SECTION 2:
HAZARD IDENTIFICATION & RISK ASSESSMENT

2.1 HIRA OVERVIEW & HAZARD IDENTIFICATION SUMMARY

The State of Ohio is prone to many natural and manmade hazards. Ohio has experienced thousands of hazard events, resulting in millions of dollars in losses and casualties, and 50 Presidential disaster declarations. In 2003 as part of an overall effort to reduce future exposure to damages and meet the planning requirements of the DMA 2000, the State of Ohio began the development of the initial Hazard Identification and Risk Assessment (HIRA). The HIRA has been subsequently reviewed and approved for the 2008, 2011 and 2014 plan updates.

This section will cover six separate requirements of the 44 CFR 201.4 (identifying hazards, profiling hazard events, assessing vulnerability by jurisdiction, estimating potential losses by jurisdiction, assessing vulnerability of state facilities, and estimating potential losses of state facilities). The first four of the six requirements are integrated into each hazard for which is detailed. The last two (state facility vulnerability assessment and loss estimation) are discussed in this section, but specifics are integrated into each hazard. The following will provide a more in-depth explanation of these six elements and describe the steps taken to ensure each element was met.

Identifying Hazards

The 44 CFR 201.4 (c)(2)(i) requires the risk assessment include an overview of the type of all natural hazards that can affect the state. This section of the plan presents a list of potential hazards that may likely impact the state. Due to the states northern geographical setting on Lake Erie, it is vulnerable to a wide array of hazards that threaten its communities, businesses, governments and environment. To determine the hazards that pose the greatest threat to the state, the OMPAT (in conjunction with FEMA) developed a list of potential hazards by conducting a review of several key resources, which include:

- Historical data on events that have occurred in the last 50 years;
- 2003, 2008, 2011 and 2014 plan data;
- Collaboration with various agencies who are known “experts” on different hazards, including the Ohio Departments of Natural Resources, Transportation and Environmental Protection Agency;
- Hazards identified in guidance materials provided by FEMA – Region V; and
- Local hazard mitigation plans. Ohio currently has 41 approved single and multi-jurisdictional plans with 39 in progress and 16 expired plans. Additionally, eight jurisdictions are scheduled to be participants in county plan revision efforts and will no longer have stand-alone plans. The approved plans were used to assess the impacts hazards are having throughout the state.

Risk Assessment

44 CFR 201.4 (c)(2)(i) – "The risk assessment shall include an overview of the location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events, using maps where appropriate."

The risk assessment section for each hazard includes a description of the location of the hazard, past occurrences, and a discussion of probability of future hazard events. The risk assessment relies upon information about past hazard events from published sources such as NOAA, USGS, USACE, Ohio EMA and ODNR, among other agencies.

Vulnerability Analysis by Jurisdiction

44 CFR 201.4 (c)(2)(ii) – The risk assessment shall include "an overview and analysis of the state's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments. The state shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events."

The methodology for the vulnerability section varies by hazard due to available data, and will be more thoroughly discussed prior to the results section for each hazard.

Improved integration of LHMP data into the state HIRA is an ongoing effort. By April 2010, all counties in the state had a mitigation plan. As local plans start to expire and jurisdictions update their plans, they are collecting updated vulnerability information and loss estimation data in the process. Where available, these local hazard data have been evaluated and incorporated into this enhanced plan, as necessary.

The State Hazard Analysis Resource and Planning Portal (SHARPP) was launched "live" in July 2012, and allows Ohio EMA to electronically track and evaluate hazard metrics and impact to residential, commercial and critical building stock, as well as evaluate damage estimates. Following state-provided training seminars and technical assistance, many of the counties uploaded their local HIRA data into SHARPP. Given local resource limitations and local priorities, some counties have yet to upload their data. However, several of the counties in the state have uploaded their hazard data into SHARPP and that information analyzed in this enhanced plan. As mentioned earlier, local hazard mitigation plans are continually being updated around the state. As these plans are updated, they will be uploaded into SHARPP and their corresponding HIRA data will entered as well. More details regarding the local HIRA data evaluated in this plan can be found within each hazard section and in Appendix J.

Estimating Potential Losses by Jurisdiction

44 CFR 201.4 (c)(2)(iii) – The risk assessment shall include "an overview and analysis of potential losses to identified structures, based on estimates provided in local risk assessments."

The methodology for this section varies by hazard due to available data, and will be more thoroughly discussed prior to the results section for each hazard.

Similar to the requirement to utilize vulnerability analysis information from LHMPs, data are incorporated using methods and input as stated in the Vulnerability Analysis section described above. Each jurisdiction's plan utilizes a formal approach to determine losses that can be expected from different hazard scenarios. For purposes of identification, this section of the plan categorizes loss estimates by hazard and provides an example of how an LHMP performed an in-depth analysis. It should be noted that this analysis of LHMPs is a summary of some good practices.

