

## 6.0 APPENDIX A: HAZARD AND VULNERABILITY DATA

The information included in this appendix supplements the hazard and vulnerability discussion from Section 2: Hazard Identification and Risk Assessment. A complete list of historical incidents of each hazard is provided here. Additionally, detailed data on the anticipated damage to Preble County from a 100-year flood and earthquake, per HAZUS estimates, is provided.

### 5.1 HAZARD HISTORY DATA

The National Climactic Data Center has maintained records on weather incidents across the United States since 1950. The tables below provide a complete history of the incidents in Preble County from 1950 through present day.

#### 5.1.1 Drought and Extreme Heat

These incidents include all occurrences categorized as drought or extreme heat.

Hazard	Location	Date	Injuries	Deaths	Property Damage	Crop Damage
Drought	Preble (Zone)	07/01/1999	0	0	0	0
Drought	Preble (Zone)	08/01/1999	0	0	0	0

#### 5.1.2 Flood

The flood incidents identified in this table include events classified as flood and flash flood that occurred in Preble County since 1950.

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Flash Flood	Countywide	04/29/1996	0	0	3K	0
Flash Flood	Southwest Portion	07/20/1998	0	0	0	0
Flash Flood	New Paris	01/22/1999	0	0	0	0
Flash Flood	Countywide	04/08/2000	0	0	3K	0
Flash Flood	Eaton	07/05/2000	0	0	5K	0
Flash Flood	Countywide	04/11/2001	0	0	2K	0
Flash Flood	Eaton	06/13/2001	0	0	2K	0
Flash Flood	Eaton	06/13/2001	0	0	3K	0
Flash Flood	Countywide	07/17/2001	0	0	0	0
Flood	Preble (Zone)	12/17/2001	0	0	0	0
Flood	Preble (Zone)	04/12/2002	0	0	0	0
Flash Flood	Countywide	05/07/2002	0	0	7K	0
Flood	Preble (Zone)	05/13/2002	0	0	0	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Flood	Preble (Zone)	06/13/2002	0	0	0	0
Flood	Preble (Zone)	11/10/2002	0	0	0	0
Flood	Preble (Zone)	06/15/2003	0	0	0	0
Flash Flood	Southwest Portion	06/15/2003	0	0	0	0
Flash Flood	Fairhaven	06/15/2003	0	0	500K	0
Flash Flood	Camden	06/15/2003	0	0	50K	0
Flood	Preble (Zone)	06/15/2003	0	0	0	0
Flood	Preble (Zone)	06/16/2003	0	0	0	0
Flash Flood	Camden	06/16/2003	0	0	0	0
Flash Flood	Fairhaven	06/16/2003	0	0	0	0
Flood	Preble (Zone)	07/07/2003	0	0	0	0
Flood	Preble (Zone)	07/09/2003	0	0	10K	0
Flood	Preble (Zone)	07/21/2003	0	0	0	0
Flood	Preble (Zone)	01/04/2004	0	0	0	0
Flood	Preble (Zone)	07/04/2004	0	0	0	0
Flash Flood	New Paris	05/27/2004	0	0	0	0
Flood	Preble (Zone)	06/11/2004	0	0	0	0
Flood	Preble (Zone)	01/05/2005	0	0	20K	0
Flood	Preble (Zone)	01/11/2005	0	0	10K	0
Flood	Preble (Zone)	06/30/2005	0	0	0	0
Flood	Eaton	07/26/2006	0	0	7K	0
Flood	Camden	03/01/2007	0	0	3K	0
Flash Flood	Morning Sun	06/01/2008	0	0	8K	0
Flash Flood	College Corner	06/04/2008	0	0	2K	0
Flood	Eaton	03/05/2011	0	0	5K	0
Flood	Green Bush	01/26/2012	0	2	15K	0
Flood	Morning Sun	12/21/2013	0	0	0	0
Flood	Verona	12/21/2013	0	0	0	0
Flood	Sugar Valley	12/21/2013	0	0	0	0
Flash Flood	Kitson Corners	12/22/2013	0	0	1K	0
Flash Flood	Eaton	06/19/2014	0	0	1K	0
Flash Flood	New Paris	06/19/2014	0	0	1K	0
Flash Flood	Kitson Corners	06/19/2014	0	0	1K	0
Flash Flood	West Alexandria	06/19/2014	0	0	1K	0
Flood	Camden	07/07/2017	0	0	0	0
Flash Flood	Sugar Valley	04/03/2018	0	0	0	0
Flash Flood	Eaton	04/03/2018	0	0	0	0
Flash Flood	Eaton	04/03/2018	0	0	0	0
Flash Flood	Lewisburg Gilmer Airport	04/03/2018	0	0	0	0

### 5.1.3 Severe Thunderstorm

Thunderstorm incidents include events that produced any combination of hail, lightning and thunderstorm wind; all hazards were not necessarily present in all incidents.

