

A topographic map of Washington County, Wisconsin, showing a grid of townships and sections. A prominent green vertical bar is drawn across the center of the map, extending from the top to the bottom. The title 'WASHINGTON COUNTY HAZARD MITIGATION PLAN' is overlaid on the map in large, bold, black capital letters.

# WASHINGTON COUNTY HAZARD MITIGATION PLAN

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**WASHINGTON COUNTY  
HAZARD MITIGATION PLAN**

Prepared by the

Southeastern Wisconsin Regional Planning Commission  
Washington County Office of Emergency Management  
Washington County Planning and Parks Department

In Cooperation with

Federal Emergency Management Agency  
Wisconsin Department of Military Affairs, Division of Emergency Management

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## Chapter I

# INTRODUCTION AND BACKGROUND

## INTRODUCTION

In March 2015, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) and the Washington County Emergency Management Office agreed to cooperatively prepare an all hazards mitigation plan for Washington County. The plan was designed to be consistent with the guidelines of the Wisconsin Department of Military Affairs, Division of Emergency Management, and the Federal Emergency Management Agency (FEMA). The plan utilized an “all hazards” mitigation approach which the Wisconsin Division of Emergency Management and FEMA recommend as an option to single hazard mitigation planning. As such, consideration was given to many hazard conditions, including flooding; severe weather conditions, including wind storms, tornadoes, periods of extreme heat or cold, and winter storms; and hazardous materials situations. While the plan considered all of the potential hazards, it was recognized that only limited mitigative actions would be feasible for some of these hazards, since they are not site-specific or repetitious in nature.

The plan was developed as a multi-jurisdictional plan, covering Washington County and all of the municipalities located within the County. The mitigation planning requirements identified in 44 *Code of Federal Regulations*, Section 201.6 (44 CFR 201.6) call for all jurisdictions participating in a multi-jurisdictional hazard mitigation plan to participate in the planning process. The municipalities that participated in the development of the Washington County hazard mitigation plan include the Cities of Hartford and West Bend; the Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; and the Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend.

The plan was prepared by the staffs of the Washington County Emergency Management Office, the Washington County Planning and Parks Department, and the Southeastern Wisconsin Regional Planning Commission. In preparing the plan, the County involved all appropriate County departments as needed. In addition, the planning was coordinated with the related activities of other concerned units and agencies of government. The plan was developed under the guidance of the Washington County Hazard Mitigation Plan Local Planning Team, which was created by the County specifically for plan development purposes. This team sought representatives from a cross-section of community interests and was comprised of elected and appointed officials, agency and business representatives, and citizens from throughout the County knowledgeable in hazard mitigation matters.

As previously noted, the mitigation planning requirements identified in 44 CFR 201.6 call for all jurisdictions participating in a multi-jurisdictional hazard mitigation plan to participate in the planning process. Examples of participation include, but are not limited to, attending planning meetings, contributing research, data, or other information, and commenting on drafts of the plan. Table 1 summarizes municipal participation in the planning process.

Table 1

**PARTICIPATION IN THE WASHINGTON COUNTY ALL HAZARDS MITIGATION PLAN UPDATE PLANNING PROCESS**

Civil Division	Attendance at Task Force Planning Meetings						Provision of Data <sup>a</sup>	Review of Report
	April 16, 2015	October 19, 2015	June 29, 2016	August 10, 2016 Public Meeting	July 10, 2017	July 27, 2017 Public Meeting		
<b>Cities</b>								
Hartford .....	X	--	X	--	--	--	--	X
West Bend .....	X	X	X	--	X	--	X	X
<b>Villages</b>								
Germantown .....	X	X	--	--	--	--	--	X
Jackson .....	X	--	--	--	--	--	--	--
Kewaskum .....	X	X	X	--	X	--	X	X
Newburg .....	X	--	--	X	--	--	X	--
Richfield .....	X	X	X	--	--	--	X	X
Slinger .....	X	X	--	X	--	--	X	X
<b>Towns</b>								
Addison .....	X	--	--	--	--	--	--	--
Barton .....	--	--	--	--	--	--	--	--
Erin .....	X	--	X	--	--	--	--	X
Farmington .....	--	--	--	--	--	--	--	--
Germantown .....	--	--	--	--	--	--	--	--
Hartford .....	X	--	--	--	--	--	--	--
Jackson .....	X	--	X	--	--	--	--	X
Kewaskum .....	X	--	--	--	--	--	--	--
Polk .....	X	--	--	X	X	--	X	X
Trenton .....	--	--	X	--	--	--	--	X
Wayne .....	--	--	--	--	--	--	--	--
West Bend .....	--	--	--	--	--	--	--	--
<b>County</b>								
Washington County .....	X	X	X	X	X	X	X	X

NOTE: X indicates participation by at least one representative of the municipality.

<sup>a</sup>Provision of data includes providing information on hazards experienced, projects undertaken, and outreach efforts as well as sharing of relevant plans, reports, and concerns.

Source: SEWRPC.

For more complete details on the level of participation of local citizens and community groups in the public involvement process, and summary notes for each Local Planning Team meeting, see Appendix A.

The procedures utilized in the plan are based upon guidance provided by FEMA and the Wisconsin Department of Military Affairs, Division of Emergency Management.<sup>1</sup> As such, the plan is consistent with the requirements

<sup>1</sup> Federal Emergency Management Agency, State and Local Mitigation Planning How-to Guide, "Understanding Your Risks, Identifying Hazards and Estimating Losses," Publication No. FEMA 386-2, August 2001. Federal Emergency Management Agency, Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008. Federal Emergency Management Agency, Local Mitigation Planning Handbook, March, 2013. See also Federal Emergency Management Agency, State and Local Plan Interim Criteria under the Disaster Mitigation Act of 2000, July 11, 2002.

and procedures defined in the Disaster Mitigation Act of 2000. The analysis includes three components: 1) profile and analysis of hazard events; 2) community vulnerability assessments; and 3) development of hazard mitigation strategies.

## **OVERVIEW OF STUDY AREA**

Washington County is located in southeastern Wisconsin, and is bordered on the east by Ozaukee County, on the south by Waukesha County, on the west by Dodge County, and on the north by Fond du Lac and Sheboygan Counties.

Washington County covers about 436 square miles and contains all or parts of two cities, all or parts of six villages, and twelve towns as shown on Map 1. There are parts of four major watersheds and a total of about 4,500 acres of inland surface waters within the County. The County has a diversified natural resource base, including several inland lakes, as well as major river systems.

The majority of the population resides in three population centers: one in the central portion of the County within the City of West Bend, another in the west-central portion of the County in the City of Hartford and the Village of Slinger, and a third in the southeastern portion of the County in the Villages of Germantown and Richfield. However, population centers are also scattered through the County including the Villages of Jackson, Kewaskum, and Newburg and in the partially urbanized town areas. Much of the land in the County remains in agriculture.

## **RELATIONSHIP OF HAZARD MITIGATION PLANNING TO EMERGENCY OPERATIONS PLANNING**

The focus of this planning effort is upon hazard mitigation measures. Such measures generally involve lasting, often permanent, measures designed to reduce the exposure to, probability of, or potential loss from, hazardous events. Such measures tend to focus on actions related to where and how to build structures, education to reduce losses or injury, and programs to improve the safety of identified hazard areas. A hazard mitigation plan outlines the strategy for mitigating the hazards potentially impacting a county or municipality.

The mitigation plan should be distinguished from, but compatible with, an emergency operations plan. Such a plan is defined as a plan which describes how people and property will be protected in disaster and disaster threat situations; details who is responsible for carrying out specific actions; identifies the personnel, equipment, facilities, supplies, and other resources available for use in the disaster; and outlines how all actions will be coordinated. Numerous such plans have been developed at the jurisdictional level, and often involve mutual assistance and cooperation agreements between local units of government in adjoining municipalities, both within and outside of Washington County. Plans for mitigating hazards are related to emergency operation activities involving short-term recovery decision-making, since such activities may highlight prospects for implementation of a mitigation strategy aimed at reducing long-term risk to human life and property.

## **SCOPE AND PURPOSE OF PLAN**

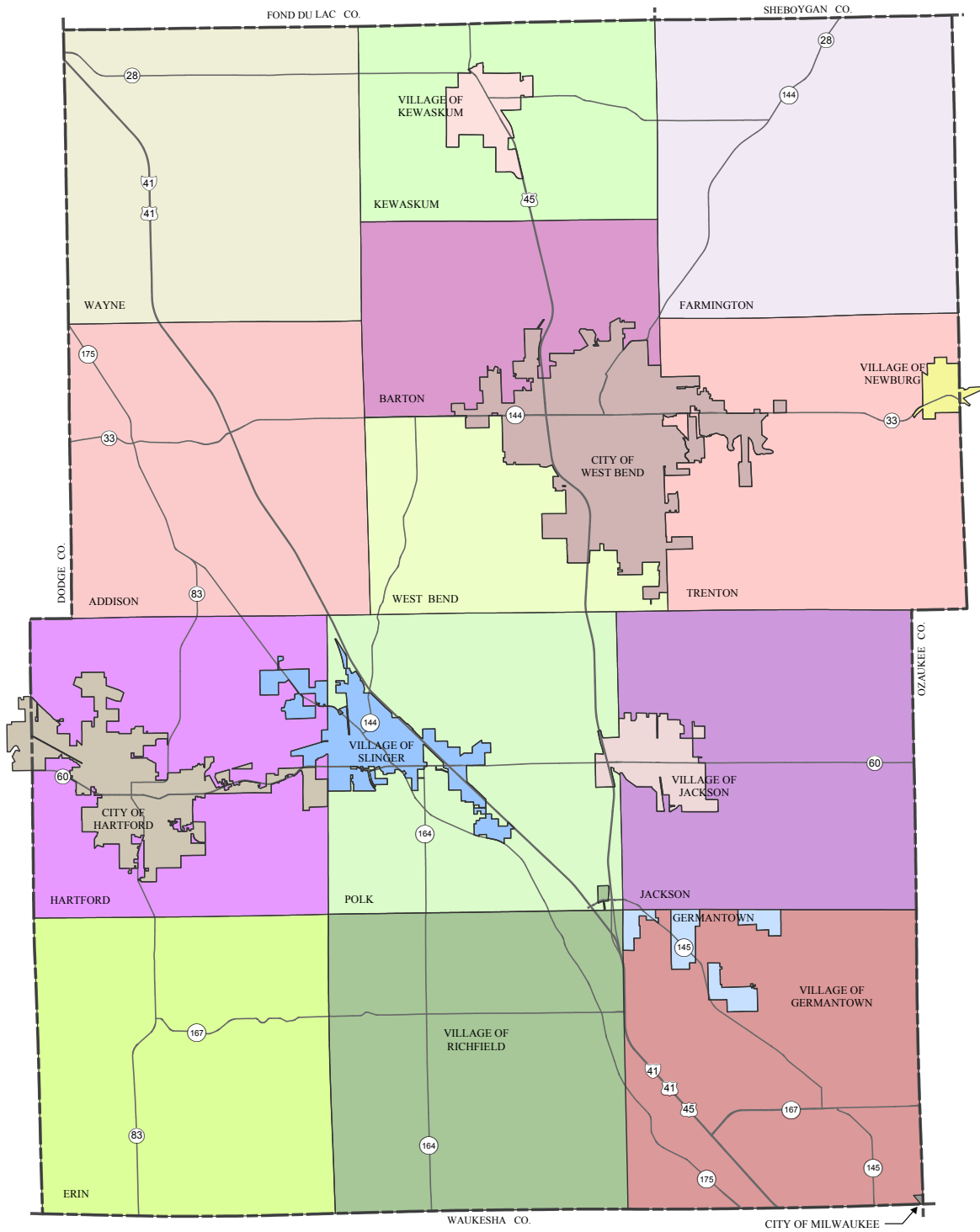
The scope of this plan is countywide, and is intended to set forth the most appropriate, feasible, and effective hazard mitigation strategy for Washington County and the local units of government within the County. The plan complements and refines the *State Hazard Mitigation Plan of Wisconsin*<sup>2</sup> and focuses on local conditions and hazards likely to occur or be experienced within Washington County and Southeastern Wisconsin. The plan development process is intended to encourage innovative programming and leadership and to build constructive partnerships with local units of government, business, and other stakeholders with a shared

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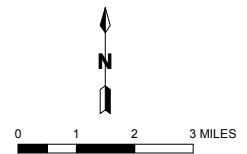
<sup>2</sup> *Wisconsin Emergency Management, State Hazard Mitigation Plan of Wisconsin, December 2016, amended January 2017.*

# Map 1

## CIVIL DIVISION BOUNDARIES IN WASHINGTON COUNTY: 2015



Source: Washington County and SEWRPC.



interest and obligation in protecting the safety and economic stability of Washington County, and to provide information and guidance to neighboring communities as they develop jurisdictional hazard mitigation plans at the local and subregional levels.

While it is acknowledged that the County can be affected by hazardous incidents that occur outside of the County jurisdiction, the degree of impact—in terms of property damage, injury, and loss of life, and ability of the County to respond, is significantly limited, and frequently unquantifiable. Thus, while some hazards, such as weather-related events, can extend over a wide area, most affect Washington County only tangentially, and many result in site-specific impacts. Those that are site-specific in their impact may be best addressed within local level hazard mitigation plans and through local action. Nevertheless, where appropriate, areas of cooperation between jurisdictions have been noted, especially with respect to hazards such as flooding, for example, which commonly affect entire river basins as well as the specific communities located within them. Generally, hazard mitigation as well as emergency response planning at the local and subregional levels, is beyond the scope of this plan.

The Washington County Hazard Mitigation Plan was developed in 2015 and 2016 through a collective effort of a number of agencies, organizations, and business representatives under the guidance of the previously described Washington County Hazards Mitigation Plan Local Planning Team, which was created by the County specifically for plan development purposes. The membership, formation, and active participation of the Local Planning Team are documented in Appendix A of this report. In addition to formation and active participation of the Local Planning Team, the plan development process included the following steps:

- Collation and review of all pertinent reports relating to the hazard mitigation activities in Washington County,
- Inventory mapping and analysis of hazards pertinent to Washington County,
- Identification of the facilities and ongoing programs related to hazard mitigation,
- Assessment of the vulnerability of County assets to each hazard,
- Identification of and prioritization of needed facilities and programs,
- Consideration of issues relating to neighboring municipalities and units of government likely to be affected or influenced by natural hazards within Washington County,
- Development and evaluation of alternatives to address the identified needs,
- The development of plan recommendations and an implementation plan,
- Development of a public informational and educational program and program of public consultation to guide the plan development and implementation program, including a prioritization of the recommended plan elements, and
- Adoption of a strategy for monitoring and refining the plan.

## **PLAN DEVELOPMENT REVIEW PROCESS AND ADOPTION**

As previously noted, the Washington County hazard mitigation plan was prepared under the guidance of a Local Planning Team comprised of representatives of the County and all of the communities within the County, as well as County businesses and agency representatives. That Team met four times during the plan preparation period to provide input on the types of hazards to be considered, the appropriate mitigation strategies, and to review the draft report chapters. The report chapters were then refined to reflect the comments and recommendations of the Team.

As draft chapters of the plan were completed, copies of the chapters were placed in downloadable form on the SEWRPC website. A webpage was available on this website on which members of the public could ask questions

and submit comments on the draft plan update. Following completion of the community profiles and the risk and vulnerability assessments sections of the plan and review by the Local Planning Team, a public informational meeting was held to review these sections of the plan with local officials, business and industry, and citizens and to solicit their input.

After the plan was completed in draft form, an additional public informational meeting was held to review the entire draft plan with local officials, businesses and industry, and citizens and solicit their input. In addition, copies of the draft plan were made available at the offices of the Washington County Emergency Management Office and on the SEWRPC website.

Once FEMA determined that the plan was approvable upon adoption, copies of the plan were sent to each of the local units of government requesting that they adopt the plan in order to retain future eligibility for mitigation funding. This funding includes FEMA Hazard Mitigation Grant, Flood Mitigation Assistance, and Pre-Disaster Mitigation programs administered by the Wisconsin Department of Military Affairs Division of Emergency Management. In addition, County and SEWRPC staffs were available to meet with communities on an individual basis to review the plan update and consider adoption and implementation steps. Copies of the adopted resolutions approving the plan by the local units of government are included in Appendix K.

## Chapter II

# BASIC STUDY AREA INVENTORY AND ANALYSIS

### INTRODUCTION

Information on pertinent natural and built features and aspects of the study area is an important consideration in sound hazard mitigation planning. Accordingly, the collection and collation of definitive information regarding basic demographic characteristics, existing and planned land use, surface water system characteristics, transportation and utility systems, critical community facilities, and existing hazard management programs constitute an important step in the planning process. The resulting information is an important element to the planning process, since sound mitigation approaches cannot be formulated and evaluated without an in-depth knowledge of the relevant conditions in the study area.

### CIVIL DIVISIONS

The geographic extent and functional responsibilities of civil divisions and special-purpose units of government are important factors to be considered in hazard mitigation planning, since these local units of government provide the basic structure of the decision-making framework, within which such planning must be addressed. The boundaries of the 20 civil divisions in Washington County are shown on Map 1 in Chapter I of this report. There are 12 towns in Washington County, including Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend. In addition, there are six villages—the Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger—and two cities—the Cities of Hartford and West Bend—located within the County.<sup>1</sup> The total land area and proportion of the County within each civil division is presented in Table 2.

### DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS

#### Population

The area that is now Washington County was first included in the Federal census in 1850. Historical population levels in Washington County are provided in Table 3. The resident population was 33,902 persons in 1950. Since then, Washington County has steadily continued to increase in population, with the greatest percent increases between the years of 1950 and 1980. As of 2010, there were 131,887 individuals residing in the County (Table 3). The population in Washington County is projected to increase through the year 2035 by approximately 25 percent to 164,500 persons.

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<sup>1</sup> A small portion of the City of Milwaukee is located within Washington County. For hazard mitigation planning purposes, this area is covered under the City's all hazard mitigation plan.

The City of West Bend is the most populous municipality in the County, with 31,078 residents, or about 24 percent of the County’s population, in 2010. The next most populous communities are the Village of Germantown, with 19,749 residents, constituting about 15 percent of the County’s population; the City of Hartford with 11,074, constituting about 8 percent of the County’s population; and the Village of Richfield with 11,300 residents, constituting about 9 percent of the County’s population. Based upon 2010 census data, several communities in Washington County experienced a relative population increase of more than 20 percent from 2000 to 2010. These communities include the City of Hartford; the Villages of Jackson, Kewaskum, and Slinger; and the Towns of Farmington and Wayne.