Many counties have uploaded their potential loss data into SHARPP, which are analyzed as appropriate in each hazard section of this plan. Given local resource limitations and local priorities, some counties have yet to upload their data. As mentioned earlier, local hazard mitigation plans are continually being updated around the state. As these plans are updated, they will be uploaded into SHARPP and their corresponding HIRA data will entered as well. More details regarding the local HIRA data evaluated in this plan can be found within each hazard section and in Appendix J. Future updates to the SOHMP will continue to spotlight data entered into SHARPP that depict risk and vulnerabilities from natural hazards.

Assessing Vulnerability of State Facilities

44 CFR 201.4 (c)(2)(ii) – The risk assessment shall include "an overview and analysis of the state's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments. State-owned or operated critical facilities located in the identified hazard areas shall be addressed."

The methodology for this section varies by hazard due to available data and their attributes, and is more thoroughly discussed below.

The State of Ohio Department of Administrative Services (DAS) (Risk Management Section) currently maintains a listing of state-owned and state-leased facilities. Both the state-owned and state-leased facility datasets are attributed and contain a geo-referenced point for each facility. These data include facilities ranging from small salt buildings owned by the Department of Transportation (ODOT) to multi-story office buildings owned by DAS. While the previous state plans only evaluated structures whose values exceeded $1 million, this plan evaluates all state-owned structures as many facilities crucial to response are worth much less than $1 million. Additionally, the state leases nearly 300 facilities around the state, and a significant percentage of those are

critical in nature. Therefore, it was deemed necessary to evaluate all state-owned and state-leased structures, and parse out those that are critical in nature.

A *critical* facility is defined as any facility whose services are necessary to the response and/or recovery operations following a disaster. Such facilities include (but are not limited to) administration office buildings, transportation facilities, highway patrol posts, armories, radio antenna towers etc. Also, numerous facilities exist at correctional institute complexes that are used for sheltering purposes immediately following a disaster, and such facilities include structures appurtenant and necessary to their function.

The state-owned and state-leased datasets are sufficient for vulnerability assessments, as all state-owned data include estimated values for replacement and all state-leased data include annual rent totals. However, assumptions made for vulnerability using these datasets must be fairly general since additional attributed information is not complete. Many of the data include year of construction, construction type, square footage, number of stories, etc. However, not all data include these pieces of information since the data were compiled through multi-agency efforts. As these data are refined and become more complete in the future, updates will be made to the methodologies used here for vulnerability assessments.

An additional dataset was acquired from the National Geospatial-Intelligence Agency in cooperation with FEMA. During DR-4002 recovery efforts, Ohio EMA worked with FEMA to gain access to the Homeland Security Infrastructure Program (HSIP) Gold Dataset 2011. These data are the products of collaborative efforts of various stakeholders in the Defense, Intelligence, and Homeland Security Communities. The data provide national critical infrastructure sectors as defined by Homeland Security. Much of the data are populated in major metropolitan areas, but gaps exist between highly populated areas. Additionally, replacement costs are not provided for various facilities, limiting the discussion on vulnerability in terms of dollars. These data are used to supplement the data obtained from DAS, especially for non-geographic hazards.

Estimating Potential Losses of State Facilities

44 CFR 201.4 (c)(2)(iii) – The risk assessment shall include “an overview and analysis of potential losses to identified structures, based on estimates provided in local risk assessments. The state shall estimate the potential dollar losses to state-owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.”

As mentioned above, the state-owned and state-leased datasets are sufficient for loss estimations, as all state-owned data include estimated values for replacement and all state-leased data include annual rent totals. However, assumptions made for losses using these datasets must be fairly general since additional attributed information is not complete. Many of the data include year of construction, construction type, square footage, number of stories, etc. However, not all data include these pieces of information since the data were

compiled through multi-agency efforts. As these data are refined and become more complete in the future, updates will be made to the methodologies used here for loss estimations.

A summary of the state-owned and state-leased facilities by county and agency is provided in Appendix C. It should be noted that facility specifics (*i.e.*, facility name, location, *etc*.) are not listed in this plan due to increased security. Further information can be obtained from Ohio DAS on said data.

Tables 2.1.a – 2.1.c list state-owned critical and non-critical facility numbers and replacement values within each county. Currently, there are a total of 4,456 state-owned facilities (2,343 critical and 2,113 non-critical) throughout Ohio worth an estimated $4.3 billion. For Region 1 there are 906 critical and 635 non-critical worth approximately $845 million and $354 million, respectively. The county with the largest dollar exposure of state-owned facilities is Marion with $421,369,273, mostly related to a large correctional facility. Marion County also has the highest dollar exposure of critical facilities at $368 million.

