

## 5.0 HAZARD AND VULNERABILITY DATA – APPENDIX A

The information included in this appendix supplements the discussion of Logan County's hazards and vulnerabilities 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 Logan 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 Logan County from 1950 through 2017.

#### 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	Logan (Zone)	07/01/1999	0	0	0	0
Drought	Logan (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 Logan County since 1950.

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Flash Flood	Countywide	06/01/1997	0	0	5K	0
Flash Flood	DeGraff	01/08/1998	0	0	5K	0
Flash Flood	Bellefontaine	04/09/1998	0	0	0	0
Flash Flood	DeGraff	04/09/1998	0	0	0	0
Flash Flood	Bellefontaine	09/23/2000	0	0	50K	0
Flash Flood	Belle Center	05/16/2001	0	0	0	0
Flash Flood	Belle Center	05/17/2001	0	0	5K	0
Flood	Logan (Zone)	04/19/2002	0	0	0	0
Flash Flood	Bellefontaine	04/19/2002	0	0	0	0
Flood	Logan (Zone)	09/27/2002	0	0	0	0
Flood	Logan (Zone)	03/13/2003	0	0	0	0
Flash Flood	Lakeview	07/07/2003	0	0	100K	0
Flood	Logan (Zone)	07/07/2003	0	0	150K	0

<b>Flood</b>	Logan (Zone)	07/07/2003	0	0	150K	0
<b>Flash Flood</b>	Lakeview	07/08/2003	0	0	100K	0
<b>Flash Flood</b>	Lakeview	07/08/2003	0	0	200K	0
<b>Flood</b>	Logan (Zone)	07/09/2003	0	0	100K	0
<b>Flood</b>	Logan (Zone)	07/09/2003	0	0	100K	0
<b>Flood</b>	Logan (Zone)	08/02/2003	0	0	0	0
<b>Flood</b>	Logan (Zone)	08/04/2003	0	0	0	0
<b>Flood</b>	Logan (Zone)	01/04/2004	0	0	0	0
<b>Flood</b>	Logan (Zone)	05/21/2004	0	0	0	0
<b>Flood</b>	Logan (Zone)	06/12/2004	0	0	0	0
<b>Flood</b>	Logan (Zone)	06/13/2004	0	0	0	0
<b>Flood</b>	Logan (Zone)	06/15/2004	0	0	0	0
<b>Flood</b>	Logan (Zone)	01/05/2005	0	0	0	0
<b>Flood</b>	Logan (Zone)	01/11/2005	0	0	20K	0
<b>Flood</b>	Logan (Zone)	06/10/2005	0	0	20K	0
<b>Flash Flood</b>	Bellefontaine	06/01/2006	0	0	0	0
<b>Flood</b>	Russells Point	06/02/2006	0	0	0	0
<b>Flash Flood</b>	Lakeview	12/01/2006	0	0	0	0
<b>Flood</b>	Bellefontaine	03/02/2007	0	0	15K	0
<b>Flood</b>	Bellefontaine	03/14/2007	0	0	3K	0
<b>Flood</b>	Lakeview	02/07/2008	0	0	3K	0
<b>Flash Flood</b>	Bellefontaine	02/28/2011	0	0	20K	0
<b>Flash Flood</b>	Rushsylvania	02/28/2011	0	0	10K	0
<b>Flash Flood</b>	Huntsville	02/28/2011	0	0	25K	0
<b>Flood</b>	Bellefontaine	02/28/2011	0	0	10K	0
<b>Flood</b>	Bellefontaine	02/28/2011	0	0	25K	0
<b>Flood</b>	Bellefontaine	03/01/2011	0	0	25K	0
<b>Flash Flood</b>	McMorran	05/11/2011	0	0	10K	0
<b>Flood</b>	Bellefontaine	05/11/2011	0	0	2K	0
<b>Flood</b>	DeGraff	12/05/2011	0	0	2K	0
<b>Flood</b>	DeGraff	01/27/2012	0	0	1K	0
<b>Flash Flood</b>	Belle Center	06/30/2013	0	0	1K	0
<b>Flash Flood</b>	Belle Center	06/30/2013	0	0	1K	0
<b>Flood</b>	Bellefontaine	07/01/2013	0	0	5K	0
<b>Flash Flood</b>	East Liberty	07/01/2013	0	0	0	0
<b>Flash Flood</b>	Rushsylvania	07/01/2013	0	0	1K	0
<b>Flash Flood</b>	Northwood	07/01/2013	0	0	1K	0
<b>Flood</b>	Lakeview VanHorn Arpt	12/21/2013	0	0	1K	0
<b>Flood</b>	Russells Point	12/22/2013	0	0	0	0
<b>Flood</b>	Lakeview	12/24/2013	0	0	0	0
<b>Flood</b>	Lakeview	12/25/2013	0	0	0	0
<b>Flood</b>	Lakeview VanHorn Arpt	06/16/2015	0	0	0	0
<b>Flood</b>	Lakeview VanHorn Arpt	06/18/2015	0	0	0	0
<b>Flood</b>	Russells Point	06/18/2015	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
Hail	Logan County	06/13/1957	0	0	0	0
Thunderstorm Wind	Logan County	06/08/1951	0	0	0	0
Thunderstorm Wind	Logan County	05/24/1970	0	0	0	0
Thunderstorm Wind	Logan County	06/25/1971	0	0	0	0
Thunderstorm Wind	Logan County	08/11/1973	0	0	0	0
Thunderstorm Wind	Logan County	07/03/1975	0	0	0	0
Hail	Logan County	07/03/1975	0	0	0	0
Thunderstorm Wind	Logan County	07/03/1975	0	0	0	0
Hail	Logan County	07/15/1976	0	0	0	0
Thunderstorm Wind	Logan County	07/15/1976	0	0	0	0
Hail	Logan County	04/08/1980	0	0	0	0
Thunderstorm Wind	Logan County	04/08/1980	0	0	0	0
Hail	Logan County	05/13/1980	0	0	0	0
Thunderstorm Wind	Logan County	05/13/1980	0	0	0	0
Hail	Logan County	06/28/1980	0	0	0	0
Thunderstorm Wind	Logan County	07/05/1980	0	0	0	0
Thunderstorm Wind	Logan County	07/05/1980	0	0	0	0
Hail	Logan County	07/09/1980	0	0	0	0
Thunderstorm Wind	Logan County	07/09/1980	0	0	0	0
Hail	Logan County	07/12/1980	0	0	0	0
Thunderstorm Wind	Logan County	07/12/0980	0	0	0	0
Thunderstorm Wind	Logan County	07/12/1980	0	0	0	0
Hail	Logan County	08/11/1980	0	0	0	0
Thunderstorm Wind	Logan County	06/24/1981	0	0	0	0
Thunderstorm Wind	Logan County	03/31/1982	0	0	0	0
Thunderstorm Wind	Logan County	08/24/1982	0	0	0	0
Thunderstorm Wind	Logan County	07/04/1983	0	0	0	0
Thunderstorm Wind	Logan County	06/13/1984	0	0	0	0
Thunderstorm Wind	Logan County	06/23/1984	0	0	0	0
Thunderstorm Wind	Logan County	04/05/0985	0	0	0	0
Thunderstorm Wind	Logan County	03/10/1986	0	0	0	0
Thunderstorm Wind	Logan County	05/06/1986	0	0	0	0
Thunderstorm Wind	Logan County	06/22/1986	0	0	0	0
Thunderstorm Wind	Logan County	08/02/1987	0	0	0	0
Thunderstorm Wind	Logan County	08/02/1987	0	0	0	0
Hail	Logan County	05/09/1988	0	0	0	0
Thunderstorm Wind	Logan County	05/25/1989	0	0	0	0
Thunderstorm Wind	Logan County	06/27/1989	0	0	0	0
Thunderstorm Wind	Logan County	07/07/1989	0	0	0	0