### Households

In addition to total population, the number of households, or occupied housing units, is of importance in land use planning and public facility planning insofar as it greatly influences the demand for urban land as well as the demand for transportation and other public facilities and services. A household includes all persons who occupy a housing unit—defined by the Census Bureau as a house, apartment, a mobile home, a group of rooms, or a single room that is occupied, or intended for occupancy, as a separate living quarters.<sup>2</sup> Persons not living in households are classified by the Census Bureau as living in group quarters, such as correctional facilities, college dormitories, and military quarters.

Trends in the number of households in the County are shown in Table 4. The County experienced significant gains in the number of new households between 1970 and 2010. Since 1970, the rate of increase in the number of households has exceeded the rate of population increase. Between 1970 and 2010, the number of households increased by about 196 percent, compared to a population increase of about 107 percent. With the number of households increasing at a faster rate than the population, the number of persons per household has decreased.

### Employment

Trends in job growth in the County are set forth in Table 5. The data reflect the number of jobs within the County, including both full- and part-time jobs. A significant increase in the number of jobs may be expected to attract additional residents to the County, thus influencing population growth. As indicated in Table 5, employment growth was significant in the County between 1970 and 2010, with an increase in the number of jobs from 24,300 to 63,900, or an increase of about 163 percent.

<sup>2</sup> Separate living quarters are defined as those in which the occupants live separately from any other persons in the building and which have direct access from the outside of the building or through a common hall.

**Table 2**

**AREAL EXTENT OF CIVIL DIVISIONS  
IN WASHINGTON COUNTY: 2015**

Civil Division	Area (acres)	Percent
<b>Cities</b>		
Hartford.....	4,853.4 <sup>a</sup>	1.7
Milwaukee.....	13.9 <sup>b</sup>	<0.1
West Bend.....	9,751.3	3.4
<b>Villages</b>		
Germantown.....	22,014.8	8.0
Jackson.....	2,003.4	0.7
Kewaskum.....	1,465.1	0.5
Newburg.....	521.5 <sup>c</sup>	0.2
Richfield.....	23,324.3	8.4
Slinger.....	3,366.9	1.2
<b>Towns</b>		
Addison.....	23,060.6	8.3
Barton.....	12,375.0	4.4
Erin.....	23,132.1	8.3
Farmington.....	23,542.0	8.5
Germantown.....	1,164.9	0.4
Hartford.....	17,976.9	6.4
Jackson.....	21,609.4	7.8
Kewaskum.....	14,116.5	5.1
Polk.....	20,094.2	7.2
Trenton.....	20,996.8	7.5
Wayne.....	22,903.5	8.2
West Bend.....	10,470.7	3.8
<b>Total</b>	<b>278,757.4</b>	<b>100.0</b>

<sup>a</sup>The City of Hartford also includes 338.1 acres located in Dodge County. The total area of the City is 5,191.5 acres.

<sup>b</sup>A small portion of the City of Milwaukee is located in Washington County. For hazard mitigation purposes, it is covered under the City’s all hazard mitigation plan.

<sup>c</sup>The Village of Newburg also includes 52.7 acres located in Ozaukee County. The total area of the Village is 574.2 acres.

Source: U.S. Bureau of the Census and SEWRPC.



It should be noted that of the employed Washington County residents—about 31,450 of the 63,900 workers in 2010, or about 50 percent—worked in Wisconsin outside of the County. By contrast a small number of employed residents—about 455 workers, or less than 1 percent of a labor force of 75,948, worked outside of the State.<sup>3</sup>

### Property Value

The value of the real estate and personal property in a municipality reflects the upper end of the potential for property damages in each municipality. The equalized value as of 2015 of the real estate and personal property in Washington County and each of the general-purpose units of government in the County is shown in Table 6.

### LAND USE

Land use is an important determinant of the potential impact a particular hazard may have, and of actions which may be taken to mitigate the impacts of the hazard. Accordingly, an understanding of the amount, type, and spatial distribution of urban and rural land uses within the County is an important consideration in the development of a sound hazard mitigation plan. This section presents a description of the land uses in the County.

### Existing Land Use

Land use in Washington County in 2010 is set forth on Map 2 and in Table 7. Urban land uses occupied about 56,410 acres or 20 percent of the County in 2010. Intensive urban development, including most commercial, industrial, and multi-family residential development, is concentrated within or near the Cities of Hartford and West Bend and the Villages of Germantown, Jackson, and Slinger. Much of the single-family residential development also occurred within or surrounding the County’s urban centers, while scattered low density development occurred outside these communities amid predominantly rural areas. Residential development was the largest component of urban land use, encompassing about 30,093 acres, or about 53 percent of urban land uses and about 11 percent of the total area of the County. Most of this consisted of single-family residential development which encompassed about 28,286 acres, or 50 percent of the urban land uses and 10 percent of the total area of the County.

Land uses categorized as transportation, communication, and utilities constituted the second largest urban land use category in 2010, encompassing about 16,815 acres, or 30 percent of the area of all urban land and 6 percent of the total area of the County.

Nonurban land uses occupied about 222,347 acres or 80 percent of the County in 2010. Agricultural land use was the largest component of nonurban land use, encompassing about 129,936 acres, or 58 percent of the area of all nonurban land and about 47 percent of the total area of the County. Cropland is a major component of this. In 2012

**Table 3**  
**RESIDENT POPULATION**  
**LEVELS IN WASHINGTON COUNTY: 1900-2035**

Year	Population	Change from Preceding Year Listed	
		Absolute	Percent
1850	19,485		
1860	23,622	4,137	21.2
1870	23,919	297	1.2
1880	23,442	-477	-2.0
1890	22,751	-691	-3.0
1900	23,589	839	3.7
1910	23,784	195	0.8
1920	25,713	1,929	8.1
1930	26,551	838	3.3
1940	28,430	1,879	7.1
1950	33,902	5,472	19.2
1960	46,119	12,217	36.0
1970	63,839	17,720	38.4
1980	84,848	21,009	32.9
1990	95,328	10,480	12.4
2000	117,496	22,168	23.3
2010	131,887	14,391	12.2
2035 <sup>a</sup>	164,500	33,387	25.3

<sup>a</sup>Intermediate growth projection from SEWRPC Technical Report No. 11, The Population of Southeastern Wisconsin (5th Edition), April 2013.

Source: U.S. Bureau of the Census and SEWRPC.

<sup>3</sup> Based on U.S. Census Bureau 2010 American Community Survey estimates.

it accounted for about 107,278 acres of land in the County.<sup>4</sup> Other major nonurban land uses present in the County include wetlands, woodlands, open lands, and surface water.

Major arterial highways serving the County include U.S. Highway (USH) 45, Wisconsin State Trunk Highways (STH) 83, 144, and 164, which traverse all or portions of the County in a north-south direction; Interstate Highway (IH) 41, STH 145, and STH 175, which traverse all or portions of the County in a northwest-southeast direction; and STH 28, 33, 60, and 167, which traverse all or portions of the County in a generally east-west direction. Other uses in the transportation, communications, and utilities category within the County include three railway freight service lines and two airports which serve the public. The County's transportation system is discussed in more detail later in this Chapter.

Mobile homes can be particularly vulnerable to some hazards such as high winds or flooding. Map 3 shows the locations of mobile home parks and individual mobile homes in Washington County. In 2010 there were 706 mobile homes located in the County, most located in six mobile home parks. In addition, there were 21 sites in the County that contained isolated individual mobile homes or small groups of mobile homes. Mobile home parks and isolated individual mobile homes are listed in Table 8.

### Planned Land Use

The planned urban areas delineated in the adopted year 2035 regional land use plan and the County comprehensive plan serve as the basis for the identification of all planned urban areas within the County.<sup>5</sup> Planned year 2035 land use, as indicated in the Washington County comprehensive plan as amended through 2014, is shown on Map 4. Planned urban-density areas depicted on Map 4 include land uses such as medium and high density residential; mixed use development; commercial development, including office and professional services; industrial development; government and institutional land use; and parks and recreational areas. Those urban-density areas are associated with the Cities of Hartford and West Bend; the Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; areas within the Towns of Barton, Hartford, Jackson, Kewaskum, Polk, Trenton, and West Bend adjacent to these Cities and Villages; and the unincorporated settlement of Allenton in the Town of Addison.

<sup>4</sup> U.S. Department of Agriculture National Agricultural Statistics Service, 2012 Census of Agriculture: Wisconsin State and County Data, Volume 1 Geographical Area Series Part 49, May 2014.

<sup>5</sup> SEWRPC Planning Report No. 48, A Regional Land Use Plan for Southeastern Wisconsin: 2035, June 2006; SEWRPC Community Assistance Planning Report No. 299, A Multi-Jurisdictional Comprehensive Plan for Washington County: 2035, April 2010; Washington County Planning and Parks Department and Southeastern Wisconsin Regional Planning Commission, Amendment No. 1 (2013-1) to A Multi-jurisdictional Comprehensive Plan for Washington County: 2035, December 10, 2013; Washington County Planning and Parks Department, A Farmland Preservation Plan for Washington County: Amendment No 2—Appendix T of A Multi-jurisdictional Comprehensive Plan for Washington County: 2035, December 10, 2013; Washington County Planning and Parks Department and Southeastern Wisconsin Regional Planning Commission, Amendment 2014-1 to A Multi-jurisdictional Comprehensive Plan for Washington County: 2035, April 14, 2014.

**Table 4**

**NUMBER OF HOUSEHOLDS IN WASHINGTON COUNTY: 1950-2035**

Year	Number of Households	Change from Preceding Census	
		Number	Percent
1950	9,396	--	--
1960	12,532	3,136	33.4
1970	17,385	4,853	38.7
1980	26,716	9,331	53.7
1990	32,977	6,261	23.4
2000	43,843	10,866	33.0
2010	51,605	7,762	17.7
2035 <sup>a</sup>	66,300	14,695	28.5

<sup>a</sup>Intermediate growth projection from SEWRPC Technical Report No. 11, The Population of Southeastern Wisconsin (5th Edition), April 2013.

Source: U.S. Bureau of the Census and SEWRPC.

Map 4 shows generalized planned urban land uses within the incorporated municipalities of the County. In order to detail planned 2035 land use for these communities, the land use plan maps adopted by local governments that provide sanitary sewer service, or plan to provide such service by 2035, were compiled. Planned land uses are shown on Map 5 for areas within adopted sanitary sewer service areas and additional areas proposed to be provided with sewer service in local comprehensive plans. The maps include planned land uses from city and village comprehensive plans for their extraterritorial areas, because cities and villages typically require land to be annexed before extending sanitary sewers to serve urban development. The land use categories included in local plans were converted to a uniform legend for mapping and analysis purposes. Table B-1 in Appendix B shows the relationship between the uniform categories used on the countywide maps and the corresponding categories used on the land use plan maps in local comprehensive plans.

**Table 5**  
**NUMBER OF JOBS IN WASHINGTON COUNTY: CENSUS YEARS 1950-2010**

Year	Number of Jobs	Change from Previous Time Period	
		Number	Percent
1950	10,200	--	--
1960	15,200	5,000	49.0
1970	24,300	9,100	59.9
1980	35,100	10,800	44.4
1990	45,800	10,700	30.5
2000	60,300	14,500	31.7
2010	63,900	3,600	6.0

Source: U.S. Bureau of Economic Analysis and SEWRPC.

## ENVIRONMENTAL CORRIDORS

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) has identified and delineated those areas of Washington County having concentrations of natural, recreational, historic, aesthetic, and scenic resources that should be preserved and protected in order to maintain the overall quality of the environment. Such areas normally include one or more of the following seven elements of the natural resource base which are essential to the maintenance of both the ecological balance and the natural beauty of the Region: 1) lakes, rivers, and streams and the associated underdeveloped shorelands and floodplains; 2) wetlands; 3) woodlands; 4) prairies; 5) wildlife habitat areas; 6) wet, poorly drained, and organic soils, and 7) rugged terrain and high-relief topography. The foregoing seven elements constitute integral parts of the natural resource base. There are five additional elements that are important considerations in identifying and delineating areas with scenic, recreational, and educational value. These additional elements are: 1) existing outdoor recreation sites; 2) potential outdoor recreation and related open space sites; 3) historic, archaeological, and other cultural sites; 4) significant scenic areas, and 5) natural and scientific areas.

In Southeastern Wisconsin, the delineation of these 12 natural resource and natural resource-related elements on maps result in an essentially linear pattern of relatively narrow, elongated areas which have been termed “environmental corridors” by SEWRPC. Primary environmental corridors include a wide variety of the aforementioned important resource and resource-related elements and are, by definition, at least 400 acres in size, two miles in length, and 200 feet in width. In Washington County in 2010 there were 62,782 acres of primary environmental corridors, or about 23 percent of the land area in the County. These generally lie along rivers and streams and adjacent to lakes, or are associated with woodlands, wetlands, or park and open space sites. In addition, smaller concentrations of natural resource features that have been separated physically from the environmental corridors by intensive urban or agricultural land uses have also been identified. These areas which are at least five acres in size are referred to as “isolated natural resource areas.” In Washington County there are 7,380 acres of isolated natural resource areas, or about 3 percent of the land area of the County. The Washington County primary environmental corridors and isolated natural resource areas are shown on Map 6.

Table 6

## EQUALIZED VALUE OF PROPERTY IN WASHINGTON COUNTY BY MUNICIPALITY: 2015

Municipality	Land	Improvements	Non-manufacturing Personal Property	Manufacturing Personal Property	Total
<b>Cities</b>					
Hartford <sup>a</sup> .....	\$ 252,377,700	\$ 788,389,600	\$ 19,777,400	\$ 7,572,300	\$ 1,068,117,000
Milwaukee .....	237,900	971,300	\$ 0	0	1,209,200
West Bend.....	518,787,800	1,846,141,400	49,320,900	3,829,900	2,418,080,000
Subtotal	\$ 771,403,400	\$2,635,502,300	\$ 69,098,300	\$11,402,200	\$ 3,487,406,000
<b>Villages</b>					
Germantown.....	\$ 645,711,900	\$1,705,709,400	\$ 32,989,100	\$21,503,000	\$ 2,405,913,400
Jackson .....	136,731,200	435,939,500	6,333,700	3,077,600	582,082,000
Kewaskum.....	67,894,000	212,181,700	3,354,400	449,800	283,879,900
Newburg <sup>b</sup> .....	15,531,100	51,737,400	485,200	17,100	67,770,800
Richfield.....	514,049,700	983,894,600	13,139,100	1,121,400	1,512,204,800
Slinger .....	125,504,800	332,664,700	7,882,800	434,900	466,487,200
Subtotal	\$1,505,422,700	\$3,722,127,300	\$ 64,184,300	\$26,603,800	\$ 5,318,338,100
<b>Towns</b>					
Addison .....	\$ 85,534,100	\$ 227,154,700	\$ 4,252,300	\$ 1,437,800	\$ 318,378,900
Barton.....	79,815,900	198,817,700	2,740,200	2,048,900	283,422,700
Erin.....	231,149,900	320,074,500	2,544,200	0	553,768,600
Farmington .....	110,453,000	253,323,200	1,552,800	20,100	365,349,100
Germantown.....	6,820,400	15,972,500	455,500	0	23,248,400
Hartford .....	131,194,100	229,719,300	903,900	331,100	362,148,400
Jackson .....	129,866,400	341,140,700	2,313,500	1,048,400	474,369,000
Kewaskum.....	39,596,300	81,034,000	3,040,300	0	123,670,600
Polk .....	223,316,500	354,384,900	4,771,800	1,735,900	584,209,100
Trenton.....	143,888,000	310,849,500	2,225,700	18,600	456,981,800
Wayne .....	47,912,900	147,814,600	854,900	207,100	196,789,500
West Bend.....	375,686,400	440,546,900	3,049,600	60,700	819,343,600
Subtotal	\$1,605,233,900	\$2,920,832,500	\$ 28,708,700	6,908,600	\$ 4,561,679,700
Washington County <sup>c</sup>	\$3,882,060,000	\$9,278,462,100	\$161,987,300	\$44,914,600	\$13,367,424,000

<sup>a</sup>This does not include the value of property in the portion of the City of Hartford that is located in Dodge County. The 2015 equalized values of property in the portion of the City of Hartford located in Dodge County was \$54,559,800. This consisted of \$4,354,800 of land, \$46,677,500 of improvements, \$198,800 in non-manufacturing personal property, and \$3,328,700 in manufacturing personal property.

<sup>b</sup>This does not include the value of property in the portion of the Village of Newburg that is located in Ozaukee County. The 2015 equalized values of property in the portion of the Village of Newburg that is located in Ozaukee County was \$5,665,300. This consisted of \$1,402,900 of land, \$4,185,900 of improvements, \$74,900 in non-manufacturing personal property, and \$1,600 in manufacturing personal property.

<sup>c</sup>This does not include the value of property in the portion of the City of Hartford that is located in Dodge County or the portion of the Village of Newburg that is located in Ozaukee County.

Source: Wisconsin Department of Revenue and SEWRPC.