Presently, there are a total of 1,709 (900 critical and 809 non-critical) state-owned facilities in Region 2, worth an estimated $2.4 billion. The estimated worth for the critical facilities is over $1.5 billion, and non-critical is over $930 million. As would be expected, Franklin County, which contains the state capital, represents the majority of the dollar value with $994 million in state-owned facilities that include 99 critical in nature, worth approximately $675.5 million.

The lowest total number (1,206) of state-owned facilities is located in Region 3, representing over $633 million. The estimated worth for critical facilities is nearly one-fifth of that in Region 2 ($389 million), and $273 million in non-critical facilities. Ross County accounts for nearly one third of the dollars at risk ($137 million) in the entire Region, which is mainly due to a large correctional facility.

Tables 2.1.d – 2.1.f list state-leased critical and non-critical facility numbers and their respective annual rental costs within each county. Currently, there is a total of 296 state facilities that are leased annually, of which 30 are critical to response and recovery following a disaster. For Region 1, there are three critical and 39 non-critical with approximately $654,528 and $2,851,641 in annual rent, respectively. Region 2 has 24 critical and 168 non-critical leases with annual rental costs of $7,841,431 and $43,721,216, respectively. In Region 3 numbers are similar to those in Region 1 with three state-leased critical facilities ($476,832) and 59 state-leased non-critical facilities ($3,063,305).

UPDATE SUMMARY

The 2003 HIRA identified a comprehensive list of hazards, both manmade and natural, but only included detailed risk assessments and vulnerability analyses for five hazards. Further updates in 2008 and 2011 included risk assessments/vulnerability analyses on all 12 natural hazards, and one technological hazard (dam/levee failure). Developing these data was a collaborative process involving several state and Federal agencies who are deemed to be the “experts” in their particular hazard(s). For the 2012 enhanced

plan, the existing analyses were reviewed for accuracy and data currency. Based on the review it was determined that the following major updates be made:

- Tornado data and loss estimations were updated with 2010 census data and 2011 hazard analyses;
- Hazard identification data from SHARPP were incorporated into the discussion for each hazard
- Vulnerability analyses were completed for all hazards with regard to state-owned and state-leased facilities (critical and non-critical);
- The Dam/Levee Failures section was rewritten to incorporate a state-maintained dam inventory and dam priority list. Also, levee inventories from the State and FEMA were combined and evaluated. Vulnerability analyses were conducted for all inundation mapping received from the USACE.
- 2010 census data and National Urban Change Indicator data were analyzed and incorporated into “Future Growth and Potential Risk Areas” (Section 2.15).
- Section 2.15 has been updated to include information addressing the Ohio Balanced Growth Initiative, hydraulic fracturing and the impacts of climate change.

Table 2.1.a

Region 1 State-Owned Critical and Non-Critical Facilities						
County	**Number of State-Owned Critical Facilities**	**Replacement Value of Critical Facilities**	**Number State-Owned Non-Crit. Facilities**	**Replacement Value of Non-Crit. Facilities**	**Total Number State-Owned Facilities**	**Replacement Value of All State-Owned Facilities**
Allen	87	$129,644,317	51	$17,589,855	138	$147,234,172
Auglaize	22	$4,306,792	11	$3,065,702	33	$7,372,494
Champaign	27	$4,698,459	7	$385,650	34	$5,084,109
Clark	41	$6,604,768	44	$6,594,661	85	$13,199,429
Clinton	9	$4,122,099	16	$1,958,400	25	$6,080,499
Crawford	15	$3,436,499	0	$0	15	$3,436,499
Darke	31	$4,098,855	2	$12,776	33	$4,111,630
Defiance	9	$2,484,068	2	$247,860	11	$2,731,928
Erie	19	$4,126,904	54	$109,901,141	73	$114,028,045
Fayette	14	$2,027,534	6	$402,900	20	$2,430,434
Fulton	14	$1,311,246	1	$51,000	15	$1,362,246
Hancock	18	$7,481,547	8	$1,351,500	26	$8,833,047
Hardin	11	$1,236,823	1	$5,500	12	$1,242,323
Henry	16	$2,139,685	12	$7,251,968	28	$9,391,653
Huron	15	$2,270,434	0	$0	15	$2,270,434
Logan	36	$4,056,192	5	$612,000	41	$4,668,192
Lucas	21	$79,831,356	50	$63,404,099	71	$143,235,456
Madison	73	$70,334,729	81	$20,016,930	154	$90,351,659
Marion	71	$368,616,129	82	$52,753,143	153	$421,369,273
Mercer	27	$3,365,812	1	$366,365	28	$3,732,177
Miami	24	$7,551,858	16	$1,300,222	40	$8,852,080
Morrow	9	$659,529	11	$1,646,280	20	$2,305,809
Ottawa	91	$35,749,476	53	$7,611,680	144	$43,361,155
Paulding	13	$1,446,227	0	$0	13	$1,446,227
Preble	3	$990,179	5	$15,686,860	8	$16,677,039
Putnam	18	$1,379,385	2	$100,000	20	$1,479,385
Sandusky	10	$1,187,463	17	$8,854,154	27	$10,041,617
Seneca	21	$3,786,742	39	$19,210,641	60	$22,997,383
Shelby	24	$10,118,878	2	$306,000	26	$10,424,878
Union	31	$50,301,698	20	$10,374,207	51	$60,675,905
Van Wert	17	$2,177,611	1	$21,165	18	$2,198,776
Williams	14	$2,762,168	13	$1,695,193	27	$4,457,361
Wood	38	$13,105,858	15	$1,412,194	53	$14,518,052
Wyandot	17	$8,118,160	7	$565,386	24	$8,683,546
REGIONAL TOTALS	**906**	**$845,529,480**	**635**	**$354,755,432**	**1,541**	**$1,200,284,912**