<b>Thunderstorm Wind</b>	Logan County	07/11/1989	0	0	0	0
<b>Thunderstorm Wind</b>	Logan County	07/27/1989	0	0	0	0
<b>Thunderstorm Wind</b>	Logan County	08/05/1989	0	0	0	0
<b>Hail</b>	Logan County	06/08/1990	0	0	0	0
<b>Thunderstorm Wind</b>	Logan County	06/08/1990	0	0	0	0
<b>Thunderstorm Wind</b>	Logan County	06/30/1990	0	0	0	0
<b>Thunderstorm Wind</b>	Logan County	08/28/1990	0	0	0	0
<b>Thunderstorm Wind</b>	Logan County	03/27/1991	0	0	0	0
<b>Thunderstorm Wind</b>	Logan County	07/02/1991	0	0	0	0
<b>Thunderstorm Wind</b>	Logan County	04/16/1992	0	0	0	0
<b>Thunderstorm Wind</b>	Logan County	06/18/1992	0	0	0	0
<b>Thunderstorm Wind</b>	Logan County	07/12/1992	0	0	0	0
<b>Thunderstorm Wind</b>	West Mansfield	06/16/1994	0	0	500K	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/29/1994	0	0	0	0
<b>Thunderstorm Wind</b>	Bellefontaine	08/04/1994	0	0	5K	0
<b>Thunderstorm Wind</b>	Russells Points	08/28/1994	0	0	5K	0
<b>Thunderstorm Wind</b>	Santa Fe	09/24/1994	0	0	500K	0
<b>Thunderstorm Wind</b>	DeGradd	05/24/1995	0	0	30K	0
<b>Thunderstorm Wind</b>	Indian Creek	05/28/1995	0	0	3K	0
<b>Thunderstorm Wind</b>	Bellefontaine	06/03/1995	0	0	40K	0
<b>Hail</b>	Bellefontaine	06/03/1995	0	0	0	0
<b>Thunderstorm Wind</b>	South Half	06/07/1995	0	0	60K	0
<b>Hail</b>	Bellefontaine	06/22/1995	0	0	0	0
<b>Hail</b>	West Liberty	06/26/1995	0	0	0	0
<b>Thunderstorm Wind</b>	West Liberty	06/26/1995	0	0	3K	0
<b>Thunderstorm Wind</b>	Countywide	07/13/1995	0	0	6K	0
<b>Thunderstorm Wind</b>	West Part	07/26/1995	0	0	4K	0
<b>Thunderstorm Wind</b>	South Part	07/26/1995	0	0	7K	0
<b>Thunderstorm Wind</b>	Bellefontaine	08/01/1995	0	0	5K	0
<b>Hail</b>	Lakeview	06/03/1996	0	0	010K	0
<b>Hail</b>	Belle Center	08/15/1996	0	0	0	0
<b>Thunderstorm Wind</b>	Bellefontaine	10/30/1996	0	0	0	0
<b>Thunderstorm Wind</b>	Countywide	07/02/1997	0	0	0	0
<b>Hail</b>	Lakeview	05/29/1998	0	0	5K	0
<b>Hail</b>	Rushsylvania	05/29/1998	0	0	10K	0
<b>Hail</b>	Belle Center	05/31/1998	0	0	5K	0
<b>Thunderstorm Wind</b>	Lakeview	06/19/1998	0	0	5K	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/19/1998	0	0	0	0
<b>Thunderstorm Wind</b>	Northwood	07/21/1998	0	0	4K	0
<b>Thunderstorm Wind</b>	Countywide	08/25/1998	0	0	2K	0
<b>Thunderstorm Wind</b>	Lakeview	11/10/1998	0	0	3K	0
<b>Thunderstorm Wind</b>	McMorran	05/06/1999	0	0	6K	0
<b>Thunderstorm Wind</b>	Huntsville	06/10/1999	0	0	10K	0
<b>Thunderstorm Wind</b>	Lakeview	06/10/1999	0	0	5K	0
<b>Thunderstorm Wind</b>	East Liberty	06/11/1999	0	0	3K	0
<b>Thunderstorm Wind</b>	West Mansfield	06/11/1999	0	0	5K	0
<b>Thunderstorm Wind</b>	West Mansfield	07/21/1999	0	0	3K	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/21/1999	0	0	5K	0

