

## 6.0 APPENDIX B: HAZARD AND VULNERABILITY DATA

The information in this appendix supplements the discussion of Sandusky 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 Sandusky County from a 100-year flood and earthquake, per HAZUS estimates, is provided.

### 6.1 HAZARD HISTORY DATA

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

#### 6.1.1 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	Sandusky County	08/01/1996	0	0	0	0
Drought	Sandusky County	06/01/1999	0	0	0	0
Drought	Sandusky County	07/01/1999	0	0	0	0
Drought	Sandusky County	08/01/1999	0	0	0	0
Drought	Sandusky County	09/01/1999	0	0	0	8M

#### 6.1.2 Flood

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

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Flood	Sandusky County	02/18/1996	0	0	0	0
Flooding	Sandusky County	02/27/1996	0	0	0	0
Flooding	Sandusky County	04/24/1996	0	0	0	0
Flash Flood	Bellevue	05/08/1996	0	0	10K	0
Flash Flood	Woodville	06/18/1996	0	0	0	0
Flood	Sandusky County	02/06/1997	0	0	0	0
Flooding	Sandusky County	02/27/1997	0	0	10K	0
Flood	Sandusky County	03/01/1997	0	0	0	0
Coastal	Erie Lakeshore	03/13/1997	0	0	50K	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Flood	Sandusky County	03/15/1997	0	0	0	0
Flood	Sandusky County	05/25/1997	0	0	0	0
Flash Flood	Sandusky County	06/01/1997	0	0	30K	20K
Coastal	Erie Lakeshore	06/01/1997	0	0	25K	0
Flood	Sandusky County	06/01/1997	0	0	175K	0
Flooding	Sandusky County	06/02/1997	0	0	50K	0
Flash Flood	Bellevue	06/21/1997	0	0	0	0
Flood	Sandusky County	01/08/1998	0	0	0	0
Flash Flood	Sandusky County	01/09/1998	0	0	0	0
Coastal	Kingsway	03/20/1998	0	0	100K	0
Coastal	White's Landing	04/09/1998	0	0	500K	0
Flood	Sandusky County	04/10/1998	0	0	0	0
Flood	Sandusky County	05/04/1998	0	0	0	0
Flooding	Sandusky County	08/25/1998	0	0	50K	0
Flood	Sandusky County	01/23/1999	0	0	0	0
Flood	Sandusky County	04/10/1999	0	0	0	0
Flood	Sandusky County	06/25/2000	0	0	0	0
Flooding	Sandusky County	01/01/2005	0	0	1.8M	0
Flooding	Sandusky County	06/22/2006	0	0	2.5M	5M
Flash Flood	Sandusky County	06/22/2006	0	0	3.3M	0
Flooding	Gibsonburg	08/20/2007	0	0	50K	0
Flood	Woodville	08/20/2007	0	0	0	0
Flooding	Slager Airport	05/27/2009	0	0	1.3M	20K
Flooding	Ballville	02/28/2011	0	0	50K	0
Flood	Ballville	05/26/2011	0	0	0	0
Flash Flood	Fremont	07/10/2013	0	0	120K	0
Flood	Fremont Progress Airport	03/11/2015	0	0	20K	0
Flood	Woodville	07/13/2017	0	0	0	0
Flood	Woodville	11/18/2017	0	0	0	0
Flash Flood	Bellevue	06/20/2019	0	0	1M	0