Table 2.1.b

Region 2 State-Owned Critical and Non-Critical Facilities						
County	**Number of State-Owned Critical Facilities**	**Replacement Value of Critical Facilities**	**Number State-Owned Non-Crit. Facilities**	**Replacement Value of Non-Crit. Facilities**	**Total Number State-Owned Facilities**	**Replacement Value of All State-Owned Facilities**
Ashland	37	$40,911,576	59	$30,237,420	96	$71,148,996
Ashtabula	68	$36,672,165	23	$4,399,911	91	$41,072,076
Butler	6	$5,677,384	2	$1,400,000	8	$7,077,384
Cuyahoga	51	$19,815,718	39	$57,101,659	90	$76,917,378
Delaware	37	$13,687,947	41	$34,864,515	78	$48,552,463
Fairfield	25	$14,201,092	29	$14,582,043	54	$28,783,134
Franklin	99	$675,509,073	134	$318,826,198	233	$994,335,271
Geauga	15	$3,749,863	43	$6,585,511	58	$10,335,374
Greene	6	$1,647,613	8	$5,291,719	14	$6,939,332
Hamilton	8	$4,955,507	20	$133,397,979	28	$138,353,486
Knox	11	$2,310,567	25	$21,921,501	36	$24,232,068
Lake	15	$3,150,402	4	$503,069	19	$3,653,471
Licking	43	$49,443,301	25	$3,826,107	68	$53,269,408
Lorain	51	$167,396,177	42	$5,956,786	93	$173,352,963
Mahoning	32	$58,580,595	15	$14,175,788	47	$72,756,384
Medina	9	$2,232,067	3	$93,636	12	$2,325,703
Montgomery	59	$32,116,440	38	$49,964,155	97	$82,080,596
Pickaway	61	$146,855,378	90	$46,384,581	151	$193,239,958
Portage	45	$11,207,858	12	$2,089,226	57	$13,297,083
Richland	22	$100,028,878	30	$18,652,194	52	$118,681,072
Stark	18	$8,056,936	9	$51,394,959	27	$59,451,895
Summit	48	$46,370,195	15	$48,131,178	63	$94,501,373
Trumbull	46	$28,726,632	22	$12,032,218	68	$40,758,850
Warren	71	$67,359,537	66	$26,480,686	137	$93,840,222
Wayne	17	$3,033,309	15	$22,317,824	32	$25,351,133
REGIONAL TOTALS	**900**	**$1,543,696,210**	**809**	**$930,610,863**	**1,709**	**$2,474,307,073**