## Map 2

### EXISTING LAND USES IN WASHINGTON COUNTY: 2010

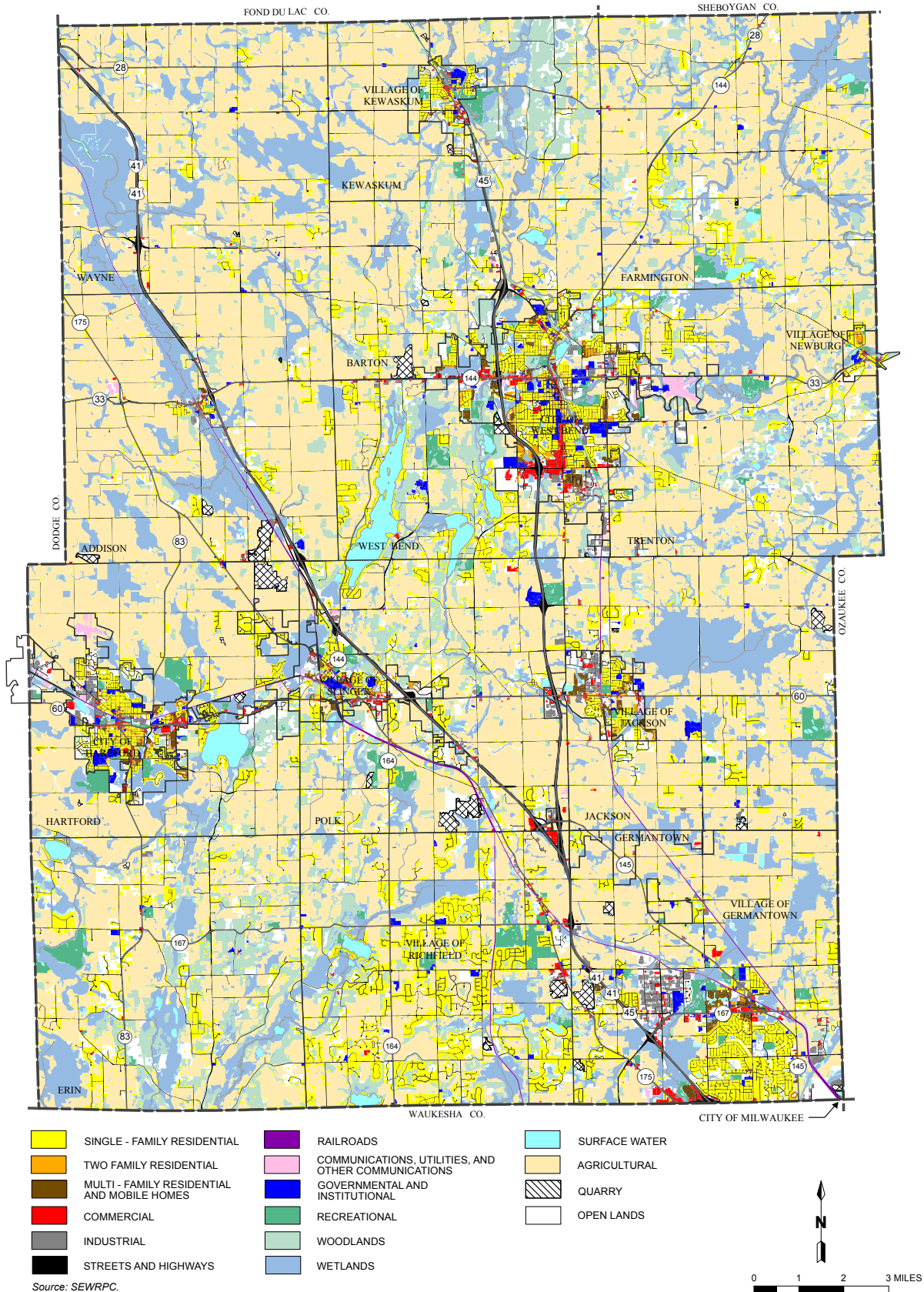


Table 7

LAND USE IN WASHINGTON COUNTY: 2010

Land Use Category	Acres	Percent of Subtotal	Percent of County
Urban			
Residential.....	30,092.7	53.4	10.8
Commercial .....	1,748.6	3.1	0.6
Industrial .....	1,863.6	3.3	0.7
Transportation, Communications, and Utilities <sup>a</sup> .....	16,814.6	29.8	6.0
Governmental and Institutional .....	1,757.0	3.1	0.6
Recreational .....	4,134.0	7.3	1.5
Subtotal	56,410.4	100.0	20.2
Nonurban			
Agricultural.....	129,935.9	58.4	46.6
Woodlands.....	24,053.1	10.8	8.6
Wetlands.....	46,527.8	20.9	16.7
Surface Water.....	5,142.9	2.3	1.9
Extractive.....	1,451.5	0.7	0.5
Landfills .....	0.0	0.0	0.0
Open Lands <sup>b</sup> .....	15,235.7	6.9	5.5
Subtotal	222,346.9	100.0	79.8
Total	278,757.4	100.0	100.0

<sup>a</sup>Includes parking areas of greater than 10 spaces.

<sup>b</sup>Open lands include lands in rural uses that are not being farmed; land under development, except for single-family residential uses; and other lands that have not been developed including residential lands or outlots attendant to existing urban development that are not expected to be developed.

Source: SEWRPC.

## SURFACE WATER RESOURCES AND FLOOD HAZARD AREAS

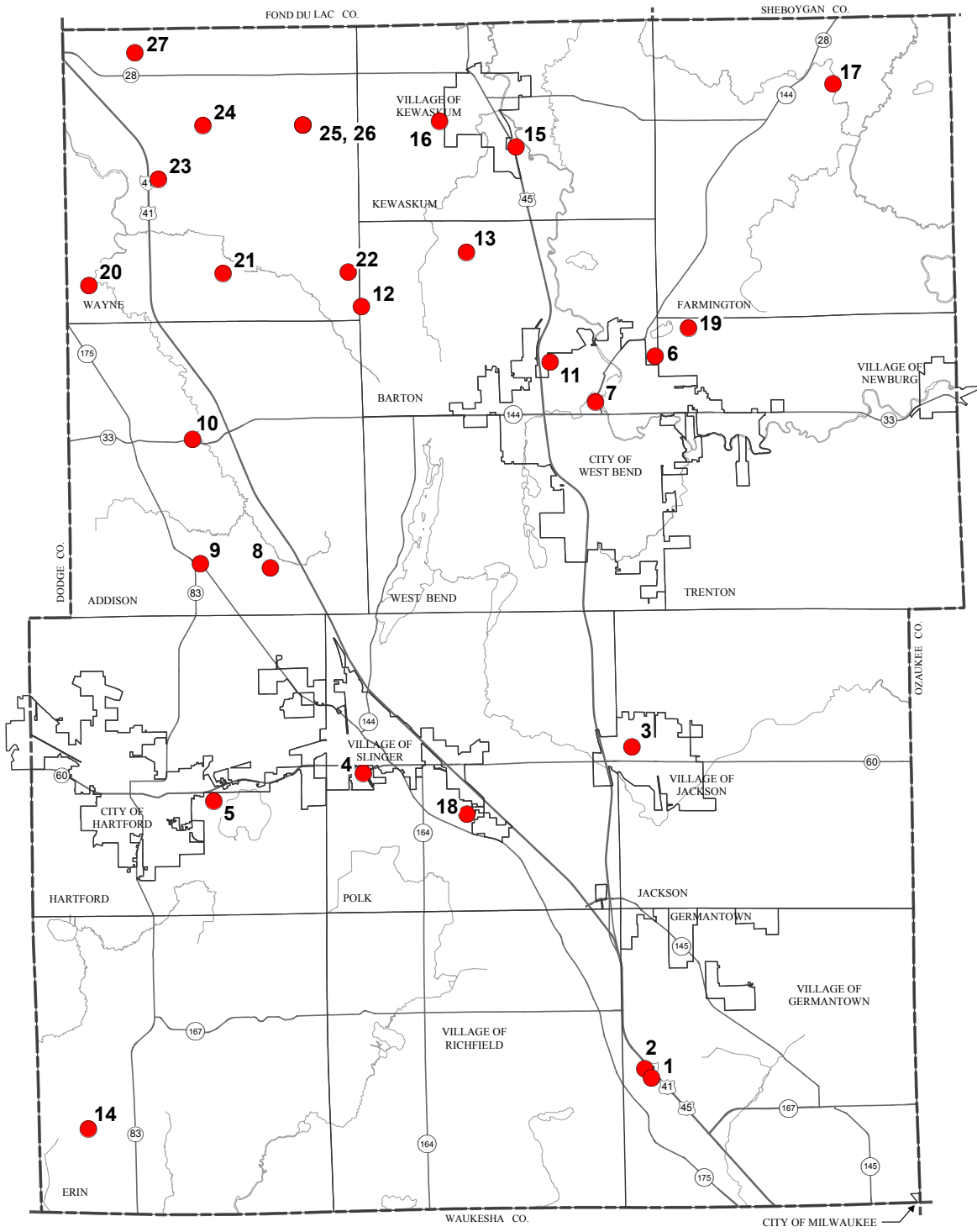
Surface water resources, consisting of streams and lakes, form a particularly important element of the natural resource base. Surface water resources provide recreational opportunities, influence the physical development of the County, and enhance its aesthetic quality. Watershed boundaries, wetlands, floodplains, and major streams and lakes within the County are shown on Map 7.

The subcontinental divide that separates the Mississippi River and the Great Lakes-St. Lawrence drainage basins crosses Washington County from the Town of Wayne on the north to the Village of Richfield on the south as shown on Map 7. About 164,684 acres, or 59 percent of the County, are located east of the divide and drain to the Great Lakes-St. Lawrence system; the remaining 114,072 acres, or 41 percent of the County, drain west to the Mississippi River. The Great Lakes-St. Lawrence drainage basin includes the Milwaukee River watershed, which encompasses about 52 percent of the County, and the Menomonee River watershed, which encompasses about 7 percent of the County. The Mississippi River drainage basin includes the Rock River watershed, which encompasses about 41 percent of the County, and the Fox River watershed, which encompasses less than one-tenth of 1 percent of the County. The Washington County portion of the Fox River watershed is located in the southeastern portion of the Village of Richfield.

Major streams are defined as those which maintain, at a minimum, a small continuous flow throughout the year except under unusual drought conditions. There are approximately 220 miles of such streams in Washington County,

Map 3

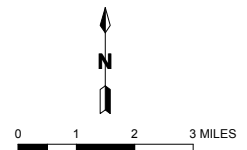
MOBILE HOMES AND MOBILE HOME PARKS IN WASHINGTON COUNTY: 2010



● SITES OF MOBILE HOMES AND MOBILE HOME PARKS

15 REFERENCE NUMBER  
(SEE TABLE II-7)

Source: SEWRPC.



**Table 8**

**MOBILE HOME PARKS AND MOBILE HOMES IN WASHINGTON COUNTY: 2015**

Number on Map 3	Mobile Home Park Name	Size (acres)	Number of Sites	Number of Mobile Homes	Location
Mobile Home Parks					
1	Hilltop Highlands	27.4	171	85	Village of Germantown
2	Maple Terrace Mobile Home Community	9.1	80	80	Village of Germantown
3	Green Valley Mobile Home Park	79.1	377	372	Village of Jackson
4	Wheel Estates	15.1	99	90	Village of Slinger
5	Voight's Lakeside Estates	4.0	32	30	Town of Hartford
6	Country Manor Estates	6.5	42	23	Town of Trenton
Single Family or Small Groupings					
7	--	0.6	--	4	City of West Bend
8	--	1.6	--	3	Town of Addison
9	--	0.6	--	1	Town of Addison
10	--	0.7	--	1	Town of Addison
11	--	0.9	--	1	Town of Barton
12	--	0.9	--	1	Town of Barton
13	--	0.4	--	1	Town of Barton
14	--	0.2	--	1	Town of Erin
15	--	0.4	--	1	Town of Kewaskum
16	--	0.4	--	1	Town of Kewaskum
17	--	0.9	--	1	Town of Kewaskum
18	--	0.8	--	1	Town of Polk
19	--	0.5	--	1	Town of Trenton
20	--	0.6	--	1	Town of Wayne
21	--	0.5	--	1	Town of Wayne
22	--	1.1	--	1	Town of Wayne
23	--	0.6	--	1	Town of Wayne
24	--	1.0	--	1	Town of Wayne
25	--	0.9	--	1	Town of Wayne
26	--	0.9	--	1	Town of Wayne
27	--	0.7	--	1	Town of Wayne

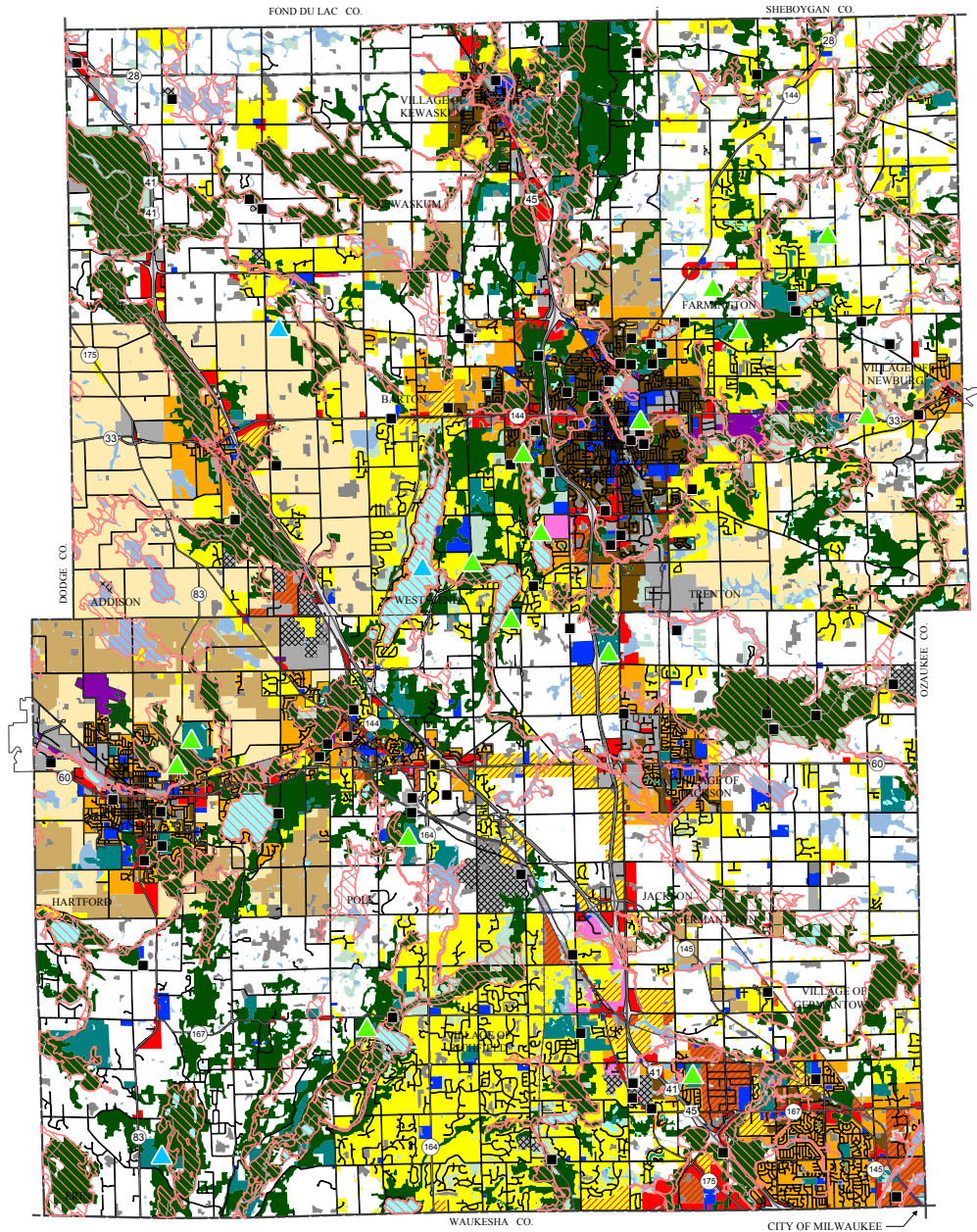
Source: Wisconsin Department of Safety and Professional Services and SEWRPC.

located within four watersheds. The major stream in the Menomonee River watershed, which is located in the southeast portion of the County, is the Menomonee River. Major streams in the Milwaukee River watershed, which generally includes the area in the eastern half of the County, include the Milwaukee River, the East Branch of the Milwaukee River, the North Branch of the Milwaukee River, Kewaskum Creek, Cedar Creek, Little Cedar Creek, the North Branch of Cedar Creek, Evergreen Creek, Quass Creek, Silver Creek, Stony Creek, and Wallace Creek.



# Map 4

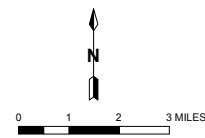
## WASHINGTON COUNTY LAND USE PLAN: 2035



- |                                    |  |
|------------------------------------|--|
| FARMLAND PRESERVATION              | GOVERNMENTAL AND INSTITUTIONAL   |
| GENERAL AGRICULTURAL               | PARK AND RECREATION  |
| AGRICULTURAL AND RURAL RESIDENTIAL | TRANSPORTATION AND UTILITIES (EXCEPT FOR STREETS AND HIGHWAYS)                       |
| SUBURBAN DENSITY RESIDENTIAL       | EXTRACTIVE   |
| MEDIUM DENSITY URBAN RESIDENTIAL   | FORMER LANDFILL IDENTIFIED ON LOCAL GOVERNMENT LAND USE PLAN MAP                     |
| HIGH DENSITY URBAN RESIDENTIAL     | PRIMARY ENVIRONMENTAL CORRIDOR   |
| MIXED USE                          | ISOLATED NATURAL RESOURCE AREA   |
| GENERAL COMMERCIAL                 | WETLANDS OUTSIDE PRIMARY ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL RESOURCE AREAS |
| OFFICE / PROFESSIONAL SERVICES     | OTHER CONSERVANCY LANDS TO BE PRESERVED BY LOCAL GOVERNMENT                          |
| BUSINESS / INDUSTRIAL              | SURFACE WATER  |
| INDUSTRIAL                         |  |

- 100 - YEAR FLOODPLAIN (FROM MAP MODERNIZATION PROGRAM COMPLETED IN 2013)
- FORMER LANDFILL IDENTIFIED IN WISCONSIN DEPARTMENT OF NATURAL RESOURCES REGISTRY
- EXISTING COUNTY PARK AND OUTDOOR RECREATION SITES
- PROPOSED COUNTY PARK
- STREET AND HIGHWAY RIGHT-OF-WAY