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Thunderstorm Wind	Preble County	07/31/1961	0	0	0	0
Hail	Preble County	04/08/1965	0	0	0	0
Hail	Preble County	06/28/1967	0	0	0	0
Thunderstorm Wind	Preble County	05/24/1970	0	0	0	0
Thunderstorm Wind	Preble County	07/20/1973	0	0	0	0
Thunderstorm Wind	Preble County	06/20/1974	0	0	0	0
Thunderstorm Wind	Preble County	05/30/1976	0	0	0	0
Thunderstorm Wind	Preble County	07/05/1980	0	0	0	0
Hail	Preble County	04/17/1981	0	0	0	0
Thunderstorm Wind	Preble County	06/13/1981	0	0	0	0
Hail	Preble County	06/24/1981	0	0	0	0
Hail	Preble County	06/15/1982	0	0	0	0
Hail	Preble County	06/15/1982	0	0	0	0
Hail	Preble County	06/15/1982	0	0	0	0
Thunderstorm Wind	Preble County	06/15/1982	0	0	0	0
Thunderstorm Wind	Preble County	06/15/1982	0	0	0	0
Thunderstorm Wind	Preble County	06/15/1982	0	0	0	0
Thunderstorm Wind	Preble County	08/24/1982	0	0	0	0
Thunderstorm Wind	Preble County	08/24/1982	0	0	0	0
Hail	Preble County	03/27/1983	0	0	0	0
Thunderstorm Wind	Preble County	07/23/1983	0	0	0	0
Thunderstorm Wind	Preble County	07/23/1983	0	0	0	0
Hail	Preble County	04/05/1985	0	0	0	0
Thunderstorm Wind	Preble County	04/05/1985	0	0	0	0
Thunderstorm Wind	Preble County	05/06/1986	0	0	0	0
Thunderstorm Wind	Preble County	05/15/1986	0	0	0	0
Thunderstorm Wind	Preble County	06/22/1986	0	0	0	0
Thunderstorm Wind	Preble County	05/20/1987	0	0	0	0
Thunderstorm Wind	Preble County	07/26/1987	0	0	0	0
Thunderstorm Wind	Preble County	05/26/1989	0	0	0	0
Thunderstorm Wind	Preble County	05/26/1989	0	0	0	0
Hail	Preble County	11/15/1989	0	0	0	0
Thunderstorm Wind	Preble County	06/03/1990	0	0	0	0
Hail	Preble County	06/30/1990	0	0	0	0
Thunderstorm Wind	Preble County	07/09/1990	0	0	0	0
Thunderstorm Wind	Preble County	08/28/1990	0	0	0	0
Thunderstorm Wind	Preble County	09/14/1990	0	0	0	0
Thunderstorm Wind	Preble County	04/09/1991	0	0	0	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Thunderstorm Wind	Preble County	05/17/1991	0	0	0	0
Thunderstorm Wind	Preble County	05/17/1991	0	0	0	0
Thunderstorm Wind	Preble County	07/09/1992	0	0	0	0
Thunderstorm Wind	Preble County	07/14/1992	0	0	0	0
Thunderstorm Wind	Preble County	10/08/1992	0	0	0	0
Hail	Eaton	04/15/1994	0	0	0	0
Thunderstorm Wind	Eaton	04/27/1994	0	0	5K	0
Hail	Camden	04/10/1995	0	0	0	0
Thunderstorm Wind	Green Bush	04/10/1995	0	0	3K	0
Thunderstorm Wind	Fairhaven	06/21/1995	0	0	4K	0
Thunderstorm Wind	Gratis	06/22/1995	0	0	3K	0
Thunderstorm Wind	New Paris	06/26/1995	0	0	3K	0
Hail	Eldorado	07/15/1995	0	0	0	0
Thunderstorm Wind	South Part	07/15/1995	0	0	4K	0
Thunderstorm Wind	Lewisburg	07/26/1995	0	0	3K	0
Thunderstorm Wind	South Half	08/08/1995	0	0	3K	0
Hail	Lewisburg	04/19/1996	0	0	0	0
Hail	Eaton	05/10/1996	0	0	0	0
Hail	Eaton	06/03/1996	0	0	0	0
Thunderstorm Wind	West Manchester	11/07/1996	0	0	1M	0
Hail	Gettysburg	03/28/1997	0	0	0	0
Thunderstorm Wind	Countywide	07/02/1997	0	0	10K	0
Hail	Eaton	04/16/1998	0	0	0	0
Hail	Camden	04/22/1998	0	0	0	0
Hail	Eaton	05/24/1998	0	0	0	0
Thunderstorm Wind	New Paris	05/31/1998	0	0	3K	0
Thunderstorm Wind	New Paris	06/12/1998	0	0	3K	0
Thunderstorm Wind	Countywide	06/19/1998	0	0	10K	0