Table 2.1.c

Region 3 State-Owned Critical and Non-Critical Facilities						
County	**Number of State-Owned Critical Facilities**	**Replacement Value of Critical Facilities**	**Number State-Owned Non-Crit. Facilities**	**Replacement Value of Non-Crit. Facilities**	**Total Number State-Owned Facilities**	**Replacement Value of All State-Owned Facilities**
Adams	11	$1,103,231	1	$765	12	$1,103,996
Athens	21	$14,665,205	10	$12,525,127	31	$27,190,332
Belmont	37	$48,194,651	5	$4,675,493	42	$52,870,144
Brown	13	$2,699,466	4	$16,869,649	17	$19,569,114
Carroll	12	$937,951	1	$387,033	13	$1,324,984
Clermont	5	$976,905	21	$10,417,513	26	$11,394,418
Columbiana	27	$3,605,208	5	$2,007,850	32	$5,613,058
Coshocton	15	$2,303,289	4	$478,282	19	$2,781,571
Gallia	7	$2,262,639	43	$21,776,188	50	$24,038,827
Guernsey	20	$5,445,827	98	$69,748,028	118	$75,193,855
Harrison	13	$1,341,875	2	$22,695	15	$1,364,570
Highland	9	$1,287,194	21	$3,145,622	30	$4,432,817
Hocking	12	$10,871,404	66	$8,637,471	78	$19,508,875
Holmes	14	$1,012,866	0	$0	14	$1,012,866
Jackson	9	$3,018,885	4	$275,400	13	$3,294,285
Jefferson	25	$2,991,311	1	$510,000	26	$3,501,311
Lawrence	19	$1,937,552	0	$0	19	$1,937,552
Meigs	15	$2,207,382	2	$145,860	17	$2,353,242
Monroe	9	$1,269,631	0	$0	9	$1,269,631
Morgan	8	$795,407	38	$6,172,377	46	$6,967,784
Muskingum	21	$2,316,961	31	$3,995,784	52	$6,312,746
Noble	22	$45,956,237	5	$6,339,333	27	$52,295,570
Perry	7	$1,075,760	2	$541,930	9	$1,617,691
Pike	8	$882,134	28	$2,012,460	36	$2,894,594
Ross	60	$137,240,093	94	$50,149,531	154	$187,389,623
Scioto	23	$59,447,289	87	$34,673,691	110	$94,120,979
Tuscarawas	54	$24,497,535	53	$6,183,531	107	$30,681,066
Vinton	9	$1,227,839	21	$2,736,660	30	$3,964,499
Washington	32	$8,161,858	22	$9,433,783	54	$17,595,641
REGIONAL TOTALS	**537**	**$389,733,587**	**669**	**$273,862,055**	**1,206**	**$663,595,642**

Table 2.1.d

Region 1 State-Leased Critical and Non-Critical Facilities						
County	**Number of State-Leased Critical Facilities**	**Annual Rent of Critical Facilities**	**Number State-Leased Non-Crit. Facilities**	**Annual Rent of Non-Critical Facilities**	**Total Number State-Leased Facilities**	**Annual Rent of All State-Leased Facilities**
Allen	0	$0	4	$584,976	4	$584,976
Auglaize	0	$0	2	$20,388	2	$20,388
Champaign	0	$0	1	$3,096	1	$3,096
Clark	0	$0	2	$315,744	2	$315,744
Clinton	0	$0	0	$0	0	$0
Crawford	0	$0	0	$0	0	$0
Darke	0	$0	0	$0	0	$0
Defiance	0	$0	3	$124,932	3	$124,932
Erie	0	$0	4	$226,683	4	$226,683
Fayette	0	$0	0	$0	0	$0
Fulton	0	$0	0	$0	0	$0
Hancock	1	$40,788	1	$72,000	2	$112,788
Hardin	0	$0	0	$0	0	$0
Henry	0	$0	0	$0	0	$0
Huron	0	$0	2	$25,536	2	$25,536
Logan	0	$0	0	$0	0	$0
Lucas	1	$23,136	4	$569,010	5	$592,146
Madison	0	$0	2	$60,000	2	$60,000
Marion	0	$0	0	$0	0	$0
Mercer	0	$0	0	$0	0	$0
Miami	0	$0	1	$19,932	1	$19,932
Morrow	0	$0	0	$0	0	$0
Ottawa	0	$0	1	$504	1	$504
Paulding	0	$0	0	$0	0	$0
Preble	0	$0	0	$0	0	$0
Putnam	0	$0	1	$12,384	1	$12,384
Sandusky	0	$0	2	$109,656	2	$109,656
Seneca	0	$0	3	$203,820	3	$203,820
Shelby	0	$0	1	$123,684	1	$123,684
Union	0	$0	1	$14,760	1	$14,760
Van Wert	0	$0	1	$2,292	1	$2,292
Williams	0	$0	0	$0	0	$0
Wood	1	$590,604	3	$362,244	4	$952,848
Wyandot	0	$0	0	$0	0	$0
REGIONAL TOTALS	**3**	**$654,528**	**39**	**$2,851,641**	**42**	**$3,506,169**