<b>Thunderstorm Wind</b>	Russells Point	07/26/1999	0	0	0	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/31/1999	0	0	50K	0
<b>Thunderstorm Wind</b>	Lewistown	10/13/1999	0	0	5K	0
<b>Hail</b>	DeGraff	05/18/2000	0	0	5K	0
<b>Lightning</b>	Huntsville	08/09/2000	0	0	0	0
<b>Thunderstorm Wind</b>	Countywide	08/09/2000	0	0	0	0
<b>Thunderstorm Wind</b>	Big Spigs	09/20/2000	0	0	3K	0
<b>Hail</b>	Lewistown	04/07/2001	0	0	10K	0
<b>Hail</b>	DeGraff	05/17/2001	0	0	10K	0
<b>Thunderstorm Wind</b>	Bellefontaine	10/24/2001	0	0	10K	0
<b>Hail</b>	Bellefontaine	04/19/2002	0	0	10K	0
<b>Hail</b>	Bellefontaine	04/19/2002	0	0	0	0
<b>Hail</b>	DeGraff	04/19/2002	0	0	0	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/29/2002	0	0	5K	0
<b>Hail</b>	DeGraff	11/10/2002	0	0	3K	0
<b>Hail</b>	West Mansfield	11/10/2002	0	0	3K	0
<b>Thunderstorm Wind</b>	Lakeview	05/11/2003	0	0	0	0
<b>Thunderstorm Wind</b>	East Liberty	06/26/2003	0	0	10K	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/04/2003	0	0	6K	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/04/2003	0	0	3K	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/07/2003	0	0	2K	0
<b>Thunderstorm Wind</b>	Quincy	07/08/2003	0	0	0	0
<b>Thunderstorm Wind</b>	DeGraff	07/21/2003	0	0	10K	0
<b>Thunderstorm Wind</b>	Bellefontaine	08/02/2003	0	0	50K	0
<b>Hail</b>	Bellefontaine	08/11/2003	0	0	3K	0
<b>Thunderstorm Wind</b>	Russells Point	08/26/2003	0	0	0	0
<b>Thunderstorm Wind</b>	Bellefontaine	09/26/2003	0	0	0	0
<b>Thunderstorm Wind</b>	Bellefontaine	05/17/2004	0	0	3K	0
<b>Hail</b>	Huntsville	05/21/2004	0	0	0	0
<b>Hail</b>	Bellefontaine	05/21/2004	0	0	0	0
<b>Thunderstorm Wind</b>	Middleburg	05/30/2004	0	0	7K	0
<b>Lightning</b>	Belle Center	06/13/2004	0	1	0	0
<b>Hail</b>	West Liberty	06/13/2004	0	0	3K	0
<b>Thunderstorm Wind</b>	Belle Center	06/13/2004	0	0	3K	0
<b>Hail</b>	Lakeview	06/05/2005	0	0	3K	0
<b>Thunderstorm Wind</b>	Middleburg	07/25/2005	0	0	3K	0
<b>Thunderstorm Wind</b>	Rushsylvania	07/25/2005	0	0	10K	0
<b>Hail</b>	Huntsville	08/20/2005	0	0	0	0
<b>Thunderstorm Wind</b>	West Liberty	11/06/2005	0	0	3K	0
<b>Hail</b>	Bellefontaine	04/07/2006	0	0	0	0
<b>Thunderstorm Wind</b>	Quincy	05/25/2006	0	0	8K	0
<b>Hail</b>	Bellefontaine	05/25/2006	0	0	0	0
<b>Thunderstorm Wind</b>	Bellefontaine	06/22/2006	0	0	2K	0
<b>Thunderstorm Wind</b>	West Liberty	07/03/2006	0	0	3K	0
<b>Hail</b>	Quincy	03/14/2007	0	0	2K	0
<b>Thunderstorm Wind</b>	Belle Center	06/13/2007	0	0	1K	0
<b>Hail</b>	DeGraff	06/13/2007	0	0	5K	0
<b>Thunderstorm Wind</b>	Lakeview VanHorn Arpt	06/13/2007	0	0	10K	0