Thunderstorm Wind	Camden	07/19/1998	0	0	10K	0
Thunderstorm Wind	Eaton	08/24/1998	0	0	3K	0
Thunderstorm Wind	West Alexandria	11/10/1998	0	0	10K	0
Thunderstorm Wind	Eaton	02/11/1999	0	0	3K	0
Thunderstorm Wind	Eaton	05/17/1999	0	0	6K	0
Hail	New Hope	06/09/1999	0	0	0	0
Thunderstorm Wind	Camden	06/13/1999	0	0	2K	0
Thunderstorm Wind	West Alexandria	07/09/1999	0	0	0	0
Thunderstorm Wind	New Paris	07/19/1999	0	0	3K	0
Thunderstorm Wind	New Lexington	07/26/1999	0	0	3K	0
Thunderstorm Wind	New Lexington	08/19/1999	0	0	5K	0
Thunderstorm Wind	West Alexandria	04/20/2000	0	0	5K	0
Thunderstorm Wind	West Alexandria	06/16/2000	0	0	1K	0
Thunderstorm Wind	West Alexandria	06/16/2000	0	0	3K	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Thunderstorm Wind	New Paris	06/24/2000	0	0	7K	0
Hail	Gettysburg	07/28/2000	0	0	0	0
Thunderstorm Wind	Countywide	08/06/2000	0	0	50K	0
Thunderstorm Wind	Countywide	08/09/2000	0	0	10K	0
Thunderstorm Wind	Countywide	08/09/2000	0	0	10K	0
Thunderstorm Wind	Eaton	09/20/2000	0	0	0	0
Thunderstorm Wind	Countywide	11/09/2000	0	0	10K	0
Thunderstorm Wind	West Sonora	05/17/2001	0	0	5K	0
Thunderstorm Wind	Countywide	06/12/2001	0	0	5K	0
Thunderstorm Wind	New Paris	07/08/2001	0	0	3K	0
Hail	Eaton	05/31/2002	0	0	0	0
Thunderstorm Wind	Eaton	06/05/2002	0	0	3K	0
Thunderstorm Wind	New Hope	07/29/2002	0	0	3K	0
Thunderstorm Wind	Camden	11/10/2002	0	0	2K	0
Thunderstorm Wind	West Elkton	04/04/2003	0	0	5K	0
Thunderstorm Wind	Camden	04/04/2003	0	0	7K	0
Thunderstorm Wind	Camden	04/20/2003	0	0	3K	0
Hail	West Alexandria	05/10/2003	0	0	0	0
Thunderstorm Wind	Camden	05/10/2003	0	0	15K	0
Thunderstorm Wind	Countywide	07/04/2003	0	0	7K	0
Thunderstorm Wind	Camden	07/05/2003	0	0	3K	0
Thunderstorm Wind	New Paris	07/06/2003	0	0	3K	0
Thunderstorm Wind	Fairhaven	07/21/2003	0	0	20K	0
Thunderstorm Wind	Eaton	05/17/2004	0	0	3K	0
Thunderstorm Wind	West Elkton	05/18/2004	0	0	2K	0
Thunderstorm Wind	Countywide	05/23/2004	0	0	6K	0
Thunderstorm Wind	Verona	05/27/2004	0	0	6K	0
Thunderstorm Wind	Lewisburg	05/27/2004	0	0	3K	0
Thunderstorm Wind	Eaton	05/30/2004	0	0	2K	0
Hail	New Paris	11/24/2004	0	0	0	0
Thunderstorm Wind	Eaton	05/11/2005	0	0	3K	0
Thunderstorm Wind	Eaton	06/30/2005	0	0	3K	0
Thunderstorm Wind	New Paris	11/06/2005	0	0	3K	0
Thunderstorm Wind	New Paris	04/02/2006	0	0	5K	0
Hail	Lewisburg	04/07/2006	0	0	0	0
Hail	Eaton	04/07/2006	0	0	0	0
Hail	Eaton	04/14/2006	0	0	0	0
Hail	Lewisburg	04/14/2006	0	0	0	0
Thunderstorm Wind	West Alexandria	05/25/2006	0	0	3K	0
Thunderstorm Wind	New Paris	06/21/2006	0	0	8K	0
Thunderstorm Wind	Camden	06/22/2006	0	0	10K	0
Thunderstorm Wind	West Alexandria	06/22/2006	0	0	3K	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Hail	Eaton	09/30/2006	0	0	1K	0
Thunderstorm Wind	New Paris	04/11/2007	0	0	2K	0
Thunderstorm Wind	West Manchester	01/29/2008	0	0	10K	0
Thunderstorm Wind	Fairhaven	02/06/2008	0	0	15K	0
Thunderstorm Wind	Eaton	05/30/2008	0	0	20K	0
Thunderstorm Wind	Eaton	05/31/2008	0	0	10K	0
Thunderstorm Wind	Eaton	06/03/2008	0	0	3K	0
Hail	Eaton	06/02/2009	0	0	0	0
Hail	Gratis	06/02/2009	0	0	0	0
Hail	Eldorado	06/09/2009	0	0	0	0
Hail	Eaton	04/05/2010	0	0	0	0
