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# *Appendix A*

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## *Hurricane Event Report from HAZUS*

# HAZUS-MH: Hurricane Event Report

**Region Name:** CR\_Hurricane

**Hurricane Scenario:** Probabilistic 100-year Return Period

**Print Date:** Thursday, November 30, 2006

**Disclaimer:**

*The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.*



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## General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 2 county(ies) from the following state(s):

- Connecticut

**Note:**

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 759.82 square miles and contains 187 census tracts. There are over 279 thousand households in the region and has a total population of 721,320 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 193 thousand buildings in the region with a total building replacement value (excluding contents) of 47,585 million dollars (2002 dollars). Approximately 98% of the buildings (and 78% of the building value) are associated with residential housing.



## Building Inventory

### General Building Stock

HAZUS estimates that there are 193,673 buildings in the region which have an aggregate total replacement value of 47,585 million (2002 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

**Table 1: Building Exposure by Occupancy Type**

<b>Occupancy</b>	<b>Exposure</b>	<b>Percent of Total</b>
Residential	37,051,041	77.9%
Commercial	7,964,932	16.7%
Industrial	1,548,253	3.3%
Agricultural	85,962	0.2%
Religious	404,194	0.8%
Government	190,722	0.4%
Education	340,336	0.7%
Total	47,585,440	100.0%

### Essential Facility Inventory

For essential facilities, there are 10 hospitals in the region with a total bed capacity of 2,457 beds. There are 321 schools, 52 fire stations, 34 police stations and 9 emergency operation facilities.



## Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

<b>Scenario Name:</b>	Probabilistic
<b>Type:</b>	Probabilistic

## Building Damage

### General Building Stock Damage

HAZUS estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

**Table 2: Expected Building Damage by Occupancy : 100 - year Event**

Occupan	None		Minor		Moderate		Severe		Destruction	
	Count	(	Count	(	Count	(	Count	(	Count	(
Agriculture	16	10	0	0.	0	0.	0	0.	0	0.
Commercial	3,417	10	0	0.	0	0.	0	0.	0	0.
Education	19	10	0	0.	0	0.	0	0.	0	0.
Government	165	10	0	0.	0	0.	0	0.	0	0.
Industrial	517	10	0	0.	0	0.	0	0.	0	0.
Religion	150	10	0	0.	0	0.	0	0.	0	0.
Residential	189,389	10	0	0.	0	0.	0	0.	0	0.
<b>Total</b>	<b>193,673</b>		<b>0</b>		<b>0</b>		<b>0</b>		<b>0</b>	

**Table 3: Expected Building Damage by Building Type : 100 - year Event**

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(	Count	(	Count	(	Count	(	Count	(
Concrete	1,271	10	0	0.	0	0.	0	0.	0	0.
Masonry	13,786	10	0	0.	0	0.	0	0.	0	0.
MH	1,302	10	0	0.	0	0.	0	0.	0	0.
Steel	2,531	10	0	0.	0	0.	0	0.	0	0.
Wood	174,66	10	0	0.	0	0.	0	0.	0	0.

## **Essential Facility Damage**

Before the hurricane, the region had 2,457 hospital beds available for use. On the day of the hurricane, the model estimates that 2457 hospital beds (only 100.00%) are available for use. After one week, 100.00% of the beds will be in service. By 30 days, 100.00% will be operational.

**Table 4: Expected Damage to Essential Facilities**

<b>Classificat</b>	Total	# Facilities		Expected Loss of Use < 1 day
		Probability of at Least Moderate	Probability of Complete Damage >	
EOCs	9	0	0	9
Fire Stations	52	0	0	52
Hospitals	10	0	0	10
Police Stations	34	0	0	34
Schools	321	0	0	321

## Induced Hurricane Damage

### Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 3,440,800 tons of debris will be generated. Of the total amount, Brick/Wood comprises 0% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

## Social Impact

### Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 721,320) will seek temporary shelter in public shelters.

## Economic Loss

The total economic loss estimated for the hurricane is 58.6 million dollars, which represents 0.12 % of the total replacement value of the region's buildings.

### **Building-Related Losses**

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 59 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 100% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

**Table 5: Building-Related Economic Loss Estimates**

(Thousands of dollars)

<b>Category</b>	<b>Area</b>	<b>Residentia</b>	<b>Commerci</b>	<b>Industrial</b>	<b>Others</b>	<b>Total</b>
<b><u>Property Damage</u></b>						
	Building	28,564.10	0.00	0.00	0.00	28,564.10
	Content	30,002.85	0.00	0.00	0.00	30,002.85
	Inventory	0.00	0.00	0.00	0.00	0.00
	<b>Subtotal</b>	<b>58,566.95</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>58,566.95</b>
<b><u>Business Interruption Loss</u></b>						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	<b>Subtotal</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>Total</b>	<b>Total</b>	<b>58,566.95</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>58,566.95</b>

**Appendix A: County Listing for the Region**

Connecticut  
Hartford  
Tolland

**Appendix B: Regional Population and Building Value Data**

	Populatio	Building Value (thousands of dollars)		
		Residential	Non-	Total
<b>Connecticut</b>				
Hartford	640,110	32,868,442	9,962,544	42,830,986
Tolland	81,210	4,182,599	571,855	4,754,454
<b>Total State</b>	<b>721,320</b>	<b>37,051,041</b>	<b>10,534,399</b>	<b>47,585,440</b>
<b>Total Study Region</b>	<b>721,320</b>	<b>37,051,041</b>	<b>10,534,399</b>	<b>47,585,440</b>