<b>Thunderstorm Wind</b>	Bellefontaine	06/17/2007	0	0	3K	0
<b>Thunderstorm Wind</b>	DeGraff	08/20/2007	0	0	10K	0
<b>Thunderstorm Wind</b>	Zanesfield	12/23/2007	0	0	2K	0
<b>Thunderstorm Wind</b>	Quincy	06/09/2008	0	0	3K	0
<b>Thunderstorm Wind</b>	West Liberty	06/09/2008	0	0	1K	0
<b>Hail</b>	West Mansfield	06/09/2008	0	0	3K	0
<b>Thunderstorm Wind</b>	Middleburg	06/28/2008	0	0	2K	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/08/2008	0	0	1K	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/08/2008	0	0	1K	0
<b>Thunderstorm Wind</b>	Zanesfield	08/19/2008	0	0	5K	0
<b>Thunderstorm Wind</b>	Bellefontaine	06/11/2010	0	0	1K	0
<b>Thunderstorm Wind</b>	McMorran	06/23/2010	0	0	60K	0
<b>Thunderstorm Wind</b>	Quincy	08/04/2010	0	0	0	0
<b>Thunderstorm Wind</b>	Lewistown	09/16/2010	0	0	2K	0
<b>Hail</b>	Bellefontaine Arpt	09/16/2010	0	0	7K	0
<b>Thunderstorm Wind</b>	Lakeview	10/26/2010	0	0	0	0
<b>Thunderstorm Wind</b>	Bellefontaine	04/27/2011	0	0	1K	0
<b>Hail</b>	Lakeview	05/11/2011	0	0	0	0
<b>Thunderstorm Wind</b>	Russells Point	05/23/2011	0	0	0	0
<b>Thunderstorm Wind</b>	Huntsville	05/23/2011	0	0	3K	0
<b>Thunderstorm Wind</b>	Russells Point	05/23/2011	0	0	3K	0
<b>Thunderstorm Wind</b>	Huntsville	07/11/2011	0	0	0	0
<b>Thunderstorm Wind</b>	Rushsylvania	08/07/2011	0	0	0	0
<b>Hail</b>	Bellefontaine	08/09/2011	0	0	2K	0
<b>Hail</b>	Bellefontaine	08/09/2011	0	0	0	0
<b>Thunderstorm Wind</b>	Rushsylvania	09/03/2011	0	0	0	0
<b>Hail</b>	Belle Center	11/14/2011	0	0	0	0
<b>Hail</b>	Bellefontaine	11/14/2011	0	0	100K	0
<b>Hail</b>	West Liberty	11/14/2011	0	0	0	0
<b>Thunderstorm Wind</b>	Bellefontaine	06/29/2012	0	0	1K	0
<b>Thunderstorm Wind</b>	Island View	06/29/2012	0	0	1K	0
<b>Thunderstorm Wind</b>	Lakeview VanHorn Arpt	07/04/2012	0	0	1K	0
<b>Thunderstorm Wind</b>	Belle Center	07/04/2012	0	0	3K	0
<b>Thunderstorm Wind</b>	Bellefontaine	07/04/2012	0	0	0	0
<b>Thunderstorm Wind</b>	Zanesfield	07/04/2012	0	0	1K	0
<b>Hail</b>	Orchard Is	07/26/2012	0	0	0	0
<b>Thunderstorm Wind</b>	West Liberty	08/05/2012	0	0	0	0
<b>Hail</b>	Rushsylvania	04/10/2013	0	0	0	0
<b>Hail</b>	West Liberty	04/10/2013	0	0	5K	0
<b>Hail</b>	West Liberty	04/10/2013	0	0	7K	0
<b>Thunderstorm Wind</b>	West Liberty	06/12/2013	0	0	10K	0
<b>Thunderstorm Wind</b>	Avondale	07/10/2013	0	0	1K	0
<b>Thunderstorm Wind</b>	McMorran	07/10/2013	0	0	1K	0
<b>Thunderstorm Wind</b>	Lewistown	07/10/2013	0	0	0	0
<b>Thunderstorm Wind</b>	Russells Point	07/10/2013	0	0	2K	0
<b>Thunderstorm Wind</b>	Cherokee	07/20/2013	0	0	2K	0
<b>Thunderstorm Wind</b>	Quincy	09/11/2013	0	0	1K	0
<b>Hail</b>	DeGraff	09/11/2013	0	0	2K	0