Thunderstorm Wind	Eaton	04/05/2010	0	0	15K	0
Thunderstorm Wind	West Alexandria	06/15/2010	0	0	1K	0
Hail	West Alexandria	04/20/2011	0	0	0	0
Hail	Eaton	04/20/2011	0	0	0	0
Hail	Camden	04/20/2011	0	0	0	0
Hail	Eaton	04/20/2011	0	0	0	0
Thunderstorm Wind	College Corner	05/23/2011	0	0	5K	0
Thunderstorm Wind	Eaton	05/23/2011	0	0	8K	0
Hail	College Corner	05/25/2011	0	0	0	0
Hail	Camden	05/25/2011	0	0	0	0
Hail	Eaton	05/25/2011	0	0	0	0
Hail	West Manchester	05/25/2011	0	0	0	0
Thunderstorm Wind	New Paris	07/11/2011	0	0	5K	0
Thunderstorm Wind	Eaton	07/11/2011	0	0	0	0
Thunderstorm Wind	West Alexandria	09/03/2011	0	0	2K	0
Hail	West Manchester	03/30/2012	0	0	0	0
Hail	West Alexandria	03/30/2012	0	0	0	0
Hail	Eaton	04/01/2012	0	0	0	0
Hail	Eaton	04/01/2012	0	0	0	0
Thunderstorm Wind	New Paris	06/29/2012	0	0	10K	0
Thunderstorm Wind	Eaton	06/29/2012	0	0	5K	0
Thunderstorm Wind	Eaton	06/29/2012	0	0	3K	0
Hail	Eaton	07/24/2012	0	0	0	0
Thunderstorm Wind	Eaton	07/24/2012	0	0	1K	0
Hail	Camden	09/07/2012	0	0	0	0
Thunderstorm Wind	West Manchester	09/21/2012	0	0	25K	0
Thunderstorm Wind	Lewisburg	02/20/2014	0	0	0	0
Thunderstorm Wind	College Corner	04/08/2015	0	0	5K	0
Thunderstorm Wind	Eaton	06/08/2015	0	0	<1K	0
Thunderstorm Wind	Eaton	06/18/2015	0	0	12K	0
Thunderstorm Wind	Eaton	06/18/2015	0	0	12K	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Thunderstorm Wind	Eaton	06/18/2015	0	0	3K	0
Thunderstorm Wind	Kitson Corners	06/18/2015	0	0	4K	0
Thunderstorm Wind	Eaton	06/18/2015	0	0	3K	0
Thunderstorm Wind	Eaton	06/18/2015	0	0	2K	0
Thunderstorm Wind	New Paris	07/13/2015	0	0	5K	0
Hail	New Paris	08/03/2015	0	0	0	0
Thunderstorm Wind	Eaton	08/03/2015	0	0	30K	0
Thunderstorm Wind	Eaton	12/23/2015	0	0	2K	0
Thunderstorm Wind	Camden	12/23/2015	0	0	4K	0
Thunderstorm Wind	Eldorado	12/23/2015	0	0	12K	0
Thunderstorm Wind	Eldorado	12/23/2015	0	0	7K	0
Thunderstorm Wind	Camden	12/23/2015	0	0	10K	0
Thunderstorm Wind	Eaton	12/23/2015	0	0	2K	0
Thunderstorm Wind	New Hope	03/27/2016	0	0	1K	0
Thunderstorm Wind	West Sonora	03/27/2016	0	0	10K	0
Thunderstorm Wind	Fairhaven	04/26/2016	0	0	6K	0
Thunderstorm Wind	Camden	04/26/2016	0	0	6K	0
Thunderstorm Wind	Eaton	06/23/2016	0	0	<1K	0
Hail	Eaton	07/13/2016	0	0	0	0
Thunderstorm Wind	Eaton	07/13/2016	0	0	3K	0
Thunderstorm Wind	Eaton	07/13/2016	0	0	<1K	0
Thunderstorm Wind	Sugar Valley	08/27/2016	0	0	3K	0
Thunderstorm Wind	Gratis	08/27/2016	0	0	2K	0
Thunderstorm Wind	Lewisburg Gilmer Airport	08/27/2016	0	0	2K	0
Hail	College Corner	02/24/2017	0	0	0	0
Hail	Sugar Valley	02/24/2017	0	0	0	0
Thunderstorm Wind	Eaton	02/24/2017	0	0	1K	0
Hail	Gratis	04/05/2017	0	0	0	0
Thunderstorm Wind	Gratis	04/05/2017	0	0	1K	0
Thunderstorm Wind	Dadsville	05/26/2017	0	0	40K	0
Thunderstorm Wind	Morning Sun	07/03/2017	0	0	2K	0
Thunderstorm Wind	West Elkton	07/07/2017	0	0	3K	0
Thunderstorm Wind	College Corner	07/07/2017	0	0	3K	0
Thunderstorm Wind	New Paris	07/11/2017	0	0	1K	0
Thunderstorm Wind	Hamburg	07/11/2017	0	0	3K	0
Thunderstorm Wind	Eaton	07/11/2017	0	0	1K	0
Thunderstorm Wind	Gratis	09/04/2017	0	0	4K	0
Hail	Camden	04/03/2018	0	0	0	0
Hail	Kitson Corners	04/03/2018	0	0	0	0