### 6.1.3 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	Sandusky County	04/24/1958	0	0	0	0
Thunderstorm Wind	Sandusky County	07/19/1960	0	0	0	0
Thunderstorm Wind	Sandusky County	06/09/1966	0	0	0	0
Hail	Sandusky County	07/20/1967	0	0	0	0
Thunderstorm Wind	Sandusky County	04/14/1968	0	0	0	0
Thunderstorm Wind	Sandusky County	04/14/1968	0	0	0	0
Thunderstorm Wind	Sandusky County	04/23/1968	0	0	0	0
Thunderstorm Wind	Sandusky County	05/15/1968	0	0	0	0
Thunderstorm Wind	Sandusky County	06/01/1969	0	0	0	0
Hail	Sandusky County	06/17/1970	0	0	0	0
Hail	Sandusky County	06/17/1970	0	0	0	0
Thunderstorm Wind	Sandusky County	05/16/1971	0	0	0	0
Thunderstorm Wind	Sandusky County	06/07/1971	0	0	0	0
Hail	Sandusky County	08/21/1971	0	0	0	0
Hail	Sandusky County	08/21/1971	0	0	0	0
Thunderstorm Wind	Sandusky County	04/16/1973	0	0	0	0
Thunderstorm Wind	Sandusky County	06/04/1973	0	0	0	0
Hail	Sandusky County	04/14/1974	0	0	0	0
Thunderstorm Wind	Sandusky County	04/14/1974	0	0	0	0
Hail	Sandusky County	06/15/1974	0	0	0	0
Thunderstorm Wind	Sandusky County	07/04/1974	0	0	0	0
Thunderstorm Wind	Sandusky County	03/12/1976	0	0	0	0
Thunderstorm Wind	Sandusky County	07/16/1976	0	0	0	0
Thunderstorm Wind	Sandusky County	07/16/1976	0	0	0	0
Hail	Sandusky County	07/04/1977	0	0	0	0
Thunderstorm Wind	Sandusky County	06/12/1978	0	0	0	0
Thunderstorm Wind	Sandusky County	06/07/1980	0	0	0	0
Hail	Sandusky County	05/22/1982	0	0	0	0
Thunderstorm Wind	Sandusky County	05/27/1982	0	0	0	0
Thunderstorm Wind	Sandusky County	06/15/1982	0	0	0	0
Thunderstorm Wind	Sandusky County	06/15/1982	0	0	0	0
Thunderstorm Wind	Sandusky County	05/02/1983	0	0	0	0
Thunderstorm Wind	Sandusky County	05/02/1983	0	0	0	0
Thunderstorm Wind	Sandusky County	07/04/1983	0	0	0	0
Thunderstorm Wind	Sandusky County	07/04/1983	0	0	0	0
Thunderstorm Wind	Sandusky County	09/06/1983	0	0	0	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Thunderstorm Wind	Sandusky County	09/06/1983	0	0	0	0
Thunderstorm Wind	Sandusky County	09/06/1983	0	0	0	0
Thunderstorm Wind	Sandusky County	08/08/1984	0	0	0	0
Hail	Sandusky County	03/28/1985	0	0	0	0
Thunderstorm Wind	Sandusky County	03/28/1985	0	0	0	0
Thunderstorm Wind	Sandusky County	05/14/1985	0	0	0	0
Hail	Sandusky County	07/05/1985	0	0	0	0
Hail	Sandusky County	07/05/1985	0	0	0	0
Hail	Sandusky County	07/10/1985	0	0	0	0
Thunderstorm Wind	Sandusky County	07/10/1985	0	0	0	0
Thunderstorm Wind	Sandusky County	03/10/1986	0	0	0	0
Hail	Sandusky County	05/06/1986	0	0	0	0
Thunderstorm Wind	Sandusky County	05/06/1986	0	2	0	0
Thunderstorm Wind	Sandusky County	06/15/1986	0	0	0	0
Thunderstorm Wind	Sandusky County	06/08/1987	0	0	0	0
Thunderstorm Wind	Sandusky County	06/29/1987	0	0	0	0
Thunderstorm Wind	Sandusky County	07/25/1987	0	0	0	0
Thunderstorm Wind	Sandusky County	08/02/1987	0	0	0	0
Thunderstorm Wind	Sandusky County	07/23/1988	0	0	0	0
Thunderstorm Wind	Sandusky County	08/05/1988	0	0	0	0
Thunderstorm Wind	Sandusky County	06/02/1990	0	0	0	0
Thunderstorm Wind	Sandusky County	03/27/1991	0	0	0	0
Thunderstorm Wind	Sandusky County	03/27/1991	0	0	0	0
Hail	Sandusky County	05/24/1991	0	0	0	0
Thunderstorm Wind	Sandusky County	06/15/1991	0	0	0	0
Hail	Sandusky County	08/30/1991	0	0	0	0
Thunderstorm Wind	Sandusky County	05/17/1992	0	0	0	0
Thunderstorm Wind	Sandusky County	05/17/1992	0	0	0	0
Thunderstorm Wind	Sandusky County	06/17/1992	0	0	0	0
Hail	Sandusky County	06/17/1992	0	0	0	0
Thunderstorm Wind	Sandusky County	07/14/1992	0	0	0	0
Hail	Sandusky County	11/22/1992	0	0	0	0
Thunderstorm Wind	Fremont	04/27/1994	0	0	5K	0
Thunderstorm Wind	Burgoon	07/06/1994	0	0	5K	0
Hail	Fremont	06/25/1995	0	0	0	0
Thunderstorm Wind	Clyde	06/28/1995	0	0	3K	0
Thunderstorm Wind	Sandusky County	07/13/1995	0	0	100K	20K
Hail	Green Springs	08/15/1995	0	0	0	0
Thunderstorm Wind	Fremont	08/17/1995	0	0	0	0
Thunderstorm Wind	Sandusky County	04/12/1996	0	0	120K	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Thunderstorm Wind	Fremont	06/14/1996	0	0	5K	0
Thunderstorm Wind	Sandusky County	07/24/1996	0	0	0	0
Thunderstorm Wind	Sandusky County	10/30/1996	0	0	0	0
Heavy Rain	Sandusky County	05/01/1997	0	0	0	35K
Lightning	Bellevue	07/18/1997	0	0	3K	0
Hail	Helena	08/03/1997	0	0	0	0
Hail	Gibsonburg	08/03/1997	0	0	0	0
Hail	Hessville	04/08/1998	0	0	0	0
Hail	Fremont	04/08/1998	0	0	0	0
Hail	Hessville	06/12/1998	0	0	0	0
Hail	Woodville	06/27/1998	0	0	0	0
Hail	Fremont	06/30/1998	0	0	0	0
Hail	Woodville	07/19/1998	0	0	0	0
Hail	Clyde	07/21/1998	0	0	0	0
Hail	Gibsonburg	07/31/1999	0	0	0	10K
Hail	Kingsway	05/09/2000	0	0	0	0
Hail	Fremont	07/14/2000	0	0	0	0
Thunderstorm Wind	Sandusky County	10/24/2001	0	0	500K	0
Hail	Sandusky County	06/21/2002	0	0	2K	0
Hail	Lindsey	07/27/2002	0	0	0	0
Hail	Gibsonburg	03/20/2003	0	0	2K	0
Thunderstorm Wind	Lindsey	03/28/2003	0	1	350K	0
Thunderstorm Wind	Vickery	04/04/2003	0	0	5K	0
Thunderstorm Wind	Fremont	04/04/2003	0	0	5K	0
Thunderstorm Wind	Clyde	04/20/2003	0	0	10K	0
Hail	Clyde	05/01/2003	0	0	2K	0
Thunderstorm Wind	Sandusky County	07/04/2003	0	0	25K	0
Thunderstorm Wind	Sandusky County	07/07/2003	0	0	25K	0
Thunderstorm Wind	Sandusky County	07/08/2003	0	0	150K	0
Thunderstorm Wind	Bellevue	08/21/2003	0	0	100K	0
Thunderstorm Wind	Fremont	08/26/2003	0	0	6K	0
Thunderstorm Wind	Fremont	11/12/2003	0	0	3K	0
Hail	Vickery	04/17/2004	0	0	0	0
Hail	Fremont	05/17/2004	0	0	0	0
Hail	Clyde	05/17/2004	0	0	0	0