<b>Thunderstorm Wind</b>	East Liberty	10/31/2013	0	0	0	0
<b>Thunderstorm Wind</b>	DeGraff	11/17/2013	0	0	2K	0
<b>Thunderstorm Wind</b>	Avondale	11/17/2013	0	0	30K	0
<b>Thunderstorm Wind</b>	McMorran	12/21/2013	0	0	5K	0
<b>Thunderstorm Wind</b>	Lewistown	12/21/2013	0	0	0	0
<b>Thunderstorm Wind</b>	Russells Point	12/21/2013	0	0	0	0
<b>Hail</b>	Cherokee	05/21/2014	0	0	0	0
<b>Hail</b>	Quincy	05/21/2014	0	0	10K	0
<b>Hail</b>	DeGraff	05/21/2014	0	0	0	0
<b>Thunderstorm Wind</b>	East Liberty	06/19/2014	0	0	0	0
<b>Hail</b>	DeGraff	07/26/2014	0	0	0	0
<b>Hail</b>	Quincy	07/27/2017	0	0	0	0
<b>Hail</b>	Big Spgs	07/27/2014	0	0	2K	0
<b>Hail</b>	Zanesfield	07/27/2017	0	0	1K	0
<b>Thunderstorm Wind</b>	East Liberty	05/26/2015	0	0	0	0
<b>Thunderstorm Wind</b>	DeGraff	05/27/2015	0	0	4K	0
<b>Thunderstorm Wind</b>	Middleburg	05/27/2015	0	0	1.5K	0
<b>Thunderstorm Wind</b>	East Liberty	06/18/2015	0	0	4K	0
<b>Thunderstorm Wind</b>	Belle Center	12/23/2015	0	0	1K	0
<b>Thunderstorm Wind</b>	West Liberty	03/27/2016	0	0	5K	0
<b>Thunderstorm Wind</b>	DeGraff	03/27/2016	0	0	5K	0
<b>Thunderstorm Wind</b>	DeGraff	03/27/2016	0	0	10K	0
<b>Thunderstorm Wind</b>	DeGraff	03/27/2016	0	0	2K	0
<b>Thunderstorm Wind</b>	Bellefontaine	03/27/2016	0	0	5K	0
<b>Thunderstorm Wind</b>	West Liberty	08/28/2016	0	0	0	0
<b>Thunderstorm Wind</b>	Bellefontaine	01/10/2017	0	0	0	0

#### 5.1.4 Tornado

Confirmed tornadoes and funnel clouds occurring in Logan County since 1950 are listed below.

Hazard	Location	Date	Fujita	Deaths	Injuries	Property Damage	Crop Damage
<b>Tornado</b>	Logan County	06/11/1957	F1	0	0	0	0
<b>Tornado</b>	Logan County	05/14/1970	F2	0	0	250K	0
<b>Tornado</b>	Logan County	05/24/1971	F3	0	0	25K	0
<b>Tornado</b>	Logan County	07/16/1992	F0	0	0	25K	0
<b>Tornado</b>	Near Quincy	06/07/1995	F1	0	0	50K	0
<b>Tornado</b>	East Liberty	11/10/2002	F3	0	0	30K	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	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
High Wind	Logan (Zone)	03/25/1997	50 kts	0	1	50K	0
High Wind	Logan (Zone)	04/06/1997	60 kts.	0	0	0	0
High Wind	Logan (Zone)	12/11/2000	58 kts.	0	0	0	0
High Wind	Logan (Zone)	03/09/2002	56 kts.	0	1	40K	0
High Wind	Logan (Zone)	05/11/2003	50 kts.	0	0	0	0
High Wind	Logan (Zone)	05/11/2003	50 kts.	0	0	0	0
High Wind	Logan (Zone)	05/11/2003	50 kts.	0	0	0	0
High Wind	Logan (Zone)	11/12/2003	50 kts.	0	0	8K	0
High Wind	Logan (Zone)	12/01/2006	50 kts.	0	0	20K	0
High Wind	Logan (Zone)	09/14/2008	55 kts.	0	0	5.4M	0
High Wind	Logan (Zone)	02/11/2009	50 kts.	0	0	0	0
High Wind	Logan (Zone)	12/09/2009	50 kts.	0	0	0	0
High Wind	Logan (Zone)	11/24/2014	51 kts.	0	0	0	0
High Wind	Logan (Zone)	04/03/2016	50 kts.	0	0	0	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 Logan County since 1950.