### 5.1.4 Tornado

Confirmed tornadoes occurring in Preble County since 1950 are listed below.

Hazard	Location	Date	Fujita Scale	Deaths	Injuries	Property Damage	Crop Damage
Tornado	Preble County	06/13/1953	F2	0	0	25K	0
Tornado	Preble County	04/25/1961	F4	0	0	2.5M	0
Tornado	Preble County	05/27/1963	F1	0	0	25K	0
Tornado	Preble County	04/11/1965	F1	0	0	25K	0
Tornado	Preble County	07/14/1973	F1	0	0	2.5K	0
Tornado	Preble County	04/08/1980	F1	0	0	250K	0
Tornado	Preble County	07/12/1986	F2	0	0	25K	0
Tornado	Preble County	11/22/1992	F3	0	0	25M	0
Tornado	Sugar Valley	07/01/1999	F0	0	0	20k	0
Tornado	Lewisburg Gilmer Airport	01/29/2008	EF0	0	0	25K	0
Tornado	Eldorado	10/26/2010	EF0	0	0	2K	0
Tornado	Kitson Corners	03/14/2016	EF1	0	0	60K	0

### 5.1.5 Windstorm

Incidents identified as windstorms are limited to wind-only events. Events in which severe wind occurred along with another hazards, such as winter weather or severe thunderstorms, are identified under the primary hazard.

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
High Wind	Preble (Zone)	03/25/1996	0	0	0	0
High Wind	Preble (Zone)	04/06/1997	0	0	0	0
High Wind	Preble (Zone)	12/11/2000	0	0	0	0
High Wind	Preble (Zone)	03/09/2002	0	0	12K	0
High Wind	Preble (Zone)	05/11/2003	0	0	0	0
High Wind	Preble (Zone)	12/01/2006	0	0	10K	0
High Wind	Preble (Zone)	09/14/2008	2	0	5M	0
High Wind	Preble (Zone)	02/11/2009	0	0	0	0
High Wind	Preble (Zone)	12/09/2009	0	0	0	0
High Wind	Preble (Zone)	12/20/2012	0	0	0	0
High Wind	Preble (Zone)	04/003/2016	0	0	1K	0



### 5.1.6 Winter Storm

Winter storm events include incidents classified as blizzard, cold/extreme cold/wind chill, ice storm, or winter storm that occurred in Preble County since 1950.

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Winter Storm	Preble (Zone)	01/02/1996	0	0	25K	0
Winter Storm	Preble (Zone)	01/06/1996	0	0	500K	0
Ice Storm	Preble (Zone)	03/06/1996	0	0	0	0
Winter Storm	Preble (Zone)	03/19/1996	0	0	0	0
Ice Storm	Preble (Zone)	01/24/1997	0	0	0	0
Winter Storm	Preble (Zone)	01/01/1999	0	0	0	0
Winter Storm	Preble (Zone)	01/07/1999	0	0	0	0
Winter Storm	Preble (Zone)	01/13/1999	0	0	0	0
Ice Storm	Preble (Zone)	12/13/2000	0	0	0	0
Winter Storm	Preble (Zone)	03/26/2002	0	0	0	0
Winter Storm	Preble (Zone)	12/25/2002	0	0	0	0
Winter Storm	Preble (Zone)	02/15/2003	0	0	0	0
Winter Storm	Preble (Zone)	12/14/2003	0	0	0	0
Winter Storm	Preble (Zone)	01/25/2004	0	0	0	0
Winter Storm	Preble (Zone)	03/16/2004	0	0	0	0
Winter Storm	Preble (Zone)	12/22/2004	0	0	0	0
Winter Storm	Preble (Zone)	01/20/2005	0	0	0	0
Winter Storm	Preble (Zone)	12/08/2005	0	0	0	0
Winter Storm	Preble (Zone)	12/15/2005	0	0	0	0
Winter Storm	Preble (Zone)	02/12/2008	0	0	0	0
Ice Storm	Preble (Zone)	03/04/2008	0	0	0	0
Winter Storm	Preble (Zone)	03/07/2008	0	0	0	0
Ice Storm	Preble (Zone)	02/01/2011	0	0	0	0
Blizzard	Preble (Zone)	12/26/2012	0	0	0	0
Ice Storm	Preble (Zone)	02/21/2013	0	0	0	0
Winter Storm	Preble (Zone)	03/05/2013	0	0	0	0
Winter Storm	Preble (Zone)	12/06/2013	0	0	0	0
Winter Storm	Preble (Zone)	02/04/2014	0	0	0	0
Winter Storm	Preble (Zone)	02/21/2015	0	0	0	0

## 5.2 HAZUS LOSS ESTIMATES

HAZUS is a nationally accepted methodology that utilizes U.S. Census and local Geographic Information Systems (GIS) data to estimate losses for earthquakes, hurricanes, and floods. Because floods and earthquakes are identified as risks for Preble County, HAZUS was used to generate and evaluate the county's vulnerability to these incidents. Estimates from HAZUS were generated using 2010 U.S. Census Bureau data, which calculated the population of Preble County as 42,270.

### 5.2.1 Flood

To evaluate Preble County's flood vulnerability, a 100-year flood scenario was utilized to generate loss estimates. For a flood of this magnitude, the damage to the county would be significant. The incident would expose a significant portion of the county's buildings to damage. Table 5-1 identifies buildings by occupancy type for all of Preble County and those exposed to risk in this scenario.