Thunderstorm Wind	Woodville	05/21/2004	0	0	5K	0
Hail	Lindsey	05/27/2004	0	0	0	0
Hail	Gibsonburg	06/09/2004	0	0	0	0
Thunderstorm Wind	Fremont	06/13/2004	0	0	5K	0
Hail	Gibsonburg	04/20/2005	0	0	0	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Thunderstorm Wind	Clyde	05/13/2005	0	0	3K	0
Thunderstorm Wind	Sandusky County	06/05/2005	0	0	20K	0
Thunderstorm Wind	Fremont	06/08/2005	0	0	50K	0
Thunderstorm Wind	Lindsey	06/09/2005	0	0	4K	0
Thunderstorm Wind	Woodville	06/14/2005	0	0	2K	0
Thunderstorm Wind	Woodville	06/30/2005	0	0	6K	0
Thunderstorm Wind	Green Springs	06/30/2005	0	0	4K	0
Thunderstorm Wind	Fremont	07/21/2005	0	0	2K	0
Thunderstorm Wind	Clyde	07/25/2005	0	0	12K	0
Thunderstorm Wind	Clyde	07/26/2005	0	0	4K	0
Thunderstorm Wind	Woodville	11/06/2005	0	0	10K	0
Hail	Millersville	04/07/2006	0	0	0	0
Hail	Clyde	04/07/2006	0	0	0	0
Hail	Gibsonburg	04/22/2006	0	0	0	0
Thunderstorm Wind	Woodville	05/25/2006	0	0	30K	0
Hail	Woodville	05/25/2006	0	0	0	0
Thunderstorm Wind	Clyde	05/25/2006	0	0	350K	0
Hail	Vickery	06/19/2006	0	0	0	0
Thunderstorm Wind	Fremont	06/21/2006	0	0	3K	0
Thunderstorm Wind	Clyde	06/21/2006	0	0	2K	0
Thunderstorm Wind	Clyde	06/22/2006	0	0	2K	0
Hail	Helena	06/22/2006	0	0	0	0
Thunderstorm Wind	Clyde	04/26/2007	0	0	0	0
Hail	Woodville	05/01/2007	0	0	10K	0
Hail	Fremont	05/01/2007	0	0	50K	0
Hail	Bellevue	05/01/2007	0	0	0	0
Hail	Clyde	05/01/2007	0	0	0	0
Thunderstorm Wind	Clyde	05/01/2007	0	0	5K	0
Hail	Gibsonburg	05/01/2007	0	0	0	0
Hail	Clyde	05/01/2007	0	0	0	0
Thunderstorm Wind	Clyde	05/01/2007	0	0	5K	0
Hail	Green Springs	05/01/2007	0	0	0	0
Hail	Clyde	05/01/2007	0	0	0	0
Thunderstorm Wind	Woodville	06/08/2007	0	0	2K	0
Thunderstorm Wind	Woodville	06/21/2007	0	0	2K	0
Thunderstorm Wind	Fremont	06/21/2007	0	0	1K	0
Hail	Clyde	05/03/2008	0	0	8K	0
Thunderstorm Wind	Fremont	06/06/2008	0	0	8K	0
Thunderstorm Wind	Fremont	06/09/2008	0	0	6K	0
Hail	Bellevue	06/22/2008	0	0	0	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Thunderstorm Wind	Gibsonburg	07/08/2008	0	0	1K	0
Thunderstorm Wind	Fremont	07/08/2008	0	0	1K	0
Thunderstorm Wind	Fremont	07/21/2008	0	0	10K	0
Hail	Burgoon	04/02/2009	0	0	0	0
Hail	Fremont	05/27/2009	0	0	0	0
Thunderstorm Wind	Fremont	06/19/2009	0	0	30K	0
Thunderstorm Wind	Bellevue	06/25/2009	0	0	4K	0
Thunderstorm Wind	Kingsway	06/25/2009	0	0	12K	0
Thunderstorm Wind	Fremont	06/25/2009	0	0	15K	0
Thunderstorm Wind	Clyde	06/25/2009	0	0	3K	0
Thunderstorm Wind	Fremont	04/07/2010	0	0	5K	0
Hail	Fremont	05/07/2010	0	0	0	0
Hail	Woodville	05/07/2010	0	0	0	0
Hail	Gibsonburg	05/07/2010	0	0	25K	0
Hail	Rollersville	05/07/2010	0	0	0	0
Hail	Fremont	05/07/2010	0	0	40K	0
Hail	Fremont	05/07/2010	0	0	0	0
Thunderstorm Wind	Clyde	05/11/2010	0	0	25K	0
Thunderstorm Wind	Gibsonburg	06/18/2010	0	0	15K	0
Thunderstorm Wind	Gibsonburg	06/18/2010	0	0	2K	0
Hail	Fremont	06/23/2010	0	0	0	0
Thunderstorm Wind	Slager Aprt	06/23/2010	0	0	35K	0
Thunderstorm Wind	Clyde	06/23/2010	0	0	1K	0
Thunderstorm Wind	Fremont	06/23/2010	0	0	2K	0
Thunderstorm Wind	Colby	06/23/2010	0	0	1K	0
Thunderstorm Wind	Bellevue	07/22/2010	0	0	15K	0
Thunderstorm Wind	Bellevue	07/22/2010	0	0	2K	0
Thunderstorm Wind	Bellevue	07/22/2010	0	0	4K	0
Hail	Clyde	09/16/2010	0	0	10K	0
Thunderstorm Wind	Bellevue	10/26/2010	0	0	0	0
Hail	Woodville	03/23/2011	0	0	1K	0
Thunderstorm Wind	Gibsonburg	05/23/2011	0	0	0	0
Hail	Bellevue	05/25/2011	0	0	1M	0
Hail	Lindsey	05/29/2011	0	0	0	0
Thunderstorm Wind	Fremont	05/29/2011	0	0	0	0
Thunderstorm Wind	Sandusky County	06/21/2011	0	0	1K	0
Thunderstorm Wind	Sandusky County	06/21/2011	0	0	25K	0
Thunderstorm Wind	Fremont	07/11/2011	0	0	20K	0
Thunderstorm Wind	Lindsey	07/18/2011	0	0	1K	0
Hail	Woodville	08/01/2011	0	0	0	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Hail	Woodville	08/01/2011	0	0	25K	0
Hail	Gibsonburg	08/01/2011	0	0	0	0
Hail	Fremont	08/01/2011	0	0	0	0
Hail	Helena	08/01/2011	0	0	0	0
Thunderstorm Wind	Fremont	08/09/2011	0	0	100K	0
Hail	Fremont	08/09/2011	0	0	0	0
Hail	Clyde	08/09/2011	0	0	0	0
Thunderstorm Wind	Fremont	08/24/2011	0	0	5K	0
Thunderstorm Wind	Bellevue	08/24/2011	0	0	100K	0
Hail	Gibsonburg	03/15/2012	0	0	0	0
Hail	Lindsey	03/15/2012	0	0	0	0
Hail	Fremont	03/15/2012	0	0	0	0
Hail	Clyde	03/15/2012	0	0	0	0
Hail	Erlin	03/15/2012	0	0	0	0
Thunderstorm Wind	Fremont	06/18/2012	0	0	5K	0
Thunderstorm Wind	Gibsonburg	07/01/2012	0	0	15K	0
Thunderstorm Wind	Fremont	07/01/2012	0	0	5K	0
Thunderstorm Wind	Woodville	08/04/2012	0	0	8K	0
Thunderstorm Wind	Girton	08/10/2012	0	0	0	0
Thunderstorm Wind	Woodville	06/12/2013	0	0	200K	0
Thunderstorm Wind	Clyde	06/25/2013	0	0	18K	0
Thunderstorm Wind	Gibsonburg	07/09/2013	0	0	3K	0
Hail	Bellevue	07/10/2013	0	0	0	0
Thunderstorm Wind	Fremont	07/10/2013	0	0	12K	0
Thunderstorm Wind	Gibsonburg	07/10/2013	0	0	3.4M	0
Thunderstorm Wind	Clyde	07/10/2013	0	0	7K	0
Hail	Kingsway	08/31/2013	0	0	0	0
Hail	Clyde	08/31/2013	0	0	0	0
Thunderstorm Wind	Fremont	11/17/2013	0	0	10K	0
Hail	Bellevue	05/21/2014	0	0	6K	0
Hail	Bellevue	05/21/2014	0	0	0	0
Thunderstorm Wind	Ballville	06/18/2014	0	0	15K	0
Thunderstorm Wind	Fremont	11/24/2014	0	0	15K	0
Thunderstorm Wind	Gibsonburg	05/26/2015	0	0	100K	0
Thunderstorm Wind	Gibsonburg	05/26/2015	0	0	100K	0
Thunderstorm Wind	Lindsey	05/26/2015	0	0	2K	0
Thunderstorm Wind	Gibsonburg	05/26/2015	0	0	10K	0
Thunderstorm Wind	Helena	05/26/2015	0	0	75K	0
Hail	Bellevue	05/27/2015	0	0	0	0
Hail	Bellevue	05/27/2015	0	0	0	0



Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Thunderstorm Wind	Fremont	05/27/2015	0	0	15K	0
Thunderstorm Wind	Clyde	05/27/2015	0	0	30K	0
Thunderstorm Wind	Green Springs	06/12/2015	0	0	1K	0
Hail	Ballville	09/03/2015	0	0	0	0
Hail	Fremont	09/04/2015	0	0	0	0
Thunderstorm Wind	Clyde	09/04/2015	0	0	15K	0
Thunderstorm Wind	Fremont	09/04/2015	0	0	0	0
Hail	Fremont	09/04/2015	0	0	0	0
Hail	Clyde	09/04/2015	0	0	0	0
Hail	Clyde	06/05/2016	0	0	2K	0
Thunderstorm Wind	Fremont	06/05/2016	0	0	1K	0
Thunderstorm Wind	Fremont	06/05/2016	0	0	0	0
Hail	Fremont	07/30/2016	0	0	0	0
Thunderstorm Wind	Fremont	02/24/2017	0	0	0	0
Hail	Bellevue	07/16/2017	0	0	0	0
Hail	Clyde	08/21/2017	0	0	0	0
Hail	Green Springs	08/21/2017	0	0	0	0
Thunderstorm Wind	Hessville	11/05/2017	0	0	30K	0
Hail	Clyde	07/26/2018	0	0	0	0
Hail	Lindsey	01/08/2019	0	0	0	0
Hail	Bellevue	01/08/2019	0	0	0	0
Thunderstorm Wind	Lindsey	05/23/2019	0	0	5K	0
Thunderstorm Wind	Clyde	05/23/2019	0	0	0	0
Thunderstorm Wind	Clyde	05/23/2019	0	0	0	0
Hail	Gibsonburg	06/01/2019	0	0	0	0
Thunderstorm Wind	Lindsey	07/02/2019	0	0	5K	0
Thunderstorm Wind	Clyde	07/02/2019	0	0	20K	0
Thunderstorm Wind	Woodville	07/05/2019	0	0	0	0
Thunderstorm Wind	Helena	07/05/2019	0	0	1K	0
Thunderstorm Wind	Woodville	08/06/2019	0	0	5K	0
Thunderstorm Wind	Clyde	08/20/2019	0	0	20K	0