Table 2.1.e

Region 2 State-Leased Critical and Non-Critical Facilities						
County	**Number of State-Leased Critical Facilities**	**Annual Rent of Critical Facilities**	**Number State-Leased Non-Crit. Facilities**	**Annual Rent of Non-Critical Facilities**	**Total Number State-Leased Facilities**	**Annual Rent of All State-Leased Facilities**
Ashland	0	$0	0	$0	0	$0
Ashtabula	0	$0	2	$47,232	2	$47,232
Butler	0	$0	4	$618,876	4	$618,876
Cuyahoga	0	$0	12	$1,882,083	12	$1,882,083
Delaware	0	$0	0	$0	0	$0
Fairfield	0	$0	3	$599,661	3	$599,661
Franklin	14	$6,511,974	72	$30,488,803	86	$37,000,777
Geauga	0	$0	1	$11,400	1	$11,400
Greene	0	$0	1	$48,912	1	$48,912
Hamilton	1	$40,224	16	$3,539,370	17	$3,579,594
Knox	0	$0	1	$2,364	1	$2,364
Lake	0	$0	3	$176,676	3	$176,676
Licking	0	$0	0	$0	0	$0
Lorain	0	$0	4	$444,920	4	$444,920
Mahoning	2	$40,519	10	$1,220,285	12	$1,260,804
Medina	0	$0	2	$44,712	2	$44,712
Montgomery	4	$756,042	14	$1,879,239	18	$2,635,281
Pickaway	0	$0	0	$0	0	$0
Portage	0	$0	0	$0	0	$0
Richland	0	$0	5	$827,256	5	$827,256
Stark	0	$0	7	$1,581,603	7	$1,581,603
Summit	2	$481,956	5	$206,022	7	$687,978
Trumbull	1	$10,716	3	$49,152	4	$59,868
Warren	0	$0	2	$28,974	2	$28,974
Wayne	0	$0	1	$23,676	1	$23,676
REGIONAL TOTALS	**24**	**$7,841,431**	**168**	**$43,721,216**	**192**	**$51,562,647**

Table 2.1.f

Region 3 State-Leased Critical and Non-Critical Facilities						
County	**Number of State-Leased Critical Facilities**	**Annual Rent of Critical Facilities**	**Number State-Leased Non-Crit. Facilities**	**Annual Rent of Non-Critical Facilities**	**Total Number State-Leased Facilities**	**Annual Rent of All State-Leased Facilities**
Adams	0	$0	0	$0	0	$0
Athens	0	$0	7	$494,856	7	$494,856
Belmont	0	$0	6	$362,712	6	$362,712
Brown	0	$0	1	$1,308	1	$1,308
Carroll	0	$0	0	$0	0	$0
Clermont	0	$0	0	$0	0	$0
Columbiana	1	$3,600	0	$0	1	$3,600
Coshocton	0	$0	0	$0	0	$0
Gallia	0	$0	0	$0	0	$0
Guernsey	1	$47,856	9	$575,928	10	$623,784
Harrison	0	$0	0	$0	0	$0
Highland	0	$0	2	$43,164	2	$43,164
Hocking	1	$425,376	2	$160,176	3	$585,552
Holmes	0	$0	0	$0	0	$0
Jackson	0	$0	2	$93,048	2	$93,048
Jefferson	0	$0	1	$21,894	1	$21,894
Lawrence	0	$0	3	$89,568	3	$89,568
Meigs	0	$0	0	$0	0	$0
Monroe	0	$0	0	$0	0	$0
Morgan	0	$0	0	$0	0	$0
Muskingum	0	$0	7	$202,932	7	$202,932
Noble	0	$0	0	$0	0	$0
Perry	0	$0	0	$0	0	$0
Pike	0	$0	2	$11,172	2	$11,172
Ross	0	$0	5	$280,656	5	$280,656
Scioto	0	$0	4	$533,843	4	$533,843
Tuscarawas	0	$0	3	$85,968	3	$85,968
Vinton	0	$0	0	$0	0	$0
Washington	0	$0	5	$106,080	5	$106,080
REGIONAL TOTALS	**3**	**$476,832**	**59**	**$3,063,305**	**62**	**$3,540,137**

HAZARD IDENTIFICATION SUMMARY

The hazards initially evaluated in the SOHMP to determine their potential effects on the state include:

1) Coastal Erosion
2) Droughts
3) Earthquakes
4) Floods
5) Storm Surges
6) Landslides
7) Land Subsidence
8) Natural Biohazards (Invasive species)
9) Severe Thunderstorms
10) Windstorms
11) Hailstorms
12) Severe Winter/Ice Storms
13) Tornadoes
14) Wildfire
15) Tropical Cyclones
16) Snow Avalanches
17) Extreme Summer Weather
18) Expansive Soils
19) Tsunami
20) Volcano
21) Dam Failure
22) HAZMAT
23) Terrorism
24) Urban Fire
25) Nuclear Accidents

The list was more closely examined, paying special attention to the likelihood of future occurrence and the interrelated nature of some of the hazards (i.e., landslides can be a result of flooding). Following this evaluation, the list of hazards was reduced from 24 to 15, retaining those most likely to affect the state and most likely to pose serious threats to lives, property, and/or the local economy.

For the purpose of ranking hazards affecting the state, in order of importance for mitigating their effects, a hazard index was assigned (see Table 2.1.g) on a scale of 1-5, with 5 being the highest priority for considering mitigation goals (highest, high, medium, low, and lowest). This index takes into account the anticipated frequency of occurrence (see Table 2.1.h), the specific consequences of impact (see Table 2.1.i) and if there has been a past declaration for that particular hazard. This is not meant to be a scientific process, but will serve as a way to prioritize mitigation goals based on the potential frequency and likely extent of damage from hazards known to affect the state.