**Table 5-1: Building Occupancy Type**

Occupancy	Preble County		100-Year Flood Scenario	
	Exposure (\$1000)	Percent of Total	Exposure (\$1000)	Percent of Total
Residential	3,721,411	79.6%	1,097,891	74.5%
Commercial	439,448	9.4%	153,125	10.4%
Industrial	303,303	6.5%	150,155	10.2%
Agricultural	63,897	1.4%	28,020	1.9%
Religion	80,182	1.7%	20,953	1.4%
Government	20,313	0.4%	2,855	0.2%
Education	48,489	1.0%	21,669	1.5%
<b>Total</b>	<b>4,677,043</b>	<b>100%</b>	<b>1,474,668</b>	<b>100.0%</b>

#### *Essential Facility Inventory*

Essential facilities are healthcare facilities like hospitals and clinics, fire and EMS stations, police stations, and operations and dispatch centers. Schools are included in essential facilities. Preble County's essential facilities are identified in table 5-2.

**Table 5-2: Essential Facility Inventory**

Facility Type	Number
Hospitals	0
Schools	19
Fire Stations	9
Police Stations	5

#### *Estimated Building Damage*

Per HAZUS estimates, 102 buildings will sustain at least moderate damage. This accounts for 80% of the total buildings identified for the scenario. Additionally, 2 buildings are likely to be completely destroyed. Tables 5-3 and 5-4 identify the anticipated building damage based on occupancy type and building type.

**Table 5-3: Expected Building Damage by Occupancy**

Occupancy	Percent Damaged					
	1-10%	11-20%	21-30%	31-40%	41- 50 %	> 50%
Agriculture	0	0	0	0	0	0
Commercial	0	1	0	0	0	0
Education	0	0	0	0	0	0
Government	0	0	0	0	0	0
Industrial	1	6	0	0	0	0
Religious	0	0	0	0	0	0
Residential	64	73	15	2	3	2
<b>Total</b>	<b>65</b>	<b>80</b>	<b>15</b>	<b>2</b>	<b>3</b>	<b>2</b>

**Table 5-4: Expected Building Damage by Building Type**

Building Type	Percent Damaged					
	1-10%	11-20%	21-30%	31-40%	41- 50 %	> 50%
Concrete	0	2	0	0	0	0
Manufactured Housing	0	0	0	0	0	2
Masonry	4	7	0	0	0	0
Steel	1	4	0	0	0	0
Wood	60	67	15	2	3	0
<b>Total</b>	<b>60</b>	<b>67</b>	<b>15</b>	<b>2</b>	<b>3</b>	<b>0</b>

Based on this scenario, HAZUS does not predict that any critical facilities will be damaged or experience loss of use.

**Table 5-5: Expected Damage to Essential Facilities**

Classification	Total	Moderate Damage	Substantial Damage	Loss of Use
Fire Stations	9	0	0	0
Hospitals	0	0	0	0
Police Stations	5	0	0	0
Schools	19	0	0	0

#### *Shelter Requirements*

When flooding forces people from their homes, some will seek refuge at a public shelter. In this incident, it is anticipated that 645 households would be displaced and approximately 625 people would seek temporary shelter.

#### *Building Related Losses*

The total economic loss for the identified 100-year flood event is estimated to be \$90.7M.

Building-related losses are separated into two loss categories: direct building loss and business interruption loss. Building losses include structural damage and damage to contents. Business interruption losses include the costs associated with not being able to conduct normal business,

displaced workers, and lost opportunities. Table 5-6 provides a summary of the anticipated losses.

**Table 5-6: Building-Related Economic Loss Estimates**

Area	Residential	Commercial	Industrial	Others	Total
<b>Building Loss</b>					
Building	22.61	3.90	7.54	0.87	<b>34.92</b>
Content	9.49	13.76	22.40	4.73	<b>50.38</b>
Inventory	0	0.56	4.58	0.08	<b>5.22</b>
<b>Business Interruption</b>					
Income	0	0.04	0	0.01	<b>0.05</b>
Relocation	0.01	0.01	0	0	<b>0.02</b>
Rental Income	0	0.01	0	0	<b>0.01</b>
Wage	0	0.06	0.01	0.05	<b>0.11</b>
<b>Total</b>	<b>32.11</b>	<b>18.33</b>	<b>34.54</b>	<b>5.74</b>	<b>90.70</b>

### 5.2.2 Earthquake

The simulated earthquake epicenter was assumed to be inside Eaton, Preble County's most populated jurisdiction, for a worst-case scenario. The magnitude of the simulated earthquake measured 5.0 on the Richter Scale. The HAZUS loss estimation program utilized 2010 U.S. Census data for this scenario. There are an estimated 18,000 buildings in the county with a replacement value of \$4,677M.

#### *Critical Facility Inventory*

HAZUS separates critical facilities into essential facilities and high potential loss (HPL) facilities. Essential facilities are healthcare facilities like hospitals and clinics, fire and EMS stations, police stations, and operations and dispatch centers. Schools are included in essential facilities. HPL facilities include dams, levees, nuclear power plants, military installations and hazardous material sites.