### 6.1.4 Tornado/Windstorm

Confirmed tornadoes and high wind events in Sandusky County since 1950 are listed below. High wind events are limited to those identified as wind-only in the Storm Events Database. Incidents of thunderstorm wind are listed in the severe thunderstorm section.

Hazard	Location	Date	Fujita Scale	Deaths	Injuries	Property Damage	Crop Damage
Tornado	Sandusky County	06/08/1953	F4	0	0	0	0
Tornado	Sandusky County	08/17/1972	F1	0	0	2.5K	0
Tornado	Sandusky County	06/30/1977	F1	18	0	25M	0
Tornado	Sandusky County	07/12/1992	F1	3	0	50K	0
High Wind	Sandusky County	01/27/1996	0	0	0	0	
High Wind	Sandusky County	01/29/1996	0	0	0	0	
High Wind	Sandusky County	02/10/1996	0	0	2K	0	
High Wind	Sandusky County	03/25/1996	0	0	4K	0	
High Wind	Sandusky County	04/25/1996	0	0	0	0	
High Wind	Sandusky County	10/30/1996	0	0	<1K	100K	
High Wind	Sandusky County	02/21/1997	0	0	0	0	
High Wind	Sandusky County	02/27/1997	0	0	50K	0	
Tornado	Fremont	11/10/2002	F1	0	0	1.3M	0
Strong Wind	Sandusky County	05/11/2003	0	0	50K	0	
High Wind	Sandusky County	11/12/2003	0	0	60K	0	
High Wind	Sandusky County	03/05/2004	0	0	100K	0	
High Wind	Sandusky County	10/30/2004	0	0	35K	0	
Strong Wind	Sandusky County	11/27/2004	0	0	5K	0	
Strong Wind	Sandusky County	12/07/2004	0	0	10K	0	
High Wind	Sandusky County	11/06/2005	0	0	25K	0	
High Wind	Sandusky County	02/17/2006	0	0	25K	0	
Strong Wind	Sandusky County	03/10/2006	0	0	10K	0	
High Wind	Sandusky County	12/01/2006	0	0	35K	0	
High Wind	Sandusky County	12/23/2007	0	0	5K	0	
High Wind	Sandusky County	01/30/2008	0	0	30K	0	
High Wind	Sandusky County	09/14/2008	0	0	2.5M	750K	
High Wind	Sandusky County	02/11/2009	0	0	400K	0	
High Wind	Sandusky County	12/09/2009	0	0	250K	0	
Tornado	Ballville	05/11/2010	EF0	0	0	25K	0
High Wind	Sandusky County	04/28/2011	0	0	50K	0	
High Wind	Sandusky County	02/24/2012	0	0	25K	0	
High Wind	Sandusky County	03/02/2012	0	0	15K	0	
High Wind	Sandusky County	10/29/2012	0	0	50K	0	
Tornado	Bellevue	07/10/2013	EF0	0	0	250K	0
High Wind	Sandusky County	11/24/2014		0	0	150K	0

Hazard	Location	Date	Fujita Scale	Deaths	Injuries	Property Damage	Crop Damage
High Wind	Sandusky County	01/10/2017		0	0	30K	0
Tornado	Vickery Warner Airport	11/05/2017	EF1	0	0	200K	0
High Wind	Sandusky County	02/24/2019		0	0	50K	0