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Winter Storm	Logan (Zone)	01/02/1995	0	0	25K	0
Ice Storm	Logan (Zone)	03/06/1996	0	0	0	0
Winter Storm	Logan (Zone)	03/19/1996	0	0	0	0
Winter Storm	Logan (Zone)	01/01/1999	0	0	0	0
Winter Storm	Logan (Zone)	01/07/1999	0	0	0	0
Winter Storm	Logan (Zone)	01/13/1999	0	0	0	0
Winter Storm	Logan (Zone)	03/26/2002	0	0	0	0
Winter Storm	Logan (Zone)	11/22/2002	0	0	0	0
Winter Storm	Logan (Zone)	12/25/2002	0	0	0	0
Winter Storm	Logan (Zone)	01/29/2003	0	0	0	0
Winter Storm	Logan (Zone)	02/15/2003	0	0	0	0
Winter Storm	Logan (Zone)	12/14/2003	0	0	0	0
Winter Storm	Logan (Zone)	1/25/2004	0	0	0	0
Winter Storm	Logan (Zone)	03/16/2004	0	0	0	0



Winter Storm	Logan (Zone)	12/22/2004	0	0	0	0
Winter Storm	Logan (Zone)	01/05/2005	0	0	0	0
Winter Storm	Logan (Zone)	01/21/2005	0	0	0	0
Winter Storm	Logan (Zone)	12/08/2005	0	0	0	0
Winter Storm	Logan (Zone)	12/15/2005	0	0	0	0
Blizzard	Logan (Zone)	02/13/2007	0	0	0	0
Winter Storm	Logan (Zone)	02/01/2008	0	0	0	0
Winter Storm	Logan (Zone)	02/12/2008	0	0	0	0
Ice Storm	Logan (Zone)	03/04/2008	0	0	0	0
Winter Storm	Logan (Zone)	03/07/2008	0	0	0	0
Ice Storm	Logan (Zone)	12/19/2008	0	0	0	0
Ice Storm	Logan (Zone)	01/10/2009	0	0	0	0
Ice Storm	Logan (Zone)	02/01/2011	0	0	0	0
Blizzard	Logan (Zone)	12/26/2012	0	0	0	0
Winter Storm	Logan (Zone)	03/05/2013	0	0	0	0
Winter Storm	Logan (Zone)	03/24/2013	0	0	0	0
Winter Storm	Logan (Zone)	02/04/2014	0	0	0	0
Winter Storm	Logan (Zone)	03/01/2015	0	0	0	0
Winter Storm	Logan (Zone)	02/08/2017	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 Logan 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 Logan County as 45,858.

### 5.2.1 Flood

To evaluate Logan County's vulnerability to flood, 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 Logan County and those exposed to risk in this scenario.

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

Occupancy	Logan County		100-Year Flood Scenario	
	Exposure (\$1000)	Percent of Total	Exposure (\$1000)	Percent of Total
Residential	2,613,248	74.7%	189,783	71.4%
Commercial	549,466	15.7%	42,310	15.9%
Industrial	175,945	5.0%	19,663	7.4%
Agricultural	37,099	1.1%	6,556	2.5%
Religion	69,496	2.0%	6,379	2.4%
Government	22,735	0.7%	1,043	0.4%
Education	28,627	0.8%	0	0%
<b>Total</b>	<b>3,496,616</b>	<b>100.0%</b>	<b>265,734</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. Essential facilities in Logan County are identified in Table 5-2.

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

Facility Type	Number
Hospital	1 (93 beds)
Schools	19
Fire Stations	10
Police Stations	8
Emergency Operation Center	1

### Estimated Building Damage

Per HAZUS estimates, 12 building will sustain at least moderate damage. This accounts for 3% of the total buildings identified for the scenario. 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	2	0	0	0	0
Education	0	0	0	0	0	0
Government	0	0	0	0	0	0
Industrial	0	0	0	0	0	0
Religious	0	0	0	0	0	0
Residential	0	1	1	8	0	0
<b>Total</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>8</b>	<b>0</b>	<b>0</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	0	0	0	0	0
Manufactured Housing	0	0	0	0	0	0
Masonry	0	0	0	1	0	0
Steel	0	7	3	0	0	0
Wood	0	1	1	7	0	0
<b>Total</b>	<b>0</b>	<b>8</b>	<b>4</b>	<b>8</b>	<b>0</b>	<b>0</b>

Based on this scenario, HAZUS does not predict that any critical facilities will sustain moderate or significant damage. Therefore, it is anticipated that the hospital beds, emergency services, and institutional services normally present in the county would continue to be functional in a 100-year flood scenario.