**Table 5-7: Critical Facility Inventory**

Essential Facilities		High Potential Loss Facilities	
Facility Type	Number	Facility Type	Number
Hospitals	0	Hazardous Materials Sites	39
Schools	19	Dams/Levees	0
Fire Stations	9	Nuclear Power Plants	0
Police Stations	5	Military Installations	0

#### *Transportation and Utility Lifeline Inventory*

Lifeline systems are defined as transportation and utilities. Transportation systems include highways, railways, and airports. Utility systems include water treatment and potable water plants, wastewater treatment plants, natural gas suppliers, fuel oil suppliers, electrical power plants, and communications hubs. The total value of these lifeline systems exceeds \$2,113M and includes more than 92 miles of highways, 97 bridges, and 5,417 miles of pipes.

**Table 5-8: Transportation System Inventory**

System	Components	Quantity	Replacement Value
Highways	Bridges	97	\$82.6M
	Segments	30	\$799.3M
Railways	Facilities	2	\$5.3M
	Segments	13	\$38.4M
<b>Total</b>			<b>\$925.7M</b>

**Table 5-9: Utility System Inventory**

System	Components	Quantity	Replacement Value
Potable Water	Distribution Lines	N/A	\$87.2M
	Facilities	1	\$35M
Waste Water	Distribution Lines	N/A	\$52.3M
	Facilities	14	\$979.0M
Natural Gas	Distribution Lines	N/A	\$34.8M
Communication	Facilities	2	\$0.2M
<b>Total</b>			<b>\$1,188.6M</b>

**Building Damage**

The estimated building damage according to HAZUS is extensive. The number of buildings projected to sustain at least moderate damage is 3,412, approximately 18% of all buildings in the county. It is estimated that 209 buildings would be destroyed. Table 5-10 summarizes the anticipated building damages.

**Table 5-10: Expected Building Damage by Occupancy**

Occupancy	None	Slight	Moderate	Extensive	Complete
Agriculture	101	48	57	28	7
Commercial	357	194	220	107	31
Education	19	8	8	3	1
Government	14	8	9	4	1
Industrial	143	73	92	50	14
Other Residential	479	254	264	105	21
Religion	66	29	27	13	4
Single Family Residential	8,671	3,622	1,745	469	131
<b>Total</b>	<b>10,853</b>	<b>4,236</b>	<b>2,423</b>	<b>780</b>	<b>210</b>

Depending on the type of building construction, damage from an earthquake can be more or less serious. Based on common types of construction, the scenario is extrapolated into damage according to type of construction type.

**Table 5-11: Expected Building Damage by Building Type**

Building Type	None	Slight	Moderate	Extensive	Complete
Wood	8,447	2,972	1,052	127	9
Steel	180	84	149	98	28
Concrete	62	28	34	17	3
Precast	60	22	36	26	5
Reinforced Masonry	23	7	11	7	1
Unreinforced Masonry	1,865	982	936	420	149
Manufactured Housing	215	140	202	86	15
<b>Total</b>	<b>10,853</b>	<b>4,236</b>	<b>2,423</b>	<b>780</b>	<b>210</b>

*Essential Facility Damage*

According to HAZUS estimates, most essential facilities will be functional in the aftermath of an earthquake.

**Table 5-12: Expected Damage to Essential Facilities**

Classification	Total	Moderate Damage >50%	Complete Damage > 50%	With Functionality >50% on Day 1
Schools	19	4	0	5
Police Stations	5	2	0	1
Fire Stations	9	1	0	2

*Transportation and Utility Lifeline Damage*

Per HAZUS estimates, nearly all highways, bridges, railways, and rail bridges will have more than 50% functionality on the first day after an earthquake and will continue to experience greater than 50% functionality throughout the recovery period. Limited damage to these transportation systems is expected. One bridge is anticipated to suffer moderate damage.

Tables 5-13 and 5-14 describe the anticipated damage to utility system facilities and pipelines.

**Table 5-13: Expected Utility System Facility Damage**

System	Total	Moderate Damage	Complete Damage	Day 1 >50% Functionality	Day 7 >50% Functionality
Potable Water	1	1	0	0	1
Waste Water	14	7	0	1	14
Communication	2	1	0	2	2

**Table 5-14: Expected Utility System Pipeline Damage**

Utility	Total Pipeline	Anticipated Leaks	Anticipated Line Breaks
Potable Water	2,709 km	394	98
Wastewater	1,625 km	198	49
Natural Gas	1,084 km	68	17

Electrical service is more challenging and time consuming to restore. Table 5-15 outlines the number of customers anticipated to be without electric service following the incident. There are 16,341 households in the county.

**Table 5-15: Expected Electric Power System Performance**

<b>Days Post-Event</b>	<b>Households Without Service</b>
Day 1	8,279
Day 3	4,893
Day 7	1,744
Day 30	274
Day 90	11

#### *Post-Incident Fire Risk*

Because there is often limited water supply following an earthquake, fires can be a significant hazard. HAZUS estimates the number of fires that would occur based upon the prospect of water not being available to fight fires and an abundance of spontaneous ignition. According to these estimates, 0 fire ignitions are anticipated.

#### *Debris Generation*

The amount of debris generated by an earthquake can be substantial. HAZUS classifies debris into two types based on the handling equipment required: brick/wood and reinforced concrete/steel. In the given scenario, a total of 126,000 tons of debris is anticipated. Brick/wood would comprise 50% of that amount. When converting these totals to truckloads, debris removal would require 5,040 truckloads, assuming 25 tons per truck.