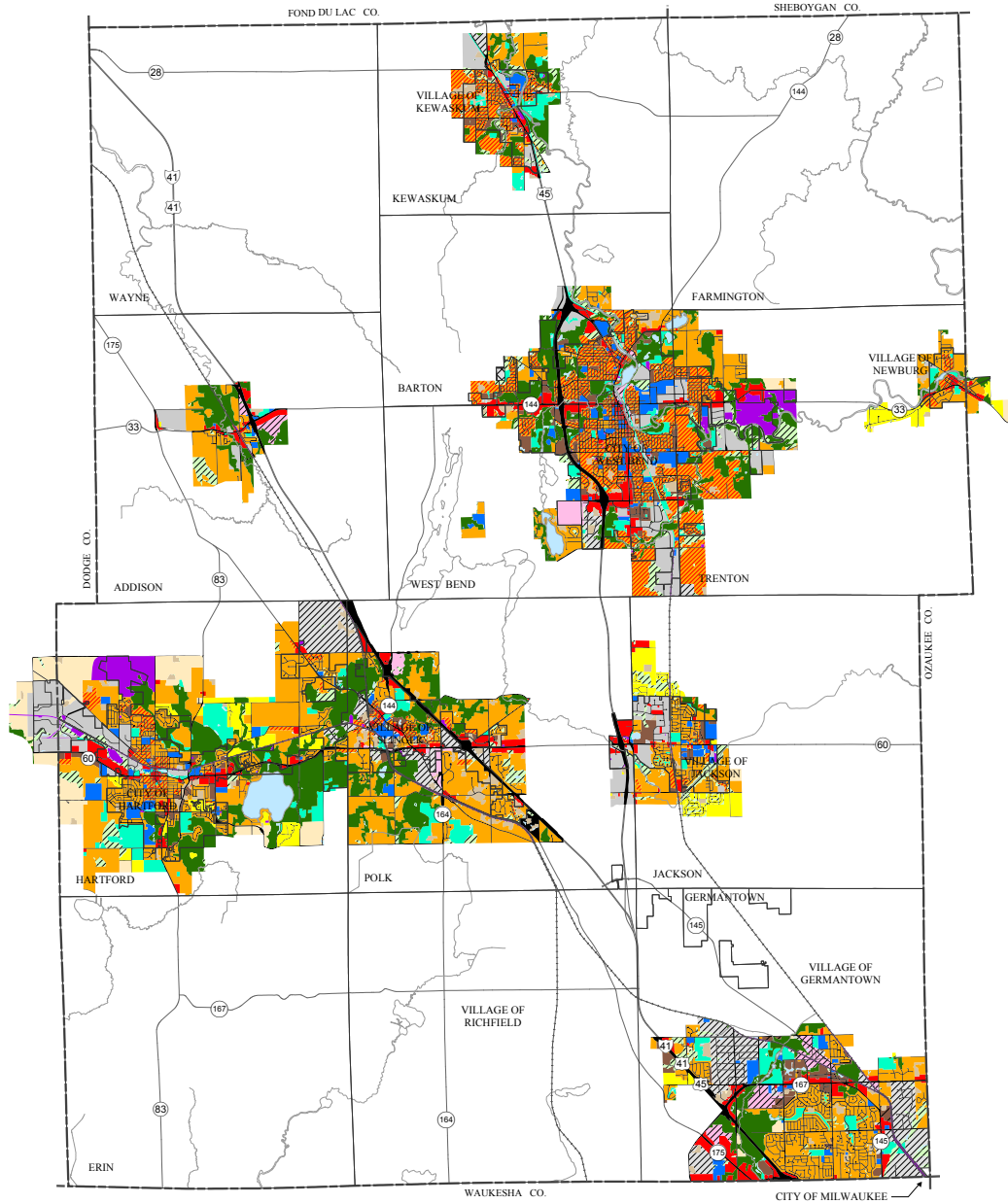
NOTE: THE WASHINGTON COUNTY FARMLAND PRESERVATION PLAN FURTHER REFINES AND DETAILS THE PLANNED LAND USES ON THIS MAP AND DELINEATES SPECIFIC AREAS, AS SHOWN ON MAP 1.26 OF THE COUNTY FARMLAND PRESERVATION PLAN, THAT MEET THE CRITERIA ESTABLISHED BY THE COUNTY FOR FARMLAND PRESERVATION AREAS AND HAVE BEEN CERTIFIED BY THE WISCONSIN DEPARTMENT OF AGRICULTURE, TRADE AND CONSUMER PROTECTION AS ELIGIBLE TO PARTICIPATE IN THE WISCONSIN FARMLAND PRESERVATION PROGRAM. MAP 1.25 IN THE WASHINGTON COUNTY FARMLAND PRESERVATION PLAN SHOWS WHOLE PARCELS AND WILL HAVE "CONTROL" IN THE IDENTIFICATION OF FARMLAND PRESERVATION AREAS FOR WASHINGTON COUNTY.



Source: Local Governments, Washington County, and SEWRPC.

# Map 5

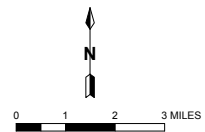
## LAND USE PLAN MAPS ADOPTED AS PART OF COMPREHENSIVE PLANS BY SEWERED COMMUNITIES IN WASHINGTON COUNTY: 2035



- |  |   |  |  |
|--|---|--|--|
|  | AGRICULTURAL AND RURAL RESIDENTIAL      |  | GOVERNMENTAL AND INSTITUTIONAL   |
|  | SUBURBAN DENSITY RESIDENTIAL            |  | PARK AND RECREATIONAL  |
|  | MEDIUM DENSITY URBAN RESIDENTIAL        |  | STREETS AND HIGHWAYS   |
|  | MEDIUM - HIGH DENSITY URBAN RESIDENTIAL |  | TRANSPORTATION AND UTILITIES (EXCEPT FOR STREETS AND HIGHWAYS)   |
|  | HIGH - DENSITY URBAN RESIDENTIAL        |  | FORMER LANDFILL IDENTIFIED ON LOCAL GOVERNMENT LAND USE PLAN MAP   |
|  | HOUSING FOR THE ELDERLY                 |  | PRIMARY ENVIRONMENTAL CORRIDOR   |
|  | MIXED USE                               |  | ISOLATED NATURAL RESOURCE AREA   |
|  | GENERAL COMMERCIAL                      |  | OTHER OPEN LAND TO BE PRESERVED (INCLUDES WETLANDS OUTSIDE OF PRIMARY ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL RESOURCE AREAS) |
|  | OFFICE / PROFESSIONAL SERVICES          |  | SURFACE WATER  |
|  | BUSINESS / INDUSTRIAL                   |  |  |
|  | INDUSTRIAL                              |  |  |

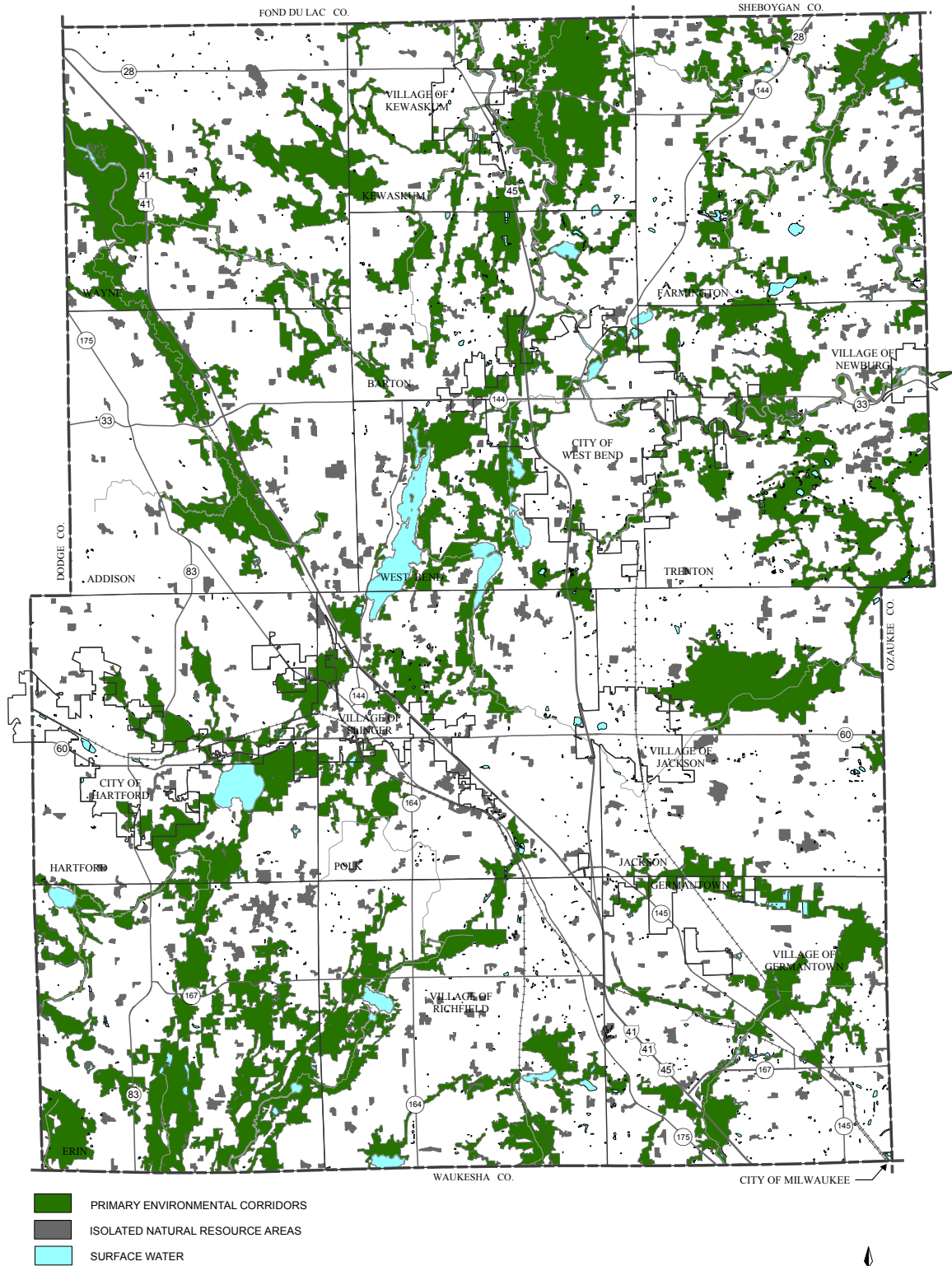
NOTE: PLANNED LAND USE CATEGORIES FROM CITY, VILLAGE, AND TOWN PLANS HAVE BEEN STANDARDIZED FOR MAPPING PURPOSES (SEE TABLE B-1 IN APPENDIX D). MAP INCLUDES AREAS WITHIN PLANNED SEWER SERVICE AREAS AND ADDITIONAL AREAS PROPOSED TO BE SERVED BY SANITARY SEWERS IN LOCAL COMPREHENSIVE PLANS.

Source: Washington County, Local Governments, and SEWRPC.

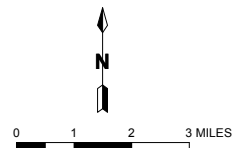


Map 6

PRIMARY ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL RESOURCE AREAS IN WASHINGTON COUNTY: 2010

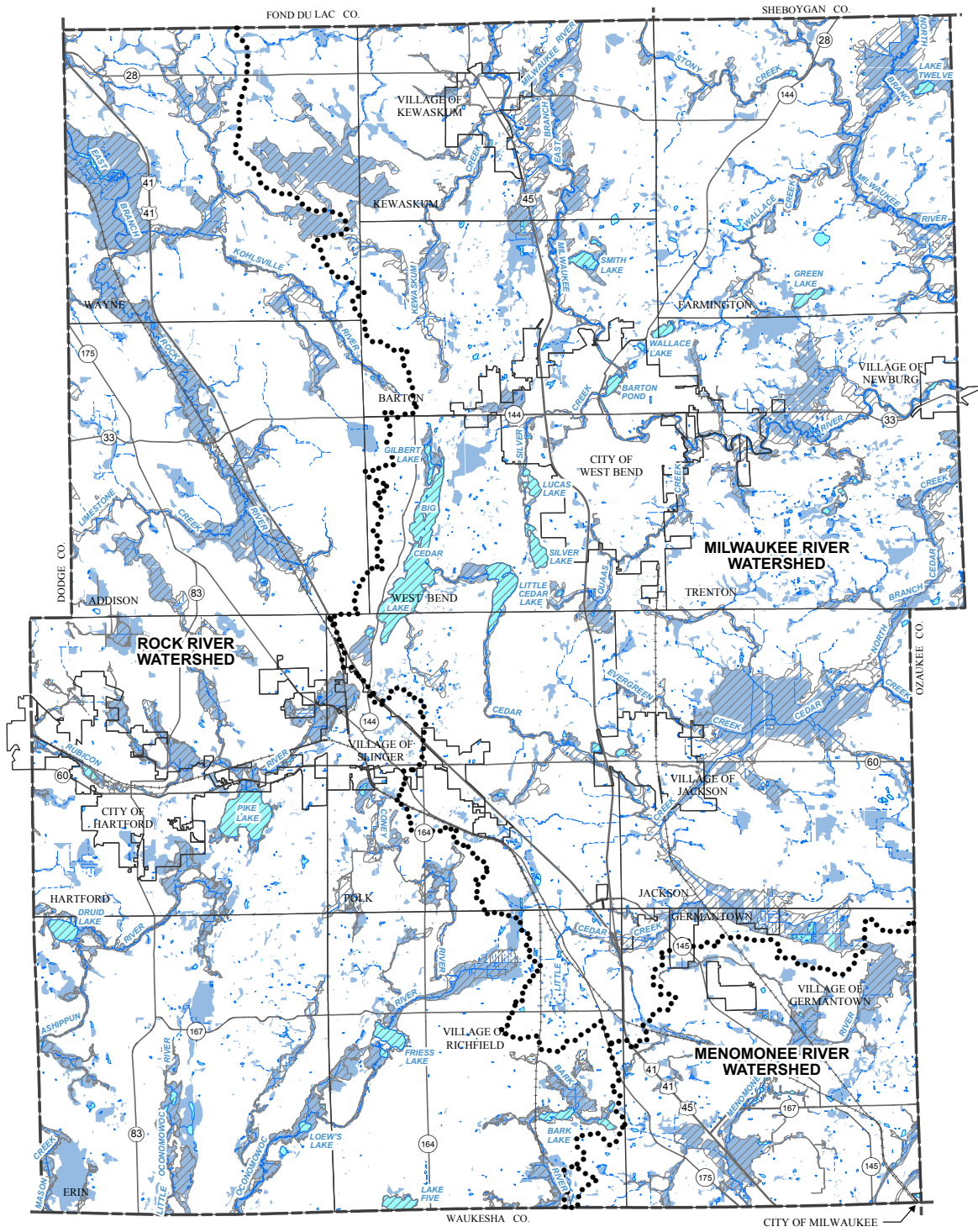


Source: SEWRPC.



Map 7

**SURFACE WATERS, WETLANDS, AND FLOODPLAINS IN WASHINGTON COUNTY**



- SURFACE WATER: 2010
- PERENNIAL STREAM
- INTERMITTENT STREAM
- WETLANDS: 2010
- 1 - PERCENT ANNUAL PROBABILITY FLOODPLAINS: 2015
- MAJOR WATERSHED BOUNDARY

Source: Federal Emergency Management Agency and SEWRPC.

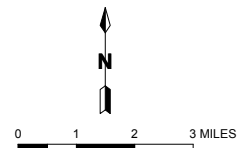


Table 9

LAKE MANAGEMENT DISTRICTS IN WASHINGTON COUNTY: 2015

Name	Lakes	Municipalities
Big Cedar Lake Protection and Rehabilitation District	Big Cedar Lake Gilbert Lake	Town of West Bend, Town of Polk
Druid Lake District	Druid Lake	Town of Erin
Little Cedar Lake Preservation and Rehabilitation District	Little Cedar Lake	Town of West Bend, Town of Polk
Pike Lake Protection District	Pike Lake	City of Hartford, Town of Hartford
Silver Lake Protection and Rehabilitation District	Silver Lake	Town of West Bend

Source: University of Wisconsin-Extension, and SEWRPC.

Major streams in the Rock River watershed, which generally includes the area in the western half of the County, are the East Branch of the Rock River, the Ashippun River, the Coney River, the Kohlsville River, Limestone Creek, Mason Creek, the Oconomowoc River, the Little Oconomowoc River, the Bark River, and the Rubicon River. There are no major streams in the portion of the Fox River watershed that is located in Washington County.

There are 14 major lakes—that is, lakes of 50 acres or more—in Washington County. The major lakes include Bark Lake, Barton Pond, Big Cedar Lake, Druid Lake, Friess Lake, Green Lake, Lake Five, Lake Twelve, Little Cedar Lake, Lucas Lake, Pike Lake, Silver Lake, Smith Lake, and Wallace Lake. In addition, there are at least 39 lakes and ponds smaller than 50 acres located wholly or partially within the County.<sup>6</sup> There are five lake management districts in the County which have responsibilities related to the protection, rehabilitation, and management of six lakes. These special-purpose units of government are listed in Table 9.

Floodplains are the wide, gently sloping areas contiguous to, and usually lying on both sides of, a stream channel. For planning and regulatory purposes, floodplains are normally defined as the areas, excluding the stream channel, subject to inundation by the one-percent-annual-probability (100-year recurrence interval) flood event. There is a 1 percent chance of this event being reached or exceeded in any given year. Floodplain areas are generally not well suited to urban development, not only because of the flood hazard, but also because of the presence of high water tables and, generally, of soils poorly suited to urban uses. Floodplain areas often contain important natural resources, such as high-value woodlands, wetlands, and wildlife habitat and, therefore, constitute prime locations for parks and open space areas.