### 6.1.5 Winter Storm

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

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Cold/Wind Chill	Sandusky County	02/02/1996	0	0	25K	0
Heavy Snow	Sandusky County	03/19/1996	0	0	6K	0
Cold/Wind Chill	Sandusky County	01/10/1997	0	0	5K	0
Winter Weather	Sandusky County	01/13/1998	3	0	0	0
Winter Storm	Sandusky County	01/02/1999	2	0	15K	0
Heavy Snow	Sandusky County	01/14/1999	2	0	50K	0
Heavy Snow	Sandusky County	03/05/1999	0	0	10K	0
Heavy Snow	Sandusky County	03/09/1999	0	0	0	0
Winter Storm	Sandusky County	03/11/2000	0	0	75K	0
Winter Storm	Sandusky County	12/13/2000	0	0	75K	0
Ice Storm	Sandusky County	01/30/2002	0	0	500K	0
Winter Storm	Sandusky County	03/24/2002	0	0	50K	0
Winter Storm	Sandusky County	03/26/2002	0	0	100K	0
Heavy Snow	Sandusky County	12/24/2002	0	0	75K	0
Heavy Snow	Sandusky County	02/22/2003	0	0	600K	0
Winter Storm	Sandusky County	01/04/2004	0	0	125K	0
Winter Storm	Sandusky County	12/22/2004	0	0	1.8M	0
Ice Storm	Sandusky County	01/05/2005	0	0	1.1M	0
Winter Storm	Sandusky County	01/22/2005	0	0	200K	0
Winter Storm	Sandusky County	02/13/2007	0	0	50K	0
Winter Storm	Sandusky County	12/15/2007	0	0	125K	0
Winter Storm	Sandusky County	02/25/2008	0	0	100K	0
Winter Storm	Sandusky County	03/04/2008	0	0	400K	0
Winter Storm	Sandusky County	03/07/2008	0	0	400K	0
Winter Storm	Sandusky County	12/19/2008	0	0	30K	0
Winter Storm	Sandusky County	01/09/2009	0	0	100K	0
Extreme Cold/Wind Chill	Sandusky County	01/15/2009	0	0	0	0
Winter Storm	Sandusky County	01/27/2009	0	0	125K	0
Winter Storm	Sandusky County	02/09/2010	0	0	150K	0

Hazard	Location	Date	Deaths	Injuries	Property Damage	Crop Damage
Winter Storm	Sandusky County	02/01/2011	0	0	250K	0
Cold/Wind Chill	Sandusky County	03/27/2012	0	0	0	0
Extreme Cold/Wind Chill	Sandusky County	04/29/2012	0	0	100K	0
Heavy Snow	Sandusky County	12/14/2013	0	0	75K	0
Winter Storm	Sandusky County	01/05/2014	0	0	0	0
Extreme Cold/Wind Chill	Sandusky County	01/06/2014	0	0	0	0
Extreme Cold/Wind Chill	Sandusky County	01/27/2014	0	0	0	0
Winter Storm	Sandusky County	02/04/2014	0	0	150K	0
Winter Storm	Sandusky County	03/12/2014	0	0	150K	0
Winter Storm	Sandusky County	2/1/2015	0	0	250K	0
Extreme Cold/Wind Chill	Sandusky County	2/15/2015	0	0	0	0
Winter Storm	Sandusky County	4/8/2016	0	0	200K	0
Winter Storm	Sandusky County	1/19/2019	0	0	75K	0
Extreme Cold/Wind Chill	Sandusky County	1/30/2019	0	0	0	0

## 6.2 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 Sandusky 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 Sandusky County's population as 60,944. Current building counts and critical facility numbers may be slightly different than this information which is based upon the 2010 census.

### 6.2.1 Flood

Sandusky County's vulnerability to flood was evaluated utilizing a HAZUS scenario for a 100-year flood event. 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 Sandusky County and those exposed to risk in this scenario. According to HAZUS data, Sandusky County has 26,200 buildings with an aggregate total replacement value of \$7,612M.

**Table 6-1: Building Exposure by Occupancy**

Occupancy	Sandusky County		100-Year Flood Scenario	
	Exposure (\$1000)	Percent of Total	Exposure (\$1000)	Percent of Total
Residential	\$5,301,451	69.6%	\$1,651,559	69.0%
Commercial	\$1,160,092	15.2%	\$330,082	13.8%
Industrial	\$711,495	9.3%	\$314,695	13.2%
Agricultural	\$71,841	0.9%	\$44,236	1.8%
Religion	\$165,150	2.2%	\$30,589	1.3%
Government	\$36,171	0.5%	\$7,551	0.3%
Education	\$166,129	2.2%	\$13,146	0.5%
<b>Total</b>	<b>\$7,612,329</b>	<b>100%</b>		<b>100%</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.

Sandusky County's essential facilities are identified in Table 5-2.

**Table 6-2: Essential Facility Inventory**

Facility Type	Number
Hospital	2 (318 beds)
Schools	33
Fire Stations	9
Police Stations	7

*Estimated Building Damage*

Per HAZUS estimates, 63 buildings will sustain at least moderate damage. This accounts for 71% of the total buildings identified for the scenario. Zero buildings are estimated to be completely destroyed. Tables 5-3 and 5-4 identify the anticipated building damage based on occupancy type and building type.

**Table 6-3: 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	0	0	0	0	0
Education	0	0	0	0	0	0
Government	0	0	0	0	0	0
Industrial	1	0	0	0	0	0
Religious	0	0	0	0	0	0
Residential	86	56	6	1	0	0
<b>Total</b>	<b>87</b>	<b>56</b>	<b>6</b>	<b>1</b>	<b>0</b>	<b>0</b>

**Table 6-4: 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	10	7	0	0	0	0
Steel	0	0	0	0	0	0
Wood	76	49	6	1	0	0
<b>Total</b>	<b>86</b>	<b>56</b>	<b>6</b>	<b>1</b>	<b>0</b>	<b>0</b>

Based on this scenario, HAZUS anticipates that most critical facilities will sustain little to no damage. One fire station is expected sustain at least moderate damage and one will experience loss of use; one police station would likely sustain moderate damage. Additionally, one school will likely be moderately damaged and one will not be useable after the incident. moderate or significant damage.