It is important to note that HIRAs are developed for different purposes. For the purposes of emergency planning and similar functions, a document called the *2007 Ohio HIRA* was produced. The *2007 Ohio HIRA* prioritizes hazards utilizing criteria developed to facilitate emergency planning. These criteria include frequency, duration, speed of onset, magnitude, impact on business, impact on people, and impact on property. This method assigns a numerical value to

vulnerability based on the criteria of impacts on businesses, people, and property. The *2007 Ohio HIRA* places more emphasis on life safety issues versus the HIRA performed for the SOHMP which places a similarly high priority on property/facility damage. Also, the *2007 Ohio HIRA* evaluates manmade hazards. These data are valuable as they represent another method to "ground truth" the data in the SOHMP HIRA. The Ohio HIRA has been updated several times since 2007. The most recent version can be found in Appendix I of the SOHMP.

According to the Ohio HIRA, the following are the top ten hazards (ranking score in parenthesis): Riverine Flooding (27.00), Windstorm/tornado (26.25), Flash flood / seiche (23.75), Snow/ice/hail/sleet (23.25), Radiological Incidents (22.25), Disease Human (22.00), Water Control Structure Failure (22.00), Disease – Animal (21.50), building/structure collapse (20.75), and terrorism (20.00). These correspond fairly well with the hazards profiled in the SOHMP HIRA, with the exception of radiological incidents, disease (human and animal), and terrorism (none of which are evaluated in the SOHMP HIRA).

Table 2.1.g

Hazard Index Ranking				
Impact → / **Frequency of Occurrence ↓**	**Catastrophic**	**Critical**	**Limited**	**Negligible**
Highly Likely	5 *(Highest)*	4 *(High)*	4 *(High)*	3 *(Medium)*
Likely	5 *(Highest)*	4 *(High)*	3 *(Medium)*	2 *(Low)*
Possible	4 *(High)*	3 *(Medium)*	2 *(Low)*	2 *(Low)*
Unlikely	3 *(Medium)*	2 *(Low)*	1 *(Lowest)*	1 *(Lowest)*
Highly Unlikely	2 *(Low)*	1 *(Lowest)*	1 *(Lowest)*	1 *(Lowest)*

Source: FEMA, 1997

Table 2.1.h

Frequency of Occurrence	
Highly Likely	Near 100 Percent probability in the next year.
Likely	Between 10 and 100 percent probability in the next year, or at least one chance in the next 10 years.
Possible	Between 1 and 10 percent probability in the next year, or at least one chance in the next 100 years.
Unlikely	Less than 1 percent probability in the next year, less than one chance in the next 100 years.
Highly Unlikely	Little to no probability in next 100 years.

Source: FEMA, 1997

Table 2.1.i

Consequences of Impact	
Catastrophic	Multiple Deaths, complete shutdown of facilities for 30 days or more, more than 50 percent of property is severely damaged.
Critical	Multiple severe injuries, complete shutdown of critical facilities for at least 2 weeks, more than 25 percent of property is severely damaged.
Limited	Some injuries, complete shutdown of critical facilities for more than one week, more than 10 percent of property severely damaged.
Negligible	Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 10 percent of property is severely damaged.

Source: FEMA, 1997

Table 2.1.j

Hazard Ranking Assessment				
Hazard	**Past Federal Declarations**	**Frequency**	**Impact**	**Hazard Ranking**
Natural Hazards				
Coastal Erosion	No	Highly Likely	Negligible	3
Droughts	No	Likely	Negligible	2
Earthquakes	No	Possible	Limited	2
Floods	Yes	Highly Likely	Critical	4
Seiche / Coastal Flooding	No	Likely	Limited	3
Landslides	Yes	Highly Likely	Limited	4
Land Subsidence	No	Possible	Negligible	2
Invasive Species	No	Highly Likely	Limited	4
Severe Thunderstorms	Yes	Highly Likely	Critical	4
Windstorms	Yes	Highly Likely	Critical	4
Hailstorms	No	Likely	Negligible	2
Severe Winter/Ice Storms	Yes	Highly Likely	Critical	4
Tornadoes	Yes	Highly Likely	Critical	4
Wildfire	No	Likely	Limited	3
Tropical Cyclones	No	Unlikely	Negligible	1
Snow Avalanches	No	Highly Unlikely	Negligible	1
Extreme Summer Weather	No	Likely	Negligible	2
Expansive Soils	No	Unlikely	Negligible	1
Tsunami	No	Highly Unlikely	Negligible	1
Volcano	No	Highly Unlikely	Negligible	1
Technological Hazards				
Dam Failure	No	Possible	Critical	3
Hazardous Materials Events	No	Likely	Negligible	2
Terrorism	No	Unlikely	Critical	2
Urban Fire	No	Highly Likely	Negligible	3
Nuclear Accidents	No	Unlikely	Critical	2