#### *Shelter Needs*

Temporary public shelters are often necessary post-quake to provide housing for people displaced by the event. HAZUS estimates that 216 households would be displaced and 128 people would seek housing in a temporary shelter.

#### *Casualties*

The number of people estimated to be injured or killed by the earthquake is divided into four categories based on the extent of the victim's injuries:

- Level 1 – Require medical attention but not hospitalization
- Level 2 – Require hospitalization for non-life-threatening injuries
- Level 3 – Require hospitalization for critical injuries
- Level 4 – Fatalities

Casualty estimates are provided for three times of day that represent periods of the day that various sectors of the community operate at peak capacity loads. These figures are provided in table 5-16.

**Table 5-16: Casualty Estimates**

<b>Time</b>	<b>Location</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Level 4</b>
2 AM	Commercial	1.10	0.25	0.03	0.06
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	1	0	0	0
	Industrial	3.48	0.79	0.10	0.19
	Other Residential	14.25	3.05	0.36	0.70
	Single Family Residential	76.19	16.76	2.23	4.36
	<b>TOTAL</b>	<b>95</b>	<b>21</b>	<b>3</b>	<b>5</b>
2 PM	Commercial	66.32	15.21	1.96	3.79
	Commuting	0.02	0.02	0.04	0.01
	Educational	23.65	5.62	0.79	1.54
	Hotels	0	0	0	0
	Industrial	25.64	5.87	0.74	1.41
	Other Residential	3.12	0.68	0.09	0.16
	Single Family	16.72	3.80	0.53	0.99
	<b>TOTAL</b>	<b>135</b>	<b>31</b>	<b>4</b>	<b>8</b>
5 PM	Commercial	49.25	11.37	1.49	2.83
	Commuting	0.30	0.41	0.68	0.13
	Educational	0.99	0.23	0.03	0.06
	Hotels	0	0	0	0
	Industrial	16.02	3.67	0.46	0.88
	Other Residential	5.49	1.20	0.15	0.28
	Single Family Residential	30.56	6.94	0.96	1.80
	<b>TOTAL</b>	<b>103</b>	<b>24</b>	<b>4</b>	<b>6</b>

*Building-Related Losses*

Total economic loss for this earthquake scenario is estimated to be \$637.77M. This estimate includes building and lifeline related losses and is based on the building inventory in the county. Building losses are examined in two categories: direct building loss and business interruption loss. Direct building losses include structural damage and damage to contents. Business interruption losses include the costs associated with not being able to conduct normal business, displaced workers, and lost opportunities.

Total estimated building losses are anticipated to be \$445.6M. Business interruption expenses account for 16% of this total. Residential structures are expected to sustain the greatest loss by far, more than 59% of the total loss for the county.

Table 5-17 provides a summary of the anticipated building-related losses. All figures are expressed in millions of dollars.



**Table 5-17: Building-Related Economic Loss Estimates**

Area	Single-Family	Other Residential	Commercial	Industrial	Other	Total
<b>Income Losses</b>						
Wage	0	0.72	9.91	1.51	1.08	13.24
Capital Related	0	0.31	8.45	0.94	0.24	9.94
Rental	5.36	1.88	4.95	0.47	0.35	13.01
Relocation	18.70	1.54	7.71	1.95	3.58	33.49
<b>Capital Stock Losses</b>						
Structural	31.70	3.45	12.15	7.71	6.33	61.35
Non-Structural	124.65	17.60	32.79	24.19	11.59	210.84
Content	50.77	5.39	18.10	17.45	7.28	99.00
Inventory	0	0	0.53	3.85	0.32	4.71
<b>TOTAL</b>	<b>231.19</b>	<b>30.91</b>	<b>94.60</b>	<b>58.08</b>	<b>30.81</b>	<b>445.60</b>

*Transportation and Utility Lifeline Losses*

Earthquakes often cause extensive damage to a community's infrastructure. Tables 5-18 and 5-19 depict the potential damage Preble County could expect to its transportation and utility systems. Loss figures address only the cost to repair, not business interruption costs. Numbers are expressed in millions of dollars.

**Table 5-18: Transportation System Economic Losses**

System	Component	Inventory Value	Economic Loss
Highway	Segments	\$799.32M	0
	Bridges	\$82.60M	\$1.03M
Railways	Segments	\$38.43M	0
	Facilities	\$5.33M	\$1.55M
<b>Total</b>		<b>\$925.68M</b>	<b>\$2.59M</b>

**Table 5-19: Utility System Economic Losses**

System	Component	Inventory Value	Economic Loss
Potable Water	Facilities	\$35.0M	\$12.12M
	Distribution Lines	\$87.19M	\$1.78M
Waste Water	Facilities	\$979.0M	\$168.45M
	Distribution Lines	\$52.31M	\$0.89M
Natural Gas	Distribution Lines	\$34.87M	\$0.30M
Communication	Facilities	\$0.21M	\$0.04M
<b>Total</b>		<b>\$1,188.57M</b>	<b>\$183.59M</b>