**Table 6-5: Expected Damage to Essential Facilities**

Classification	Total	Moderate Damage	Substantial Damage	Loss of Use
Fire Stations	9	1	0	1
Hospitals	2	0	0	0
Police Stations	7	1	0	1
Schools	33	1	0	1

#### *Shelter Requirements*

When flooding forces people from their homes, some will seek refuge at a public shelter. In this incident, it is anticipated that 679 households would be displaced and approximately 21 people would seek temporary shelter.

#### *Building Related Losses*

The total economic loss for the identified 100-year flood event is estimated to be \$46.84M. 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 6-6: Building-Related Economic Loss Estimates**

<b>Area</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Others</b>	<b>Total</b>
<b><i>Building Loss</i></b>					
Building	16.24	2.77	2.36	0.61	<b>21.98</b>
Content	7.19	7.61	5.83	3.36	<b>23.99</b>
Inventory	0	0.14	0.61	0.12	<b>0.87</b>
<b><i>Business Interruption</i></b>					
Income	0.16	6.28	0.20	1.64	<b>8.28</b>
Relocation	8.28	1.67	0.34	0.64	<b>10.92</b>
Rental Income	2.66	0.78	0.05	0.05	<b>3.54</b>
Wage	0.38	8.97	0.34	4.97	<b>14.66</b>
<b>Total</b>	<b>34.91</b>	<b>28.21</b>	<b>9.73</b>	<b>11.39</b>	<b>84.24</b>

### 6.2.2 Earthquake

The simulated earthquake epicenter was assumed to be in Fremont, the county's most populated jurisdiction. The simulated earthquake had a magnitude of 5.0 on the Richter Scale and a depth of 5.0 km. The HAZUS loss estimation program utilized 2010 U.S. Census data for this scenario. There are an estimated 26,000 buildings in the county with a replacement value of \$7,612M.

#### *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 centers. Schools are included in essential facilities. HPL facilities include dams, levees, nuclear power plants, military installations and hazardous material sites.

**Table 6-7: Critical Facility Inventory**

<b>Essential Facilities</b>		<b>High Potential Loss Facilities</b>	
<b>Facility Type</b>	<b>Number</b>	<b>Facility Type</b>	<b>Number</b>
Hospital	2 (318 beds)	Hazardous Materials Sites	53
Schools	33		
Fire Stations	9		
Police Stations	7		

#### *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 \$2,789M and includes more than 146 miles of highway, 334 bridges, and 7,384 miles of pipes.

**Table 6-8: Transportation System Inventory**

System	Components	Quantity	Replacement Value
Highways	Bridges	334	185.56M
	Segments	66	1,325.27M
Railways	Facilities	1	2.66M
	Segments	131	133.35M
Airport	Facilities	2	21.30M
	Runways	3	113.89M
<b>Total</b>			<b>\$1,782.0M</b>

**Table 6-9: Utility System Inventory**

System	Components	Quantity	Replacement Value
Potable Water	Distribution Lines	N/A	118.85M
Waste Water	Distribution Lines	N/A	71.31M
	Facilities	11	769.23M
Natural Gas	Distribution Lines	N/A	47.54M
Communication	Facilities	3	0.31M
<b>Total</b>			<b>\$1,007.20M</b>

**Building Damage**

The estimated building damage according to HAZUS is extensive. The number of buildings projected to sustain moderate damage is 5,176, approximately 20% of all buildings in the county. It is estimated that 352 buildings would be destroyed. Table 5-10 summarizes the anticipated building damages.

**Table 6-10: Expected Building Damage by Occupancy**

Occupancy	None	Slight	Moderate	Extensive	Complete
Agriculture	113.30	46.62	55.84	29.65	7.59
Commercial	583.43	299.57	356.39	181.20	55.40
Education	24.83	11.40	13.11	5.83	1.82
Government	21.91	9.31	10.90	4.49	1.39
Industrial	222.34	109.25	142.13	80.05	23.22
Other Residential	1106.53	556.26	584.93	280.71	65.57
Religion	75.72	33.18	31.10	16.03	4.97
Single Family Residential	13029.19	4780.48	2374.82	656.66	192.85
<b>Total</b>	<b>15,177</b>	<b>5,846</b>	<b>3,569</b>	<b>1,255</b>	<b>353</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 6-11: Expected Building Damage by Building Type**

Building Type	None	Slight	Moderate	Extensive	Complete
Wood	11667.38	4050.84	1507.31	191.23	14.81
Steel	270.91	115.14	212.63	147.66	45.45
Concrete	92.80	38.88	50.57	26.59	5.73
Precast	88.62	31.37	54.02	39.85	8.12
Reinforced Masonry	38.14	10.70	18.79	13.20	1.85
Unreinforced Masonry	2609.76	1322.62	1291.98	602.29	244.80
Manufactured Housing	409.66	276.53	433.95	233.81	52.06
<b>Total</b>	<b>15,177</b>	<b>5,846</b>	<b>3,569</b>	<b>1,255</b>	<b>353</b>

*Essential Facility Damage*

Anticipated damage to essential facilities is detailed in Table 5-12.