Once the hazard ranking was complete an assessment was conducted to narrow the field of hazards (see Table 2.1.j). Several hazards were deleted from the list based on the unlikelihood of occurrence and/or the potential for a negligible impact on the state should they occur. These included tropical cyclones, snow avalanches, extreme summer weather, expansive soils, tsunami events, and volcano events. Other hazards were combined, as many of them are factors in larger hazards (*i.e.*, windstorms are related to tornadoes and hailstorms are usually related to severe summer storms). The final hazard inventory included 15 hazards, which are listed in order of importance below.

- **Flooding** (4) – includes flash flooding and normal riverine flooding. There have been numerous federal and state declarations for this disaster during the past 60 years.

- **Seiche / Coastal Flooding** (4) – this is a geographically specific hazard for areas bordering Lake Erie. There have been no past declarations for this disaster.
- **Tornadoes** (4) – include windstorms. There have been several past declarations for tornadoes and high wind events resulting from severe thunderstorms.
- **Landslides** (4) – include road slips and mudslides. There have been several declarations for this type of disaster many resulting from severe flooding.
- **Winter Storms** (4) – include snowstorms, ice storms and any other winter precipitation. There have been many declarations for this type of disaster.
- **Severe Summer Storms** (4) – these storms have a higher ranking than dam/levee failure because there are many factors associated with severe thunderstorms. In Ohio the primary disaster factors for severe thunderstorms have been flooding, tornadoes, high wind events, and landslides all of which have been addressed separately. Other aspects of severe thunderstorms (hail and lightning) are not as pressing in the overall mitigation process.
- **Invasive Species** (4) – There have been no federal declarations for invasive species to date.
- **Dam / Levee Failure** (3) – Though dam/levee failure is not at the top of the ranking chart, it is still considered an important hazard since it is related to flooding as either a cause or effect.
- **Coastal Erosion** (3) –Erosion from coastal storms and normal Lake Erie fluctuations.
- **Wildfire** (3) – there have been no federal declarations for wildfires to date.
- **Land Subsidence** (2) – there have been no federal declarations for land subsidence to date.
- **Droughts** (2) – there have been no federal declarations for droughts to date.
- **Earthquakes** (2) – there have been no federal declarations for earthquakes to date.
- **Hazardous Materials (HAZMAT)** (2) – which include nuclear accidents. There have been no federal declarations for HAZMAT events to date.
- **Terrorism** (2) – there have been no federal declarations directly referred to as terrorism in the past. However, in August 2003 there was a declaration related to power outage, which began in Cleveland and spanned across a significant portion of the northern United States and southern Canada. This grid could be considered a major target area in future terrorist activity and should be investigated accordingly.

It should be noted the State Hazard Analysis Resource and Planning Portal (SHARPP) collects similar hazard analysis data from local hazard mitigation plans. Similar to the *2007 Ohio HIRA*, local hazard analyses in SHARPP are based on a number of factors, including frequency, magnitude, onset, impact, etc. This allows for an increased ability to "ground truth" local priorities with respect to the SOHMP HIRA. To date, over 50 percent of the counties throughout the state have populated SHARPP with their hazard scores. Since a representative sample of counties have populated these hazard data, it was possible to assess local priorities with regard to the various hazards affecting their communities. Table 2.1.k shows the ranking of the top ten hazards based on local priorities.

Table 2.1.k

SHARPP Overall Local Hazard Ranking		
Hazard	**Adjusted Total Score**	**Rank**
Tornado	18.0	1
Flooding	17.4	2
Winter Storm	16.6	3
Earthquake	16.5	4
Dam/Levee Failure	15.6	5
Severe Summer Storms	15.2	6
Windstorm	15.1	7
Coastal Erosion	13.8	8
Hail Storm	13.1	9
Drought	12.9	10

While there are some differences in the scores and subsequent ranks, the overall ranking is similar to the SOHMP assessment (Table 2.1.j) and the *2007 Ohio HIRA*. Tornadoes, flooding, and winter storms rank at or near the top in all assessments. Once the hazard analyses are populated in SHARPP for all counties, these comparisons will more than likely result in the same conclusion. Additional information about SHARPP and local HIRA data can be found in Appendix J.

This state hazard mitigation plan discusses each of these hazards in more detail with the exception of two technological hazards that were previously mentioned in the 2003 SOHMP – terrorism and hazardous materials. These two hazards are better addressed in ongoing Homeland Security and emergency management planning efforts, and are presented in the *updated Ohio HIRA*.