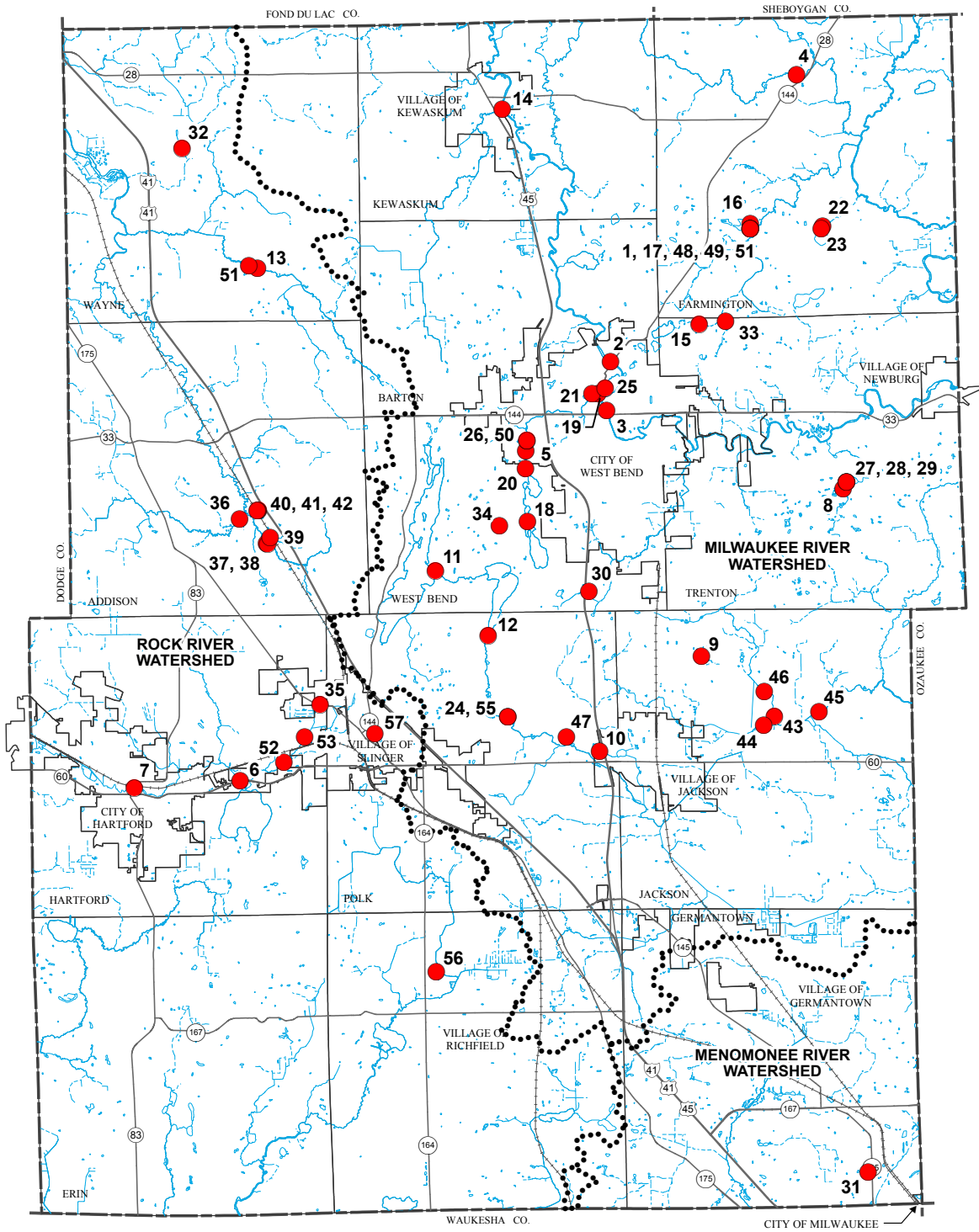
Floodplains identified by Washington County, SEWRPC, and the Federal Emergency Management Agency are shown on Map 7. Approximately 45,741 acres, or 16 percent of the total area of the County, are located within the one-percent-annual-probability flood hazard area. A consideration in flood hazard mitigation is the potential for increased flooding due to dam failures. Since there are several major and minor dams in Washington County, future evaluation of floodplain areas related to dam failure should be considered. Dams in the County that have been identified by the Wisconsin Department of Natural Resources (WDNR) are shown on Map 8 and described in Table 10. As indicated in the table, of the 57 dams identified, one, Barton dam, has been assigned a high hazard rating by the WDNR, indicating the potential for loss of human life as well as economic loss, environmental damage, or

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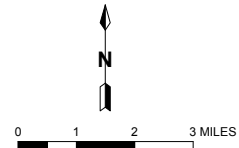
<sup>6</sup> SEWRPC Memorandum Report No. 139, Surface Water Resources of Washington County, Wisconsin Lake and Stream Classification Project: 2000, September 2001; Wisconsin Department of Natural Resources, Wisconsin Lakes, PUB-FH-800, 2005.

# Map 8

## DAMS LOCATED WITHIN WASHINGTON COUNTY: 2015



- DAM LOCATION
- 5 REFERENCE NUMBER  
(SEE TABLE II-8A)



Source: Wisconsin Department of Natural Resources, Washington County, and SEWRPC.

Table 10

WISCONSIN DEPARTMENT OF NATURAL RESOURCES DAM INVENTORY INFORMATION: 2015

Number on Map 8	WDNR Dam Sequence Number	Dam Name		Owner	Waterbody	WDNR Field File Number	Size	Hydraulic Height (feet)	Structural Height (feet)	Impoundment Surface Area (acres)	Maximum Impoundment Storage (acre-feet)	Hazard Potential
		Official	Local									
1	90	Ehne	--	Neil Dinesen	Wallace Creek	66.20	Large	16.0	20.0	18.0	150.0	Low
2	216	Barton	--	City of West Bend	Milwaukee River	66.01	Large	10.0	14.0	18.0	170.0	High
3	318	West Bend	--	City of West Bend	Barton Pond/Milwaukee River	66.13	Large	7.0	13.0	67.0	460.0	Low
4	319	Boltonville	--	Boltonville Sportsmen Club	Boltonville Millpond/Stony Creek	66.16	Large	8.0	12.0	9.0	50.0	Low
5	320	Lucas Lake	--	Milwaukee Area Girl Scouts-Camp Silverbrook	Lucas Lake/Silver Creek	66.18	Large	5.0	8.0	78.0	630.0	Low
6	615	Pike Lake	--	Hartford Pike Lake Association	Rubicon River	66.15	Large	2.0	12.0	522.0	5,740.0	Low
7	974	Hartford	City of Hartford	City of Hartford	Hartford Millpond/Rubicon River	66.03	Large	13.0	13.7	11.0	50.0	Low
8	1541	Tillman and Stern	Clyde Wirth SCS	Clyde Wirth	Myra Creek	66.00	Small	11.0	18.0	--	42.0	Low
9	1542	Ratzsch	K. A. Raatsch SCS	Karl Ratzsch	Unnamed tributary to Evergreen Creek	66.00	Small	--	--	--	--	Low
10	1543	Mayfield	Ivan Knoll	Ivan H. Knoll	Tilly Lake	66.05	Small	10.0	14.0	8.0	30.0	Significant
11	1544	Big Cedar Lake	Cedar Creek Hydraulic Company	Cedar Creek Hydraulic Company	Big Cedar Lake/Cedar Creek	66.08	Small	1.0	4.0	932.0	3,000.0	Low
12	1545	Little Cedar Lake	Washington County Fish and Game Association	Little Cedar Lake Protection Rehabilitation District	Little Cedar Lake/Cedar Creek	66.10	Small	1.8	4.4	246.0	700.0	Low
13	1546	Kohlsville	Town of Wayne	Town of Wayne	Kohlsville	66.11	Small	8.0	15.0	6.0	40.0	Low
14	1547	Kewaskum	Village of Kewaskum	Village of Kewaskum	Millpond/Kohlsville River	66.17	Small	3.0	10.0	5.0	35.0	Significant
15	1548	Wallace Lake	--	--	Wallace Creek	66.19	Small	1.0	3.0	52.0	75.0	Low
16	1549	A. W. Johnson-Pond A	G. J. Kahn	A. W. Johnson	Wallace Creek	66.21	Small	18.0	20.0	3.0	30.0	Low
17	1550	A. W. Johnson-Pond D	G. J. Kahn	A. W. Johnson	Wallace Creek	66.00	Small	--	--	--	--	Low
18	1551	Silver Lake	Silver Lake Protective Association	Silver Lake Protective Association	Silver Creek	66.22	Small	1.0	6.0	118.0	600.0	Low
19	1552	West Bend Carp Pond	City of West Bend	City of West Bend	Silver Creek	66.23	Small	2.0	6.0	--	--	Low
20	1553	Pick Dam	Washington County Park System Dam	Ridge Run Trust	Silver Creek	66.24	Small	5.0	8.0	4.0	20.0	Low
21	1555	City Park	City of West Bend	City of West Bend	Silver Creek	66.26	Small	1.0	3.0	--	--	Low
22	1556	Erler Lake Lower	Leonard Yahr	Leonard Yahr	Erler Creek	66.28	Small	5.0	6.0	--	--	Low
23	1557	Erler Lake Upper	Leonard Yahr	Leonard Yahr	Erler Creek	66.29	Small	4.0	6.0	37.0	140.0	Low
24	1558	Lent	R. Wacker	--	Lent Lake/Cedar Creek	66.29	Small	6.0	10.0	8.0	30.0	Low
25	1559	Swimming Pool	City of West Bend	City of West Bend	Silver Creek	66.30	Small	6.0	7.0	--	--	Low
26	1560	Ridge Run Trust No. 2	Washington County	Washington County	Silver Creek	66.31	Small	12.0	16.0	--	--	Low
27	2292	Oliver H. Baumgartner No. 1	Washington County	Oliver H. Baumgartner	Myra Creek	66.00	Small	2.0	4.0	1.0	1.0	--
28	2293	Oliver H. Baumgartner No. 2	--	Oliver H. Baumgartner	Myra Creek	66.00	Small	3.0	5.0	1.0	3.0	--
29	2294	Oliver H. Baumgartner No. 3	--	Oliver H. Baumgartner	Myra Creek	66.00	Small	1.0	2.0	1.0	1.0	--
30	2295	Andrew Gundrum	--	Andrew Gundrum	Unnamed Tributary to Quaaas Creek	66.00	Small	3.0	4.0	1.0	1.0	--
31	2296	Edward Linder	Hal Barth	Edward Linder	Unnamed Tributary to Menomonee River	66.00	Small	--	--	1.0	--	--
32	2297	Bernard Timmer	P. H. Schultz	--	Unnamed Tributary to Wayne Creek	66.00	Small	6.0	--	2.0	10.0	--
33	2298	Washington County	Washington County	Washington County	Wallace Creek	66.00	Small	7.0	9.0	3.0	15.0	--
34	2835	Bernard C. Ziegler Dam	--	Bernard C. Ziegler	Little Cedar Lake/Cedar Creek	66.00	Small	12.0	16.0	3.0	27.0	--
35	3047	Carl Arkins	--	--	Rubicon River	66.35	Small	1.0	--	--	--	--
36	3095	Unknown	Main Flowage	WDNR	Limestone Creek	66.00	Small	2.5	--	40.0	--	--

Table 10 (continued)

Number on Map 8	WDNR Dam Sequence Number	Dam Name		Owner	Waterbody	WDNR Field File Number	Size	Hydraulic Height (feet)	Structural Height (feet)	Impoundment Surface Area (acres)	Maximum Impoundment Storage (acre-feet)	Hazard Potential
		Official	Local									
37	3096	Allentown Marsh Pool 1	Wisconsin DNR	WDNR	Allenton Creek	66.00	Small	1.5	--	2.0	--	--
38	3097	Allentown Marsh Pool 2	State of Wisconsin	WDNR	Allenton Creek	66.00	Small	1.5	--	2.0	--	--
39	3098	Allentown Marsh Pool 3	State of Wisconsin	WDNR	Unnamed Tributary to Allenton Creek	66.00	Small	2.0	--	2.0	--	--
40	3099	Allentown Marsh Pool 4	State of Wisconsin	WDNR	Unnamed Tributary to East Branch Rock River	66.00	Small	2.0	--	0.5	--	--
41	3100	Allentown Marsh Pool 5	State of Wisconsin	WDNR	Unnamed Tributary to East Branch Rock River	66.00	Small	2.0	--	0.5	--	--
42	3102	Allentown Marsh Pool 6	State of Wisconsin	WDNR	Unnamed Tributary to East Branch Rock River	66.00	Small	2.0	--	1.0	--	--
43	3103	Jackson Marsh Wildlife Area Pool 1	Wisconsin DNR	WDNR	Cedar Creek	66.00	Small	2.0	2.0	8.0	--	--
44	3104	Jackson Marsh Wildlife Area Pool 2	Wisconsin DNR	WDNR	Cedar Creek	66.00	Small	2.0	--	10.0	--	--
45	3105	Jackson Marsh Wildlife Area Pool 3	Wisconsin DNR	WDNR	Cedar Creek	66.00	Small	2.0	--	10.0	--	--
46	3106	Jackson Marsh Wildlife Area Pool 4	Wisconsin DNR	WDNR	Evergreen Creek	66.00	Small	2.0	--	0.5	--	--
47	3210	Nature's Friends	Peter Hembel	--	Schwetzer Pond	66.27	Small	7.0	15.0	8.0	20.0	--
48	3433	Ehne No. 3	Leon C. Fleming	--	Wallace Creek	66.20	Small	2.0	3.0	--	--	--
49	3434	Ehne No. 4	Leon C. Fleming	--	Wallace Creek	66.20	Small	3.0	4.0	--	--	--
50	3480	Ridge Run Trust No. 1	Washington County	Washington County	Silver Creek	66.31	Small	5.0	9.0	8.0	45.0	--
51	3484	Kohlsville Fire Department	Town of Wayne	Town of Wayne	Kohlsville River	66.00	Small	--	16.0	1.0	10.0	--
52	3578	Schaeffer	--	Kent C. Shaffer	Rubicon River	66.36	Small	3.4	5.4	7.0	28.0	Low
53	3579	Schaeffer	--	Kent C. Shaffer	Rubicon River	66.00	--	--	--	--	--	--
54	3591	Ehne Uppermost	Shalom Wildlife Sanctuary	Paul Chechvala	Wallace Creek	66.33	Small	6.8	9.2	6.5	--	Low
55	4442	Cedar Creek Dam	Cedar Creek Dam	D. W. Maxon	Cedar Creek	66.06	--	12.0	--	--	--	--
56	4443	Richfield Dam	Richfield Dam	C. W. Mayer	Coney River	66.09	Small	24.0	25.0	--	--	--
57	5713	Tennies Pond-Main Pond	--	Village of Slinger	Unnamed Stream	66.34	Small	--	5.0	--	67.0	--

NOTE: Dashes indicate that information was not available.

Source: Wisconsin Department of Natural Resources and SEWRPC.



disruption of lifeline facilities during failure or misoperation of the dam. Two dams, Mayfield dam and Kewaskum dam, have been assigned significant hazard ratings, indicating the potential for economic loss, environmental damage, or disruption of lifeline facilities. It should be noted that the hazard potential of 29 of these dams has not been determined.

Floodplain areas for the portions of the Rock River watershed in western Washington County were mapped using geographical information systems (GIS) techniques through FEMA's Risk Mapping, Assessment, and Planning (RiskMAP) Program. The floodplain mapping for this portion of the County is shown on the FEMA digital flood insurance rate maps for Washington County which were finalized in October 2015 and is available as a digital file layer for the Washington County cadastral mapping system which covers the entire County. The floodplain areas in the eastern portion of the County have been mapped on large-scale topographic mapping prepared at a scale of one inch equals 200 feet, with a contour interval of two feet. The floodplain mapping is shown on the FEMA digital flood insurance rate maps for Washington County which were finalized in 2013 and are available as a digital file layer for the Washington County cadastral mapping system which covers the entire County.

## **TRANSPORTATION SYSTEM**

The transportation system of Washington County provides the basis for movement of goods and people into, out of, through, and within the County. An efficient transportation system is essential to the sound social and economic development of the County and of the Region of which the County is a part. An understanding of the existing transportation system is also a factor to be considered in hazard mitigation planning for the County. Accordingly, this section presents a description of existing transportation facilities in Washington County. Included are descriptions of the existing arterial street and highway system, public transit facilities, railway facilities, and airport facilities.

### **Arterial Streets and Highways**

The arterial street and highway system serving Washington County is shown on Map 9. As shown on Map 9, the existing arterial network in the extreme southeastern portion of the County and within the City of West Bend is relatively densely spaced with arterials occurring at about one-mile intervals in both the north-south and east-west directions. IH 45 traverses the entire County in a north-south direction and IH 41/USH 41 traverses the entire County in a northwest-southeast direction. The existing arterial network in the rest of the County is less-densely spaced, with arterials occurring at about two- to four-mile intervals. The jurisdictional responsibilities for the arterial street and highway system are also shown on Map 9.

The traffic-carrying capacity of the arterial street system, while dependent upon a number of factors, is primarily a function of the number of traffic lanes and the type of facility. As shown in Table 11, a two-lane arterial generally has a design capacity of about 14,000 vehicles per average weekday, a four-lane undivided arterial has a design capacity of about 18,000 vehicles per average weekday, a four-lane arterial with a two-way left turn lane has a design capacity of about 21,000 vehicles per average weekday, a four-lane divided arterial has a design capacity of about 27,000 vehicles per average weekday, a six-lane divided arterial has a capacity of about 38,000 vehicles per average weekday, and an eight-lane divided arterial has a capacity of about 50,000 vehicles per average weekday. The design capacities cited are for urban arterials typically having urban cross-sections with curb and gutter and auxiliary parking lanes, which can also serve as distress lanes and, importantly, serve as bypass lanes at intersections. The traffic capacities of urban arterials are established by the capacity of the intersections with other arterial streets, which are typically controlled by traffic signals. As also shown in Table 11, a four-lane freeway has a design capacity of about 60,000 vehicles per average weekday, a six-lane freeway has a design capacity of about 90,000 vehicles per average weekday, and an eight-lane freeway has a design capacity of about 120,000 vehicles per average weekday.