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

Classification	Total	Moderate Damage	Substantial Damage	Loss of Use
Fire Stations	10	0	0	0
Hospitals	1	0	0	0
Police Stations	8	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 486 households would be displaced and approximately 398 people would seek temporary shelter.

### *Building Related Losses*

The total economic loss for the identified 100-year flood event is estimated to be \$12.10M.

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
<i>Building Loss</i>					
<b>Building</b>	3.28	0.72	0.32	0.34	4.66
<b>Content</b>	1.92	2.46	0.60	1.97	6.95
<b>Inventory</b>	0.00	0.14	0.16	0.05	0.34
<i>Business Interruption</i>					
<b>Income</b>	0.00	0.02	0.00	0.00	0.02
<b>Relocation</b>	0.01	0.01	0.00	0.00	0.02
<b>Rental Income</b>	0.00	0.00	0.00	0.00	0.01
<b>Wage</b>	0.01	0.02	0.00	0.08	0.15
<b>Total</b>	<b>5.23</b>	<b>3.36</b>	<b>1.08</b>	<b>2.44</b>	<b>12.10</b>

## **5.2.2 Earthquake**

The simulated earthquake epicenter was assumed to be inside the City of Bellefontaine, Logan County's most populated jurisdiction, for a worst-case scenario. The magnitude of the simulated earthquake measured 5.5 on the Richter Scale. The HAZUS loss estimation program utilized 2010 U.S. Census data for this scenario. There are an estimated 22,000 buildings in the county with a replacement value of \$5,472M.

### *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
Hospital	1 (93 beds)	Hazardous Materials Sites	37
Schools	19		
Fire Stations	10		
Police Stations	8		
Emergency Operation Center	1		

#### *Transportation and Utility Lifeline Inventory*

Lifeline systems are defined as transportation and utilities. Transportation systems include highways, railways, and airports. Logan County has seven identified transportation system. Utility systems include water treatment and potable water plants, wastewater treatment plants, natural gas suppliers, fuel oil suppliers, electrical power plants, and communications hubs. There are six utility systems in the county. The total value of the these lifeline systems exceeds \$1,434M and includes more than 81 km of highways, 262 bridges, and 3,681 km of pipes.

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

System	Components	Quantity	Replacement Value
Highways	Bridges	262	\$102.00M
	Segments	12	\$354.00M
Railways	Bridges	8	\$0.30M
	Segments	51	\$91.10M
Airport	Facilities	1	\$10.70M
	Runways	1	\$38.00M
<b>Total</b>			<b>\$595.90M</b>

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

System	Components	Quantity	Replacement Value
Potable Water	Distribution Lines	N/A	\$36.80M
	Facilities	2	\$69.90M
Waste Water	Distribution Lines	N/A	\$22.10M
	Facilities	11	\$769.20M
Natural Gas	Distribution Lines	N/A	\$14.70M
Communication	Facilities	3	\$0.30M
<b>Total</b>			<b>\$913.10M</b>

### *Building Damage*

The estimated building damage according to HAZUS is extensive. The number of buildings projected to sustain moderate damage is 6,130, approximately 27% of all buildings in the county. It is estimated that 566 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
<b>Agriculture</b>	71	46	67	43	15
<b>Commercial</b>	293	222	318	193	82
<b>Education</b>	11	7	10	6	3
<b>Government</b>	12	8	13	7	3
<b>Industrial</b>	85	60	91	59	24
<b>Other Residential</b>	1,170	734	868	385	107
<b>Religion</b>	41	27	29	19	9
<b>Single Family Residential</b>	9,320	4,620	2,626	830	325
<b>Total</b>	<b>11,002</b>	<b>5,724</b>	<b>4,022</b>	<b>1,542</b>	<b>567</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
<b>Wood</b>	8,355	4,023	1,804	279	26
<b>Steel</b>	129	78	169	138	55
<b>Concrete</b>	44	27	43	28	8
<b>Precast</b>	39	20	42	40	13
<b>Reinforced Masonry</b>	19	7	15	14	4
<b>Unreinforced Masonry</b>	1,600	1,058	1,227	714	378
<b>Manufactured Housing</b>	817	511	720	330	83
<b>Total</b>	<b>11,002</b>	<b>5,724</b>	<b>4,022</b>	<b>1,542</b>	<b>567</b>

### *Essential Facility Damage*

According to HAZUS estimates, only 2 of the county's 60 hospital beds (4%) would be available and functional on the day of the earthquake. These would be needed by patients already hospitalized at the time of the earthquake and by those requiring hospitalization for injuries sustained in the incident. One week post-quake, it is estimated that 8% of these beds would be available. By the 30-day mark, an estimated 27% would be fully functional. Anticipated damage to other essential facilities is detailed in Table 5-12.

