used to estimate Somerset County's estimated potential losses at the census block level.

- Hurricane/Wind: A HAZUS-MH probabilistic analysis was performed to analyze the wind hazard losses for Somerset County. The probabilistic hurricane hazard activates a database of thousands of potential storms that have tracks and intensities reflecting the full spectrum of Atlantic hurricanes observed since 1886 and identify those with tracks associated with the County. Annualized losses and the 100- and 500-year MRPs were examined for the wind/severe storm hazard. Default demographic data in HAZUS-MH and updated building and critical facility data were used for the analysis.

- Earthquake: A Level 2 HAZUS-MH analysis using a probabilistic scenario was performed to analyze the earthquake hazard losses for Somerset County (annualized losses and 100-, 500- and 2,500-year mean return period [MRP] losses). According to the New Jersey Geologic and Water Survey, Somerset County is made up of dense soil/soft rock (C), stiff/soft soils (D) with a small area of soft soils (E) in the northeastern portion of the county. When unchanged, HAZUS-MH default soil types are class "D". To more closely reflect the soils of the County as indicated by the New Jersey Geological and Water Survey (not available in time for this analysis), HAZUS-MH was updated with the approximate locations of NEHRP soil classes "C" and "D" with the class 'D' soils closely following riverine reaches and floodplains. In addition to the probabilistic scenarios mentioned, an annualized loss run was conducted in HAZUS 4.0 to estimate the annualized general building stock dollar losses for the County. The annualized loss methodology combines the estimated losses associated with ground shaking for eight return periods: 100, 250, 500, 750, 1000, 1500, 2000, 2500-year, which are based on values from the USGS seismic probabilistic curves. Annualized losses are useful for mitigation planning because they provide a baseline upon which to 1) compare the risk of one hazard across multiple jurisdictions and 2) compare the degree of risk of all hazards for each participating jurisdiction.

- Wildfire: The Wildfire Urban Interface (interface and intermix) obtained through the SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin-Madison was used to define the wildfire hazard areas. The University of Wisconsin-Madison wildland fire hazard areas are based on the 2010 Census and 2006 National Land Cover Dataset and the Protected Areas Database. For the purposes of this risk assessment, the high-, medium- and low-density interface areas were combined and used as the 'interface' hazard area and the high-, medium- and low-density intermix areas were combined and used as the 'intermix' hazard areas. The asset data (population, building stock and critical facilities) presented in Section 4 was used to support an evaluation of assets exposed and the potential impacts and losses associated with this hazard. To determine what assets are exposed to wildfire, available and appropriate GIS data was overlaid upon the hazard area. The limitations of this analysis are recognized, and as such the analysis is only used to provide a general estimate.

- Other Hazards: HAZUS-MH support was used to evaluate other hazards, as feasible. For many of the hazards evaluated in this risk assessment, historic data are not adequate to model future losses at this time. However, HAZUS-MH can map hazard areas and calculate exposures if geographic information on the locations of the hazards and inventory data are available. For some of the other hazards of concern, areas and inventory susceptible to specific hazards were mapped and exposure was evaluated to help guide mitigation efforts discussed in Section 9. For other hazards, a qualitative analysis was conducted using the best available data and professional judgment.

For this risk assessment, the loss estimates, exposure assessments, and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss

estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

1) Approximations and simplifications necessary to conduct such a study

2) Incomplete or dated inventory, demographic, or economic parameter data

3) The unique nature, geographic extent, and severity of each hazard

4) Mitigation measures already employed by Somerset County and the amount of advance notice residents have to prepare for a specific hazard event

These factors can result in a range of uncertainty in loss estimates, possibly by a factor of two or more. Therefore, potential exposure and loss estimates are approximate. These results do not predict precise results and should be used to understand relative risk. Over the long term, Somerset County will collect additional data to assist in developing refined estimates of vulnerabilities to natural hazards.