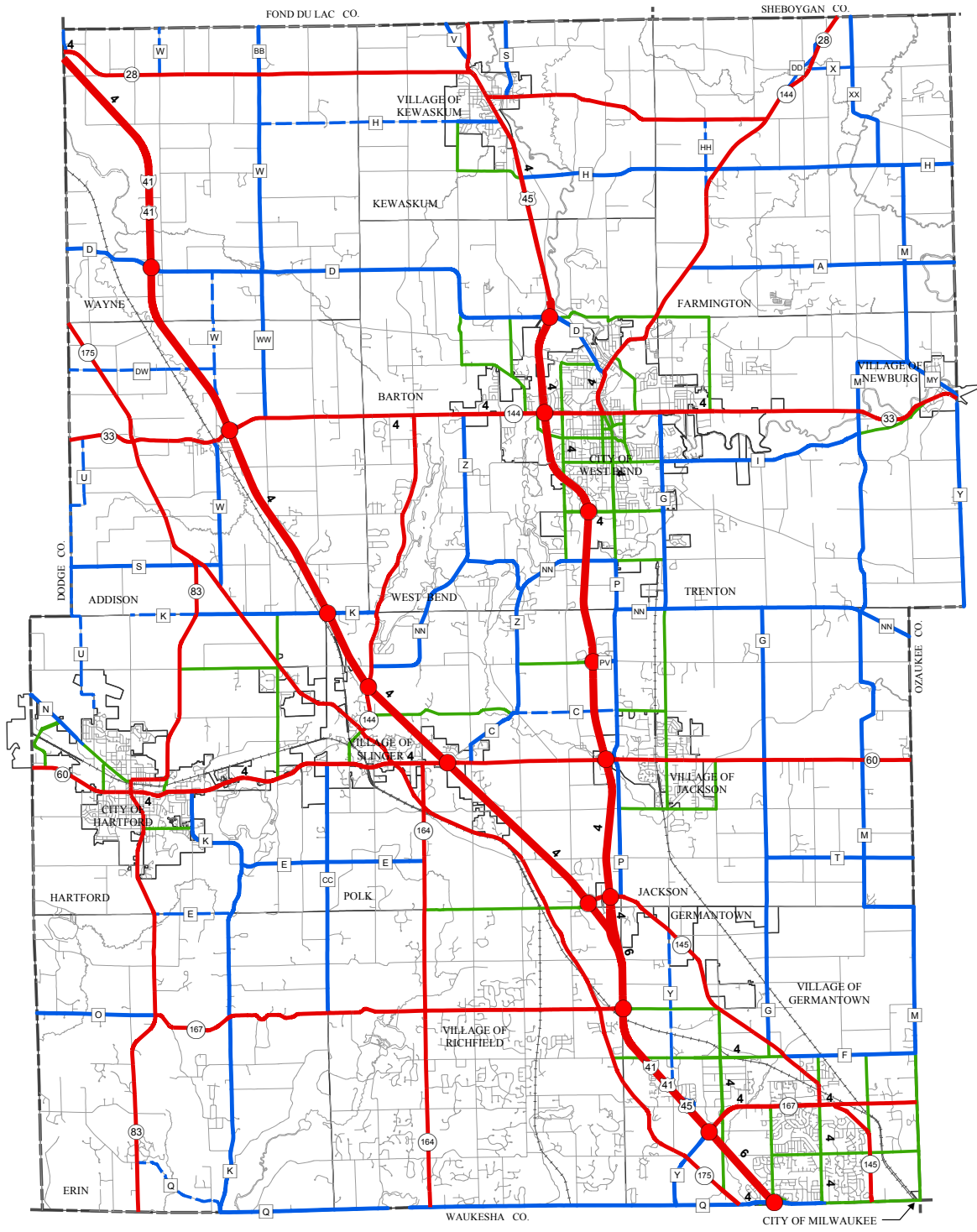
### **Public Transit Facilities**

#### ***Washington County Transit System***

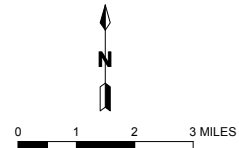
Washington County provides public transit through the Washington County Transit System. This system provides two major services, the Commuter Express traditional commute service and the Shared-Ride Taxi Service. The

# Map 9

## ARTERIAL STREETS AND HIGHWAYS IN WASHINGTON COUNTY: 2015



- |                                 |   |
|---------------------------------|---|
| <b>FREEWAY</b>                  | <b>STANDARD ARTERIAL</b>                      |
| STATE TRUNK HIGHWAY INTERCHANGE | STATE TRUNK HIGHWAY                           |
|                                 | COUNTY TRUNK HIGHWAY                          |
|                                 | COUNTY TRUNK HIGHWAY (NON-ARTERIAL)           |
|                                 | LOCAL TRUNK HIGHWAY                           |
|                                 | <b>4</b> NUMBER OF LANES (2 WHERE UNNUMBERED) |



Source: Washington County and SEWRPC.

**Table 11**

**ESTIMATED FREEWAY AND SURFACE ARTERIAL FACILITY  
DESIGN CAPACITY AND ATTENDANT LEVEL OF CONGESTION<sup>a</sup>**

Facility Type	Average Weekday Traffic Volumes (vehicles per 24 hours)			
	Design Capacity and Upper Limit of Level of Service C	Upper Limit of Moderate Congestion and Level of Service D	Upper Limit of Severe Congestion and Level of Service E	Extreme Congestion and Level of Service F
<b>Freeway</b>				
Four-Lane .....	60,000	80,000	90,000	>90,000
Six-Lane .....	90,000	121,000	135,000	>135,000
Eight-Lane .....	120,000	161,000	180,000	>180,000
<b>Standard Arterial</b>				
Two-Lane .....	14,000	18,000	19,000	>19,000
Four-Lane Undivided .....	18,000	23,000	24,000	>24,000
Four-Lane with Two-way Left Turn Lane .....	21,000	29,000	31,000	>31,000
Four-Lane Divided .....	27,000	31,000	32,000	>32,000
Six-Lane Divided .....	38,000	45,000	48,000	>48,000
Eight-Lane Divided .....	50,000	60,000	63,000	>63,000

The level of congestion on arterial streets and highways may be summarized by the following operating conditions:

Freeway			
Level of Traffic Congestion	Level of Service	Average Speed	Operating Conditions
None	A and B	Freeway free-flow speed	No restrictions on ability to maneuver and change lanes
None	C	Freeway free-flow speed	Ability to maneuver and change lanes noticeably restricted
Moderate	D	1 to 2 mph below free-flow speed	Ability to maneuver and change lanes more noticeably limited; reduced driver physical and psychological comfort levels
Severe	E	Up to 10 mph below free-flow speed	Virtually no ability to maneuver and change lanes. Operation at maximum capacity. No usable gaps in the traffic stream to accommodate lane changing
Extreme	F	Typically 20 to 30 mph or less	Breakdown in vehicular flow with stop-and-go, bumper-to-bumper traffic

Surface Arterial			
Level of Traffic Congestion	Level of Service	Average Speed	Operating Conditions
None	A and B	70 to 100 percent of free-flow speed	Ability to maneuver in traffic stream in unimpeded. Control delay at signalized intersections is minimal
None	C	50 to 100 percent of free-flow speed	Restricted ability to maneuver and change lanes at mid-block locations
Moderate	D	40 to 50 percent of free-flow speed	Restricted ability to maneuver and change lanes. Small increases in flow lead to substantial increases in delay and decreases in travel speed
Severe	E	33 to 40 percent of free-flow speed	Significant restrictions on lane changes. Traffic flow approaches instability
Extreme	F	25 to 33 percent of free-flow speed	Flow at extremely low speeds. Intersection congestion with high delays, high volumes, and extensive queuing

<sup>a</sup>Design capacity is the maximum level of traffic volume a facility can carry before beginning to experience morning and afternoon peak traffic hour traffic congestion, and is expressed in terms of number of vehicles per average weekday.

Source: SEWRPC.

system is owned by the County and operated by two private contractors under supervision of the Washington County Highway Department.

#### *Washington County Commuter Express*

The Washington County Commuter Express consists of two weekday-only traditional commute routes operating from three park and ride lots in Washington County to destinations in Milwaukee County. These routes provide Washington County residents with transit access to downtown Milwaukee, the Milwaukee Regional Medical Center, and the Milwaukee County Research Park. A private contractor owns and operates the vehicles and vehicle maintenance facility. Two of the park and ride lots are owned by the Wisconsin Department of Transportation. The other park and ride lot is owned by Washington County.

#### *Washington County Shared-Ride Taxi*

The Washington County Shared-Ride Taxi service provides county-wide mobility for County residents using a fleet of sedans, accessible vans, and accessible buses to serve trips within the County and into northeastern Waukesha County. The service excludes trips where both trip ends are within the borders of the City of Hartford or within the borders of the City of West Bend. The vehicles for the service are owned by the County. The service is operated by a private contractor. This contractor also owns and operates the vehicle maintenance facility for the service.

#### *Hartford City Taxi*

The City of Hartford owns and operates a publicly subsidized taxi system which provides demand-response, curb-to-curb service for the general public. Hartford City Taxi serves trips within the City and between the City and any point within one mile of the City's borders in Washington County and 10 miles of its borders in Dodge County. The vehicles for this service are owned and operated by the City.

#### *West Bend Taxi*

The City of West Bend owns and operates a publicly subsidized taxi system which provides demand-response, curb-to-curb service for the general public. The West Bend Taxi serves trips within the City. In addition, the Taxi serves trips between the City and any point within two miles of its borders. The vehicles are owned by the City, while the service is operated by a private contractor. The contractor also maintains the vehicles at their maintenance facility.

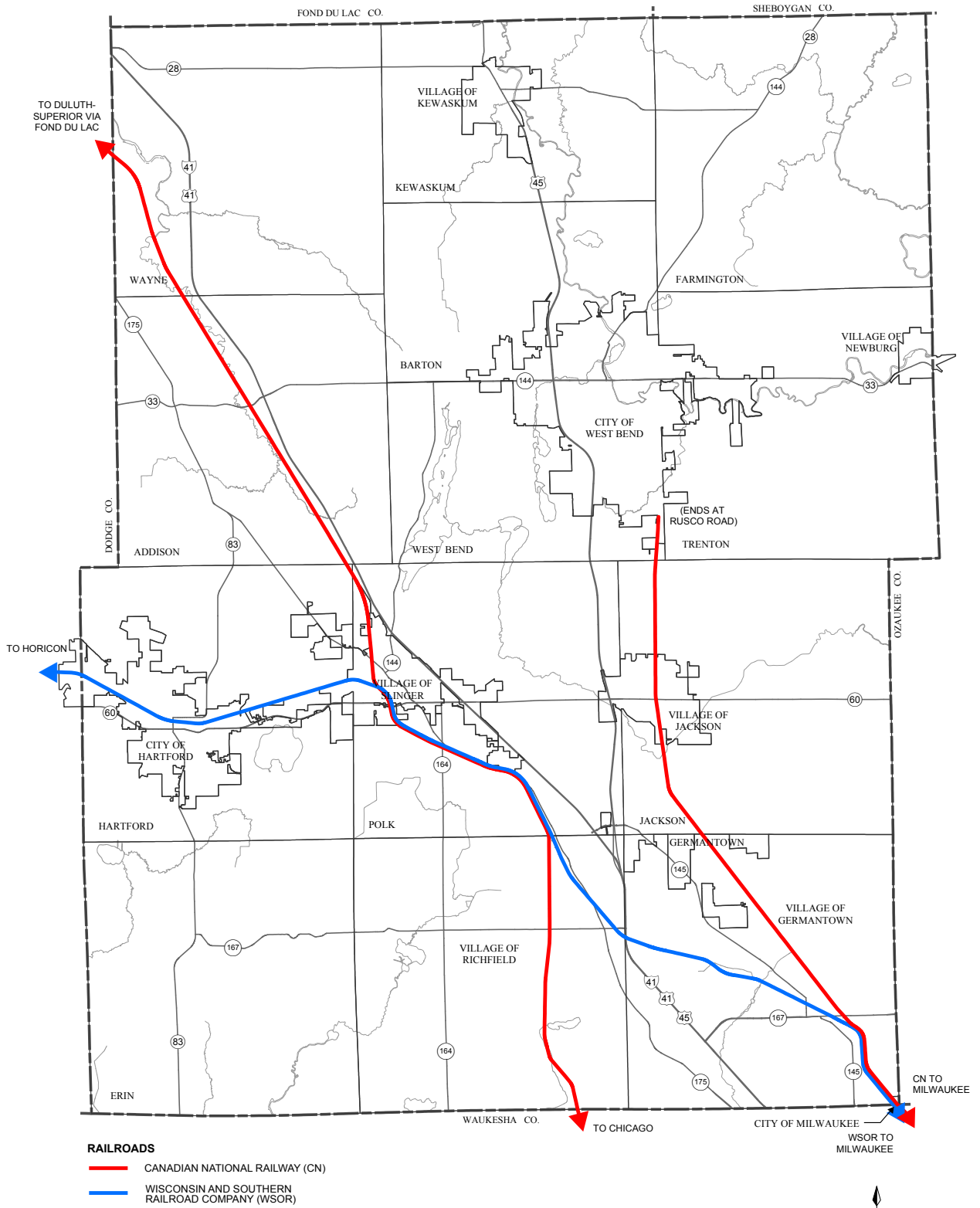
#### **Railway Facilities**

Map 10 shows rail freight lines in Washington County. As of 2015, railway freight service was being provided within Washington County by two railway companies operating 48 miles of active mainline railway and a 15-mile spur railway line. The Wisconsin & Southern Railroad Company provides freight service over an approximately 23-mile segment of railway in the southern portion of the County. This railway traverses the County from its southeast corner northwest to Slinger, then west to the City of Hartford and beyond. The Canadian National Railway operates freight service over an approximately 25-mile segment of mainline railway traveling north through the western half of the County towards Duluth-Superior via Fond du Lac serving the Village of Slinger and Allenton in the Town of Addison. The Canadian National Railway also provides freight service over an approximately 15-mile spur segment of railway in the central portion of the County from the County's southeastern corner to the southern boundary of the City of West Bend. This spur serves the urban areas of the Villages of Germantown and Jackson and a planned industrial area on the south side of the City of West Bend.

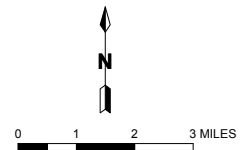
No intercity passenger train service is provided in Washington County, but County residents are served in nearby counties. Intercity passenger train service is provided by Amtrak between Milwaukee and Chicago over Canadian Pacific Railway lines, with stops in 2015 at the Milwaukee Intermodal Station and General Mitchell International Airport in the City of Milwaukee in Milwaukee County, and the Village of Sturtevant in Racine County.

Map 10

COMMON CARRIER RAIL FREIGHT LINES IN WASHINGTON COUNTY: 2015



Source: Wisconsin Department of Transportation and SEWRPC.



## **Airports**

Washington County has two publicly-owned airports which serve the public: West Bend Municipal Airport and Hartford Municipal Airport. West Bend Municipal Airport is owned and operated by the City of West Bend. It is classified as a general utility-corporate airport which is designed to handle single and twin-engine aircraft as well as corporate jets. This airport provides both chartered air and air freight services. It does not have scheduled air carrier services. As of 2013, there were a total of 97 aircraft based at this airport and total operations included about 46,000 flights per year. The Wisconsin National Guard 832nd Medical Company, an air ambulance unit, has its headquarters at this airport. Hartford Municipal Airport is owned and operated by the City of Hartford. It primarily serves general aviation, single-engine aircraft, although it also serves some helicopters, gliders, and ultralight aircraft. This airport provides air freight services. As of 2012, 106 fixed-wing aircraft, as well as three helicopters, seven gliders, and eight ultralight aircraft, were based at this airport. Total operations included about 15,500 flights per year. In addition to these public-use airports, there are a number of private airports and heliports in and adjacent to Washington County which are also shown on Map 11.

## **UTILITY SYSTEMS**

Utility systems are among the most important and permanent elements of urban growth and development, as urban development is highly dependent upon utility systems providing electricity, natural gas, communications, water, and sewerage. Because of this reliance, utility systems are an important consideration in hazard mitigation planning.

### **Public and Private Water Supply Systems**

As of the year 2010, 38 percent of the residents of the County utilized private systems relying on groundwater as a water supply source for domestic use. The remaining 62 percent of County residents have access to public water supply systems that rely on groundwater. The areas served by public water supply are shown on Map 12. Over 97 percent of the water used in the County in 2010 was withdrawn from groundwater.

All of the public water utilities in the County rely upon groundwater as a source of supply. These utilities include the Allenton Sanitary District, the City of Hartford Water Utility, the City of West Bend Water Utility, Slinger Utility, the Village of Germantown Water Utility, the Village of Jackson Water Utility, and the Village of Kewaskum Municipal Water Utility. In addition, there are several privately owned water systems operating in Washington County. These systems provide water primarily to residential subdivisions, apartments and condominium developments, and mobile home parks. The areas served by public water utilities and the private, other than municipal, community systems are shown on Map 12.

The uses of groundwater, as well as surface water, are summarized in Table 12. As shown in Table 12, in 2010 about 7.59 million gallons per day (mgd) of groundwater supply were used by public water utility systems in the County. Considering all water uses, including industrial, commercial, agricultural, and private water supply, 12.86 mgd of groundwater and 0.45 mgd of surface water were used.

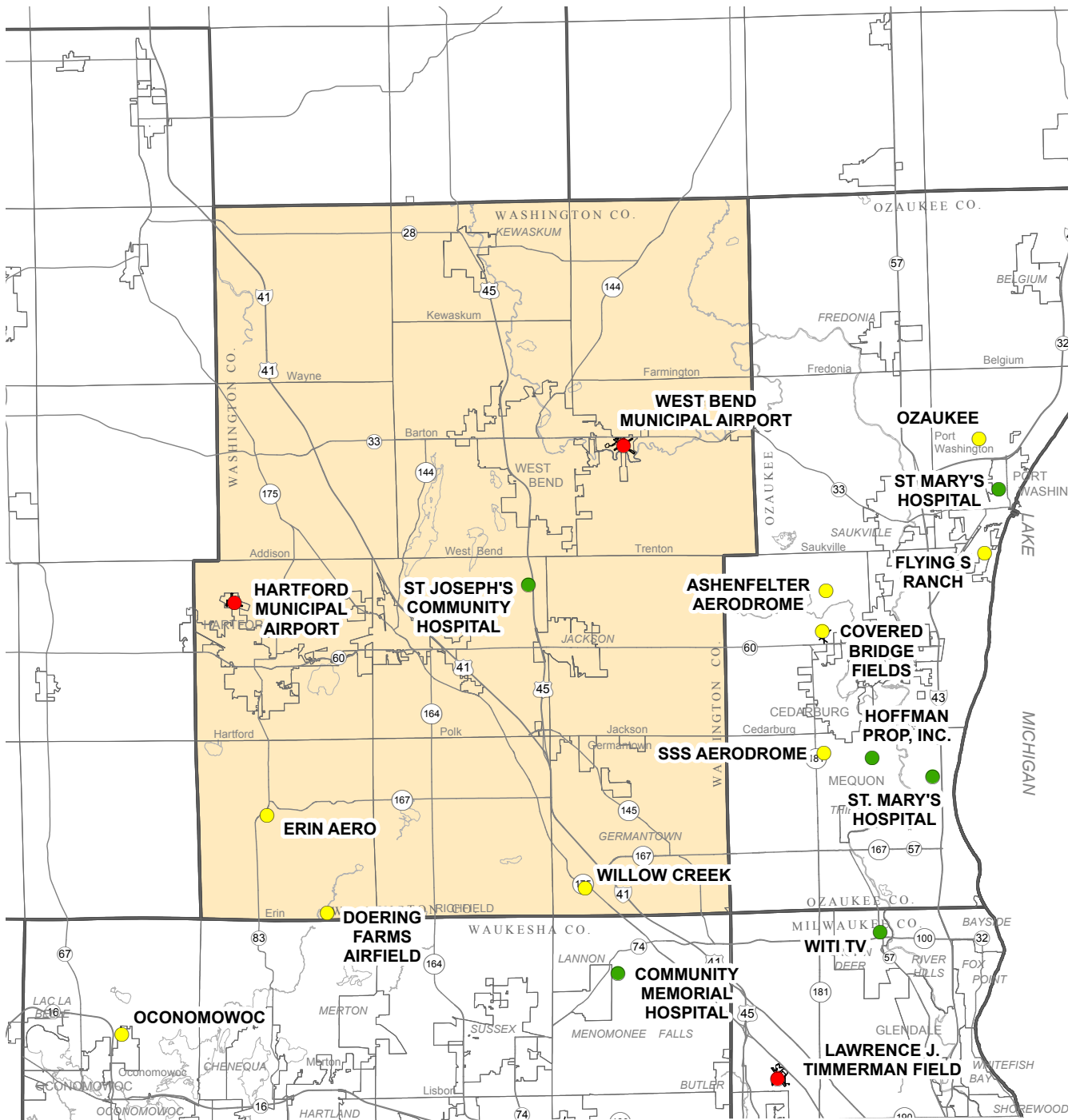
The protection of the public water supply facilities from potential contamination is a consideration for hazard mitigation planning. As such, well head protection planning and protection and monitoring of water supply intake, treatment, storage, and distribution systems is an important potential plan element.