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

Classification	Total	Moderate Damage >50%	Complete Damage > 50%	With Functionality >50% on Day 1
Hospitals	1	1	0	0
Schools	19	14	0	0
EOCs	1	1	0	0
Police Stations	8	5	0	0
Fire Stations	10	5	0	0

*Transportation and Utility Lifeline Damage*

Per HAZUS estimates, 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% function throughout the recovery period. Limited damage to these transportation systems is expected. It is anticipated that the county's airport facility will sustain at least moderate damage but will be functional within seven days of the incident.

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	2	1	0	0	2
Waste Water	11	8	0	0	7
Communication	3	3	0	1	3

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

Utility	Total Pipeline	Anticipated Leaks	Anticipated Line Breaks
Potable Water	1,841 km	265	66
Wastewater	1,105 km	190	47
Natural Gas	736 km	54	14

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 18,111 total households in the county.

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

Days Post-Event	Households Without Service	Percentage of Total
Day 1	10,146	56.0%
Day 3	7,600	41.9%
Day 7	3,970	21.9%
Day 30	941	5.2%
Day 90	11	0.06%

### *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, no fire ignitions are probable and no damage or loss is 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 0.26 million tons of debris is anticipated. Brick/wood would comprise 48% of that amount. When converting these totals to truckloads, debris removal would require 10,480 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 629 households would be displaced and 385 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 3 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 II</b>	<b>Level III</b>	<b>Level IV</b>
<b>2 AM</b>	Commercial	2	1	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	7	2	0	1
	Other Residential	52	12	2	3
	Single Family Residential	151	37	5	10
	<b>TOTAL</b>	<b>212</b>	<b>52</b>	<b>7</b>	<b>14</b>
<b>2 PM</b>	Commercial	140	36	5	10
	Commuting	0	0	0	0
	Educational	78	21	3	6
	Hotels	0	0	0	0
	Industrial	54	14	2	4
	Other Residential	11	3	0	1
	Single Family	32	8	1	2
	<b>TOTAL</b>	<b>316</b>	<b>82</b>	<b>12</b>	<b>23</b>
<b>5 PM</b>	Commercial	104	27	4	7
	Commuting	2	4	5	1
	Educational	3	1	0	0
	Hotels	0	0	0	0
	Industrial	34	9	1	2
	Other Residential	20	5	1	1
	Single Family Residential	61	15	2	4
	<b>TOTAL</b>	<b>224</b>	<b>60</b>	<b>14</b>	<b>16</b>

*Building-Related Losses*

Total economic loss for this earthquake scenario is estimated to be \$1,139.51M. This estimate includes building and lifeline related losses and is based on the building inventory in Logan 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 \$870.87M. Business interruption expenses account for 15% of this total. Residential structures are expected to sustain the greatest loss by far, more than 54% 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
<i>Income Losses</i>						
<b>Wage</b>	0.00	1.26	23.32	1.31	1.58	27.46
<b>Capital Related</b>	0.00	0.53	18.75	0.93	0.38	20.58
<b>Rental</b>	6.21	4.89	11.84	0.50	0.76	24.20
<b>Relocation</b>	22.57	5.15	19.08	2.18	5.63	54.61
<i>Capital Stock Losses</i>						
<b>Structural</b>	53.01	10.10	35.16	9.84	10.02	118.13
<b>Non-Structural</b>	211.64	54.88	97.29	34.70	23.82	422.33
<b>Content</b>	84.93	16.68	55.90	25.18	14.14	196.83
<b>Inventory</b>	0.00	0.00	1.92	4.40	0.40	6.73
<b>TOTAL</b>	<b>378.36</b>	<b>93.48</b>	<b>236.26</b>	<b>79.03</b>	<b>56.72</b>	<b>870.87</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 Logan 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
<b>Highway</b>	Segments	353.97	\$0.00M
	Bridges	102.20	\$6.45M
<b>Railways</b>	Segments	91.05	\$0.00M
	Bridges	0.30	\$0.01M
<b>Airport</b>	Facilities	10.65	\$5.56M
	Runways	37.96	\$0.00M
<b>Total</b>		<b>595.90</b>	<b>\$12.00M</b>

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

System	Component	Inventory Value	Economic Loss
<b>Potable Water</b>	Facilities	69.90	\$13.82M
	Distribution Lines	36.80	\$1.19M
<b>Waste Water</b>	Facilities	769.20	\$240.39M
	Distribution Lines	22.10	\$0.85M
<b>Natural Gas</b>	Distribution Lines	14.70	\$0.24M
<b>Communication</b>	Facilities	0.30	\$0.12M
<b>Total</b>		<b>913.11</b>	<b>\$256.62M</b>