**Table 6-12: Expected Damage to Essential Facilities**

Classification	Total	Moderate Damage >50%	Complete Damage > 50%	With Functionality >50% on Day 1
Hospitals	2	2	0	0
Schools	33	14	0	10
Police Stations	7	2	0	4
Fire Stations	9	3	0	4

*Transportation and Utility Lifeline Damage*

Per HAZUS estimates, most 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.

Airports are also expected to have at least 50% functionality immediately following the incident. It is anticipated that two airports will sustain at least moderate damage. This damage is not expected to prevent them from functioning.

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

**Table 6-13: Expected Utility System Facility Damage**

System	Total	Moderate Damage	Complete Damage	Day 1 >50% Functionality	Day 7 >50% Functionality
Waste Water	11	8	0	1	11
Communication	3	1	0	2	3

**Table 6-14: Expected Utility System Pipeline Damage**

Utility	Total Pipeline	Anticipated Leaks	Anticipated Line Breaks
Potable Water	3,692	542	136
Waste Water	2,215	272	68
Natural Gas	1,477	93	23

Electrical service is more difficult to restore. Table 5-15 outlines the number of customers anticipated to be without electric service following the incident. There are 24,182 households in the county.

**Table 6-15: Expected Electric Power System Performance**

<b>Days Post-Event</b>	<b>Households Without Service</b>
Day 1	12,394
Day 3	7,660
Day 7	2,914
Day 30	483
Day 90	16

#### *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 246,000 tons of debris is anticipated. Brick/wood would comprise 46% of that amount. When converting these totals to truckloads, debris removal would require 9,840 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 430 households would be displaced and 260 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 6-16: Casualty Estimates**

<b>Time</b>	<b>Location</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Level 4</b>
<b>2 AM</b>	Commercial	1.72	0.40	0.05	0.10
	Commuting	0.01	0.01	0.02	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	6.14	1.44	0.18	0.36
	Other Residential	34.07	7.29	0.83	1.59
	Single Family Residential	102.95	23.04	3.09	6.06
	<b>TOTAL</b>	<b>145</b>	<b>32</b>	<b>4</b>	<b>8</b>
<b>2 PM</b>	Commercial	103.04	24.33	3.25	6.30
	Commuting	0.08	0.10	0.17	0.03
	Educational	56.16	13.74	1.98	3.84
	Hotels	0	0	0	0
	Industrial	45.27	10.62	1.37	2.64
	Other Residential	7.56	1.67	0.20	0.38
	Single Family	22.87	5.29	0.74	1.39
	<b>TOTAL</b>	<b>235</b>	<b>56</b>	<b>8</b>	<b>15</b>
<b>5 PM</b>	Commercial	75.91	18.03	2.44	4.66
	Commuting	1.51	1.93	3.35	0.64
	Educational	3.12	0.75	0.11	0.21
	Hotels	0	0	0	0
	Industrial	28.29	6.64	0.86	1.65
	Other Residential	13.09	2.87	0.35	0.64
	Single Family Residential	41.32	9.55	1.34	2.51
	<b>TOTAL</b>	<b>163</b>	<b>40</b>	<b>8</b>	<b>10</b>

*Economic Loss*

Total economic loss for this earthquake scenario is estimated to be \$1,044.61M. This 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 \$868.33M. Business interruption expenses account for 18% of this total. Residential structures are expected to sustain the greatest loss by far, more than 45% 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 6-17: Building-Related Economic Loss Estimates**

Area	Single-Family	Other Residential	Commercial	Industrial	Other	Total
<b>Income Losses</b>						
Wage	0	1.5699	31.4872	2.6623	1.7315	37.4776
Capital Related	0	0.6808	22.4038	1.6084	0.5836	25.2766
Rental	7.3741	4.4852	10.4221	1.1597	0.8367	24.2778
Relocation	25.7059	3.9374	21.6748	5.6157	8.5248	65.4586
<b>Capital Stock Losses</b>						
Structural	42.5877	8.3710	33.2671	18.4997	11.9294	114.6549
Non-Structural	168.0139	44.0854	94.4042	59.7408	28.3306	394.5749
Content	68.6501	13.6002	55.2121	43.9644	16.6429	189.0697
Inventory	0	0	1.2132	6.9663	0.3569	8.5364
<b>TOTAL</b>	<b>312.33</b>	<b>76.76</b>	<b>270.08</b>	<b>140.22</b>	<b>68.94</b>	<b>868.33</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 Sandusky 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 6-18: Transportation System Economic Losses**

System	Component	Inventory Value	Economic Loss
Highway	Segments	1325.2733	0
	Bridges	185.5632	7.5738
Railways	Segments	133.3508	0
	Facilities	2.6630	1.1894
Airport	Facilities	21.3020	8.3670
	Runways	113.8920	0
<b>Total</b>		<b>1,782.04</b>	<b>17.13</b>

**Table 6-19: Utility System Economic Losses**

System	Component	Inventory Value	Economic Loss
Potable Water	Distribution Lines	118.8500	2.4391
Waste Water	Facilities	769.2300	155.0166
	Distribution Lines	71.3100	1.2252
Natural Gas	Distribution Lines	45.5400	0.4198
Communication	Facilities	0.3150	0.0499
<b>Total</b>		<b>1,007.25</b>	<b>159.15</b>