### **Sanitary Sewer Service Systems**

Portions of Washington County are served by public sanitary sewer service. Map 13 shows existing sewer service areas and planned sewer service areas within the County. Sewer service areas within the County include the Cities of Hartford and West Bend and surrounding areas; the Villages of Jackson, Kewaskum, Newburg, and Slinger and surrounding areas; portions of the Village of Germantown; and the unincorporated hamlet of Allenton in the Town of Addison. Within Washington County, about 50,648 acres are located within planned sewer service areas. This

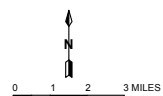
Map 11

EXISTING AIRPORTS IN WASHINGTON COUNTY AND VICINITY: 2015



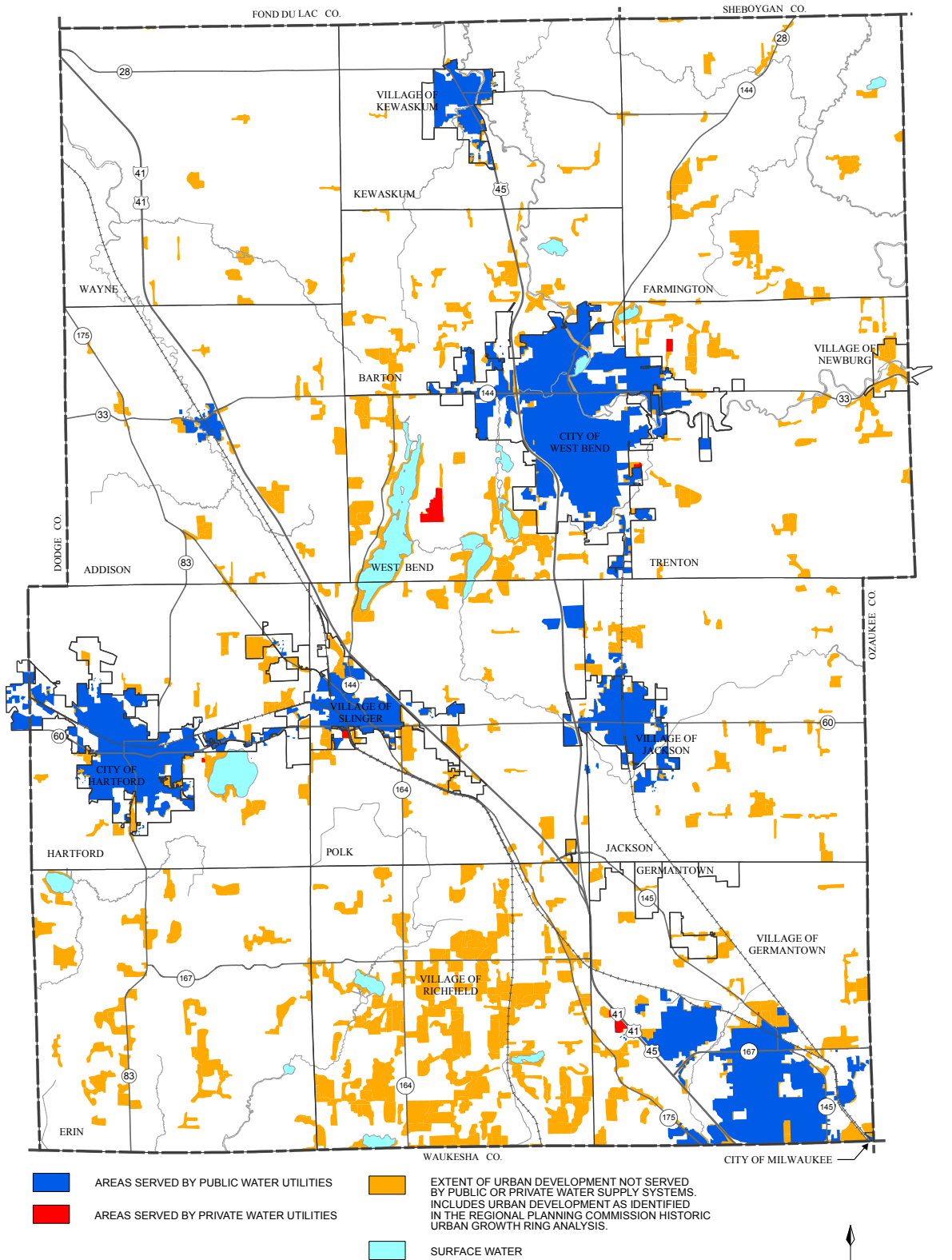
- PUBLIC-USE AIRPORT - PUBLIC OWNERSHIP
- PUBLIC-USE AIRPORT - PRIVATE OWNERSHIP
- PRIVATE-USE AIRPORT - PRIVATE OWNERSHIP
- PRIVATE-USE HELIPORT - PRIVATE OWNERSHIP

Source: Wisconsin Bureau of Aeronautics and SEWRPC.

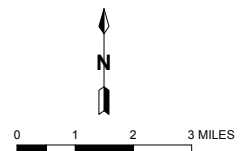


Map 12

AREAS SERVED BY PUBLIC AND PRIVATE WATER UTILITIES IN WASHINGTON COUNTY: 2010



Source: SEWRPC.





includes about 18,594 acres that are currently served by public sanitary sewers, as well as about 3,712 acres of urban density land within the sewer service area that are not currently served. The County includes about 19,390 acres of urban density land use that is located outside of planned sewer service areas.

**Other Public and Private Utilities**

Most of Washington County is provided with electric power service by We Energies. A We Energies electric power generation facility is located in the Village of Germantown. The plant can be powered by either natural gas or oil and is a peak-load plant used during hours of high demand. The City of Hartford and the Village of Slinger operate their own electric utilities through Wisconsin Public Power, Inc. Hartford Electric is located in the City of Hartford and serves about 6,800 customers in the City of Hartford and adjacent areas in the Town of Hartford. The Village of Slinger Electric Utility is located in the Village of Slinger and serves about 2,200 customers, all within the Village of Slinger. American Transmission Company owns, maintains, and operates the major electric power transmission facilities located in Washington County. The electric utility service areas, major transmission lines, and major substations associated with the transmission system in Washington County are shown on Map 14.

All of Washington County is within We Energies’ service area for natural gas service, although service has not been extended throughout the County. We Energies is the distributor of natural gas. ANR Pipeline Company has an underground mainline that runs from north to south through the eastern portion of the County in the Towns of Farmington, Trenton, and Jackson; the City of West Bend; and the Villages of Germantown and Jackson. The pipeline delivers natural gas from Canada to the Upper Midwest. Portions of the pipeline “branch out” while traversing the County, with the most significant “branch” located in the Town of Jackson where the pipeline extends eastward to a We Energies generating station in the City of Port Washington. The location of this pipeline in Washington County is shown on Map 14.

A Koch Pipeline Company pipeline runs diagonally across the County from the northwest corner of the Town of Addison to the southeast corner of the Village of Germantown, in the Towns of Addison, Hartford, Jackson, and Polk and the Villages of Germantown and Slinger. The Koch Pipeline transports refined petroleum products from a refinery in the Twin Cities to distribution points in Wisconsin. A West Shore Pipe Line Company pipeline originates near Chicago and extends north through Washington County to Green Bay.<sup>7</sup> The pipeline transports refined petroleum products in the Chicago area and to northern Illinois and Wisconsin. The West Shore pipeline extends through the Towns of Germantown, Jackson, and Trenton, along the eastern boundary of the West Bend Airport in the City of West Bend, and through the Town of Farmington. The locations of these pipelines in Washington County are shown on Map 14.

A variety of telecommunications services are available in Washington County. Although there are many telecommunication service providers, there are only a few basic types of communication services. These include:

- Voice transmission services, including standard telephone land line service;

**Table 12**

**ESTIMATED USE OF WATER IN WASHINGTON COUNTY  
IN 2010 IN MILLION GALLONS PER DAY**

Usage Category	Water Source	
	Surface Water	Groundwater
Public <sup>a</sup> .....	--	7.59
Industrial.....	0.35	0.35
Commercial.....	--	--
Irrigation.....	0.02	0.77
Agricultural.....	0.08	0.71
Aquaculture.....	--	0.03
Domestic.....	--	2.38
<b>Total</b>	<b>0.45</b>	<b>12.86</b>

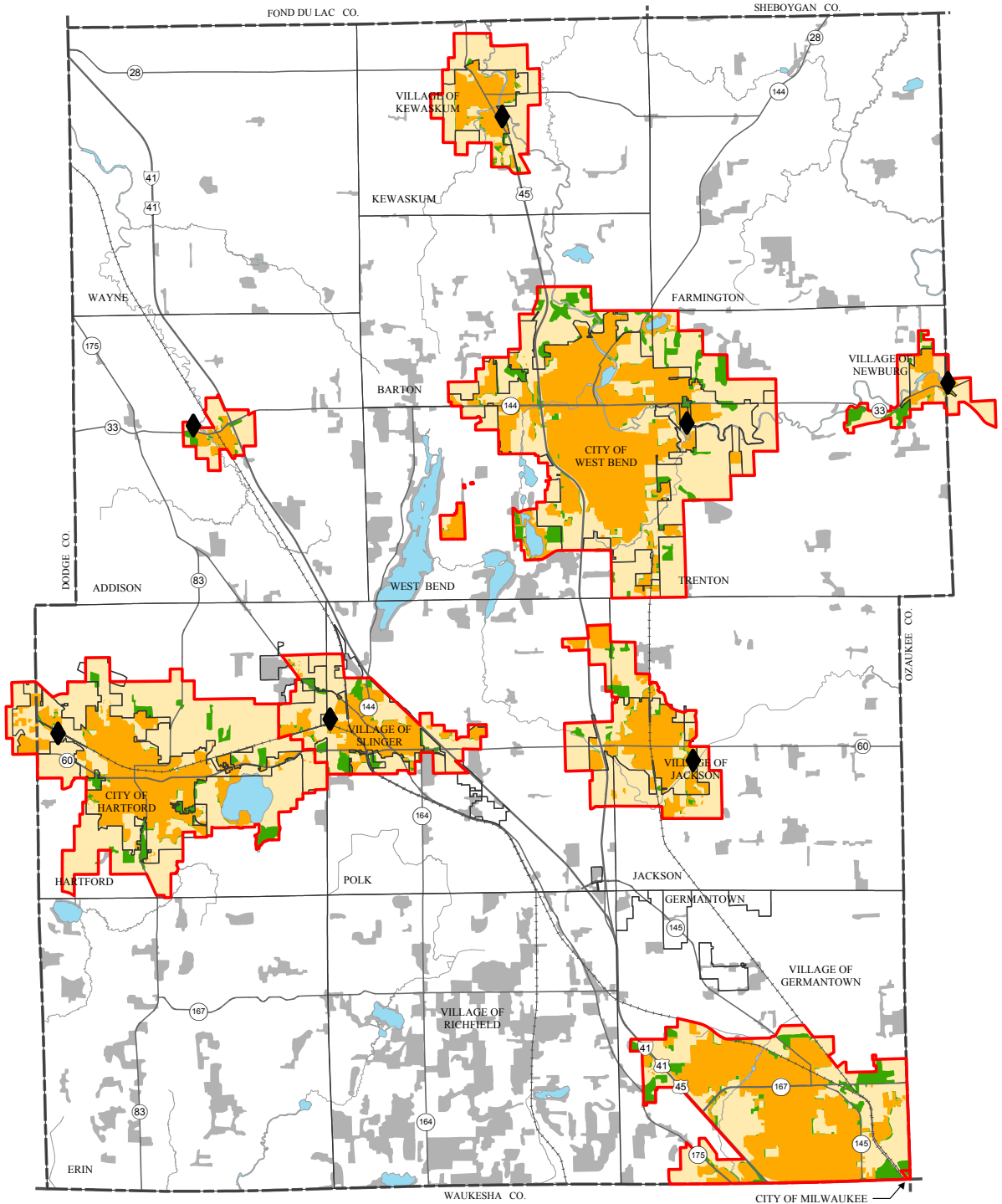
<sup>a</sup>Includes water delivered to residents, industry, and commerce within the served area.

Source: U.S. Geological Survey and SEWRPC.

<sup>7</sup> As of June 22, 2016, West Shore Pipeline Company announced that it had suspended operations on this pipeline indefinitely. See Don Behm, “Pipeline Serving Green Bay Closes Indefinitely,” Milwaukee Journal-Sentinel, June 22, 2016.

Map 13

**PLANNED SANITARY SEWER SERVICE AREAS AND AREAS SERVED BY SEWER IN WASHINGTON COUNTY**

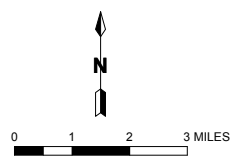


- AREA SERVED BY SANITARY SEWER: 2010
- PLANNED SANITARY SEWER SERVICE AREAS (MARCH 2015)
- PLANNED SANITARY SEWER SERVICE AREA BOUNDARIES (MARCH 2015)
- EXTENT OF URBAN DEVELOPMENT WITHIN PLANNED SANITARY SEWER SERVICE AREAS NOT CURRENTLY SERVED BY PUBLIC SEWERAGE SYSTEMS
- EXTENT OF URBAN DEVELOPMENT NOT SERVED BY PUBLIC SEWERAGE SYSTEMS

- SEWAGE TREATMENT PLANT
- SURFACE WATER

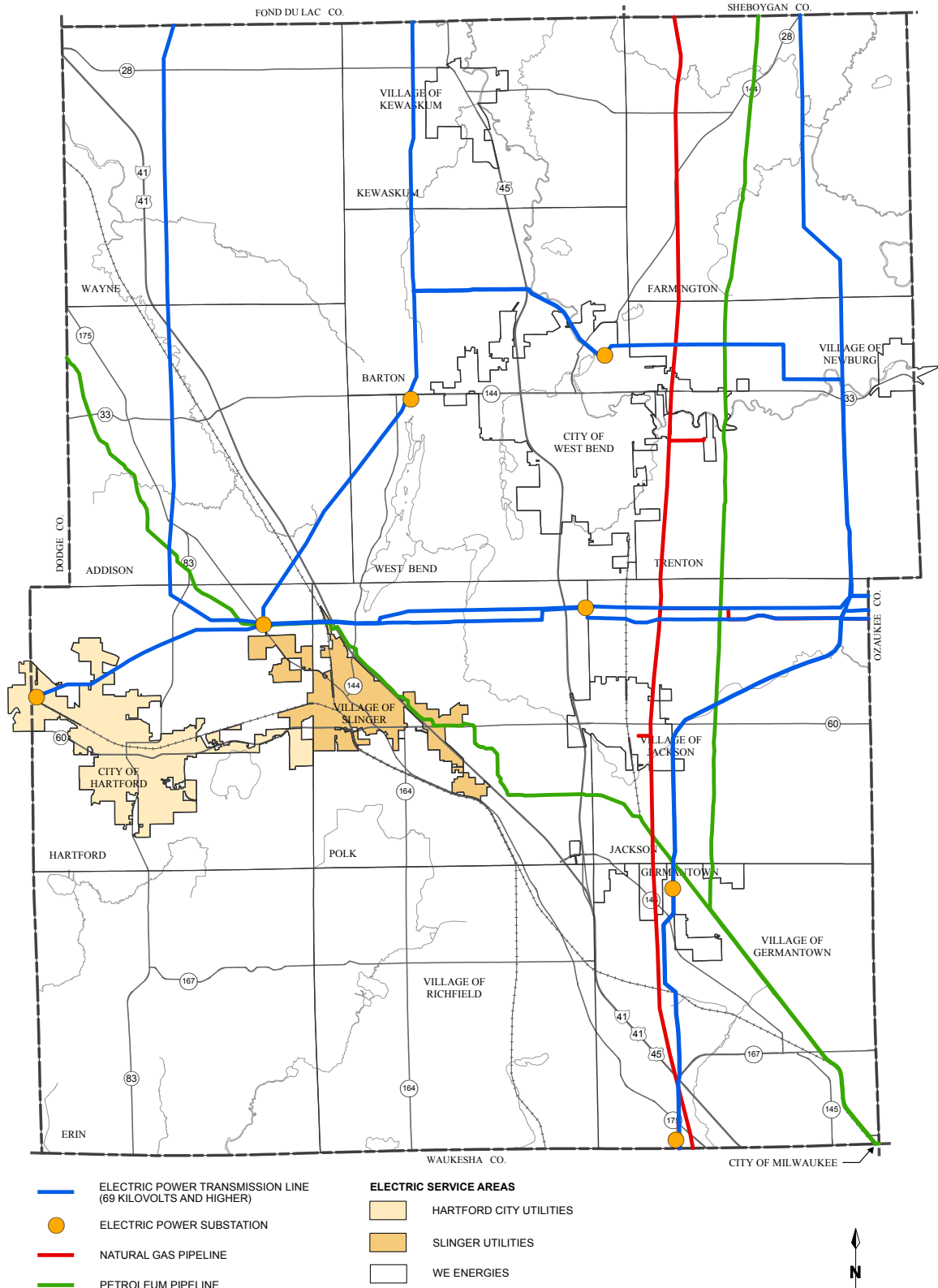
NOTE: SEWER SERVICE FOR THE VILLAGE OF GERMANTOWN IS PROVIDED BY THE MILWAUKEE METROPOLITAN SEWERAGE DISTRICT.

Source: SEWRPC.

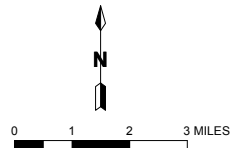


Map 14

**ELECTRIC POWER TRANSMISSION LINES, SUBSTATIONS, AND PIPELINES IN WASHINGTON COUNTY: 2015**



Source: Public Service Commission of Wisconsin and SEWRPC.



- Data transmission services, including the internet, ATM-frame relay, and fourth generation (4G) wireless networks;
- Multimedia services, including video, imaging, streaming video, data, and voice; and
- Broadcast services, including AM/FM terrestrial radio, satellite radio and television, terrestrial television, and cable television.

In general, telephone service is available on demand throughout the County and is provided through a number of telephone companies. The service areas of the telephone exchange carrier operators are shown on Map 15. It should be noted that several switch houses for telephone service are located within the County. In addition, a major cable hub for Charter Communications is located within Washington County.

### **Solid Waste Disposal**

Landfills are a potential factor in hazard mitigation planning. There are no active landfills in Washington County. There are 76 total licensed landfills and other solid waste disposal sites in Washington County. Most of the 65 inactive landfill sites have undergone proper closure procedures specified by the Wisconsin Department of Natural Resources. The other facilities include recycling stations, compost sites, transfer sites, and storage facilities. The locations of the solid waste disposal sites in Washington County are shown on Map 16. Appendix C lists the locations and the owners of these sites.

## **PUBLIC SAFETY FACILITIES AND SERVICES**

The type and location of public safety facilities are an important consideration in hazard mitigation planning because of the potential direct involvement of such facilities in certain hazard situations. The location of fire stations and associated service areas are set forth on Map 17. Emergency medical rescue department service areas are shown on Map 18. The locations of police stations and sheriff offices and associated service areas are shown on Map 19. A listing of these facilities is included in Appendix D. The location of these stations in relationship to the floodplain areas are indicated as a basis for further analysis described in Chapter III.

### **Fire Suppression and Rescue Services**

All of the 20 local units of government in Washington County either own, or contract for, fire suppression or emergency medical services. The locations of each of the fire stations and the fire service areas within Washington County are shown on Map 17. Table 13 provides information about the working status of fire fighters within each system—that is, whether they are full-time, volunteer, or paid on-call volunteer, or some combination thereof.

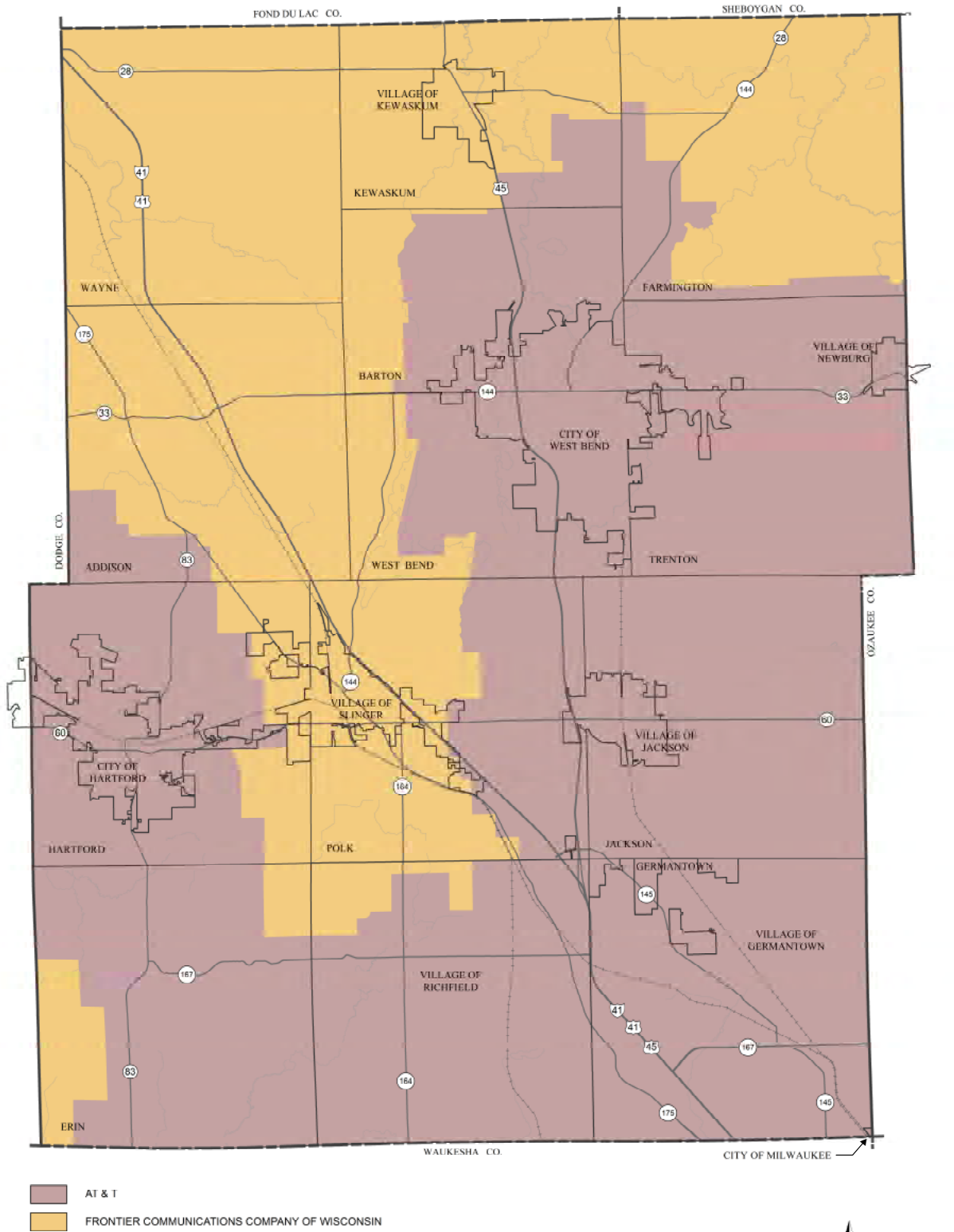
A variety of remote fire suppression systems are also present in Washington County. Throughout the County, fire departments, municipalities, and schools have installed devices such as fire suppression cisterns and dry hydrants to aid in fire suppression activities.

The emergency medical service areas in Washington County are shown on Map 18. All but one of the fire suppression departments in Washington County independently maintains an emergency medical service. In some areas of the County, the emergency rescue service areas of these departments are different from the fire suppression service area. In addition, in some portions of the County first response service is provided by a different department than the department providing other emergency medical services. First response service area boundaries for those portions of the County are shown on Map 18.

All of the fire and rescue departments in Washington County participate in a mutual aid agreement with each other and numerous other Illinois and State of Wisconsin fire and rescue departments, and through a Mutual Aid Box Alarm System (MABAS) agreement. This agreement enables each department to render assistance to, and receive assistance from, other departments in the County as needed to respond to fire and rescue emergencies. Under the

Map 15

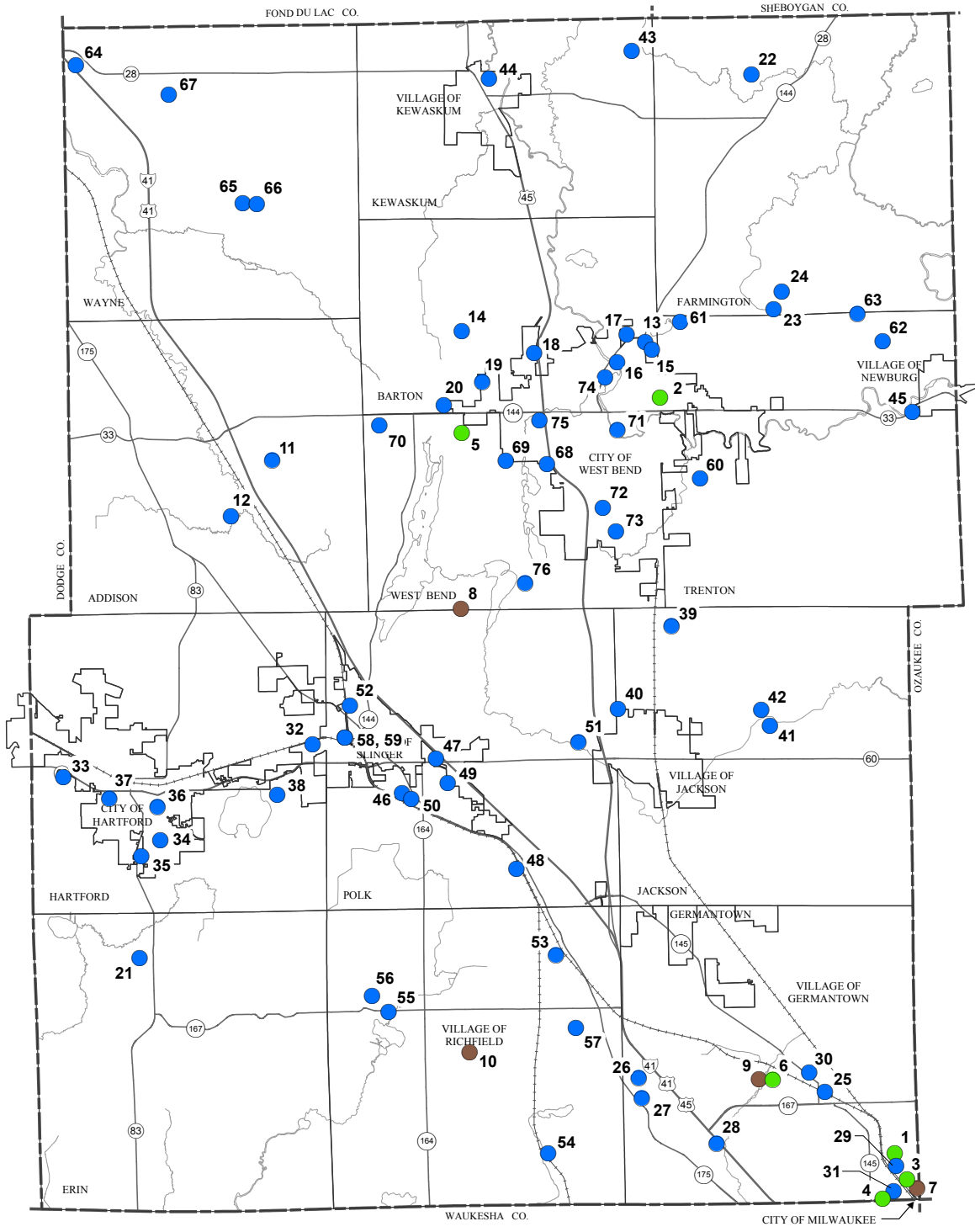
TELEPHONE EXCHANGE CARRIER SERVICE AREAS IN WASHINGTON COUNTY: 2011



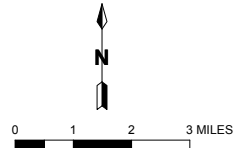
Source: Wisconsin Public Service Commission and SEWRPC.

# Map 16

## SOLID WASTE DISPOSAL SITES IN WASHINGTON COUNTY: 2015



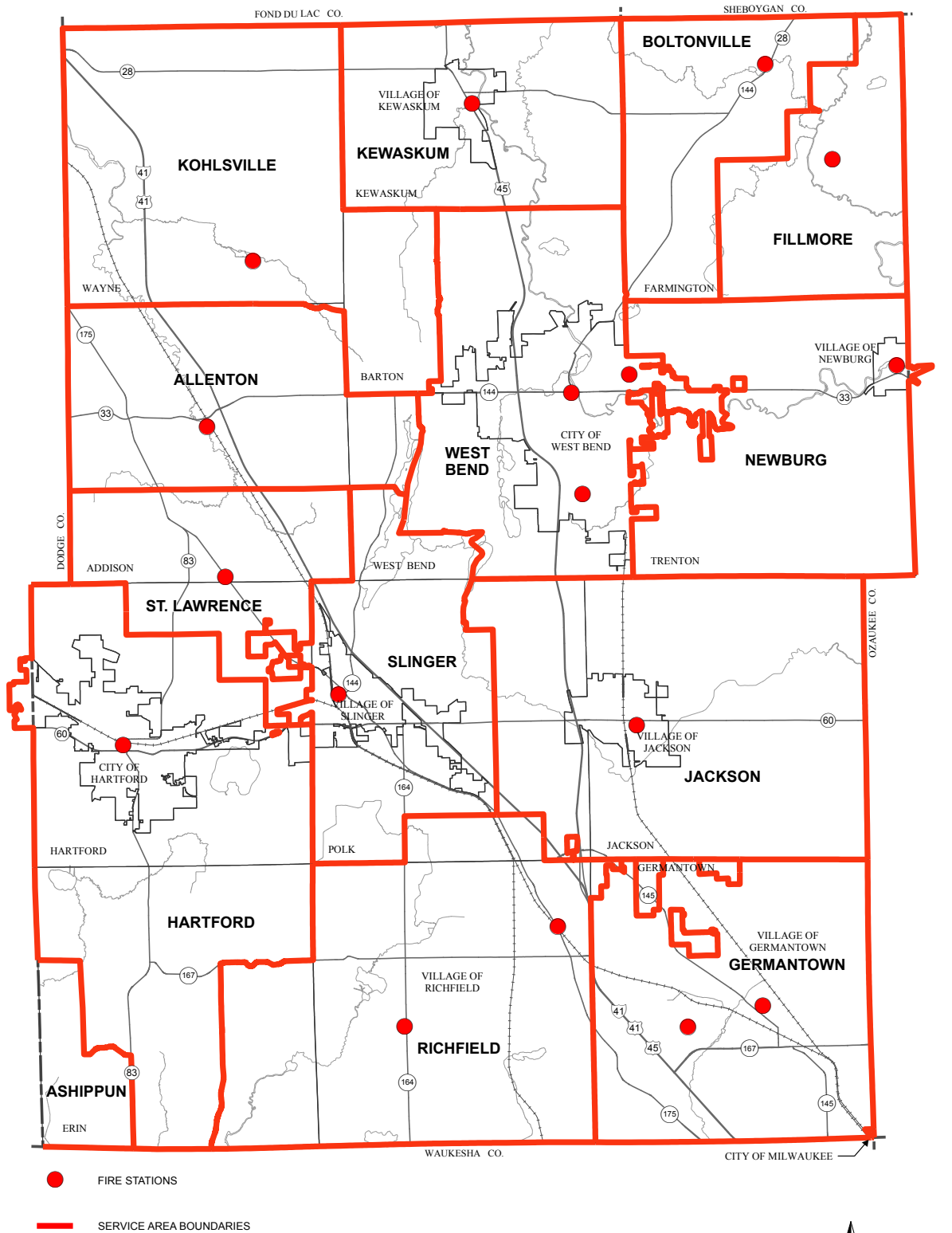
- INACTIVE LANDFILL
- COMPOST SITE
- RECYCLING CENTERS, TRANSFER SITES, AND STORAGE FACILITIES
- 5 REFERENCE NUMBER (SEE APPENDIX C IN APPENDIX C)



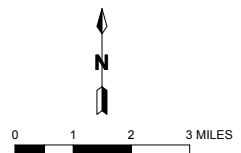
Source: Wisconsin Department of Natural Resources, Washington County, and SEWRPC.

Map 17

FIRE STATIONS AND SERVICE AREAS IN WASHINGTON COUNTY: 2015

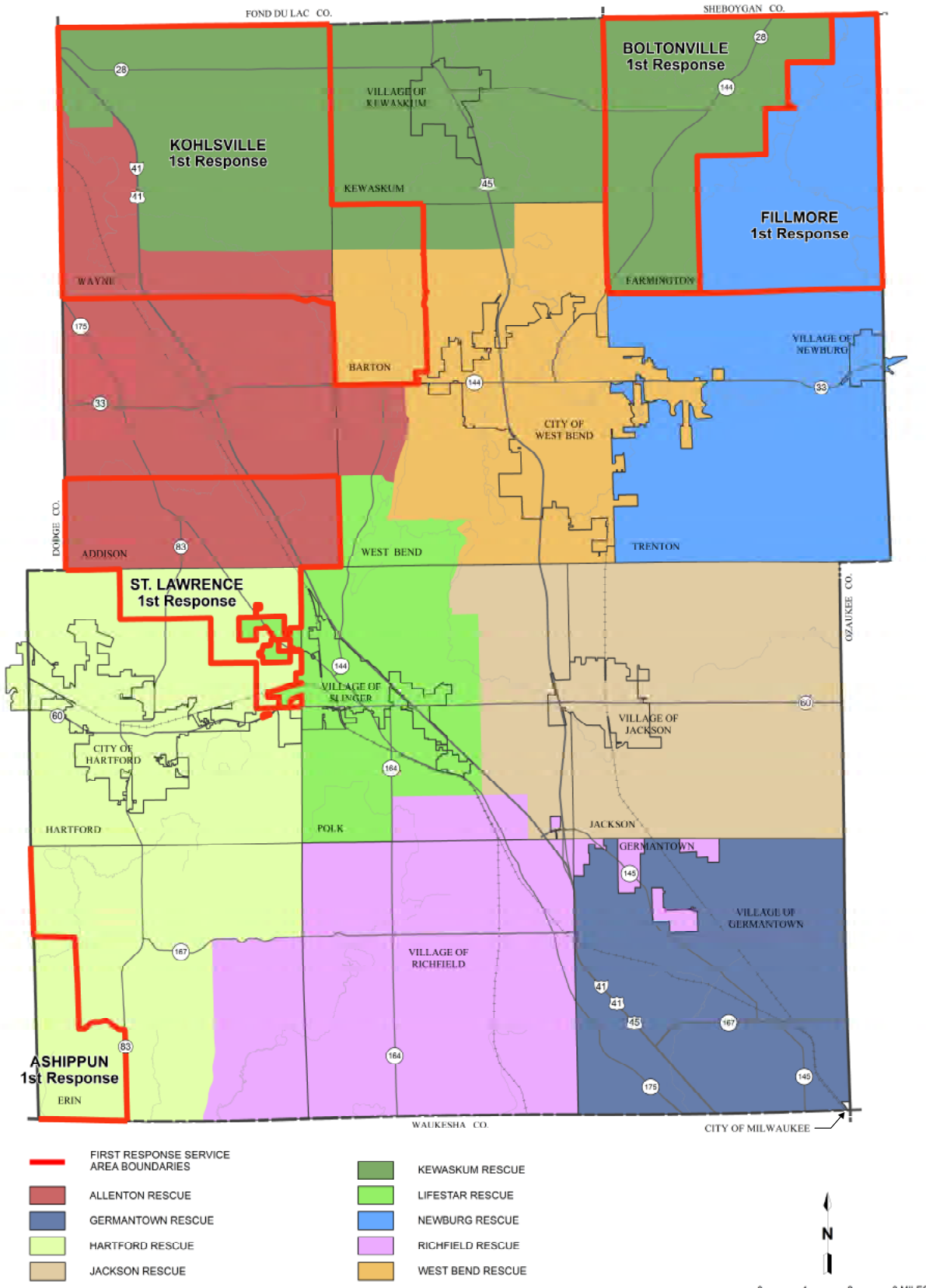


Source: Washington County and SEWRPC.



Map 18

EMERGENCY MEDICAL SERVICE AREAS IN WASHINGTON COUNTY: 2015

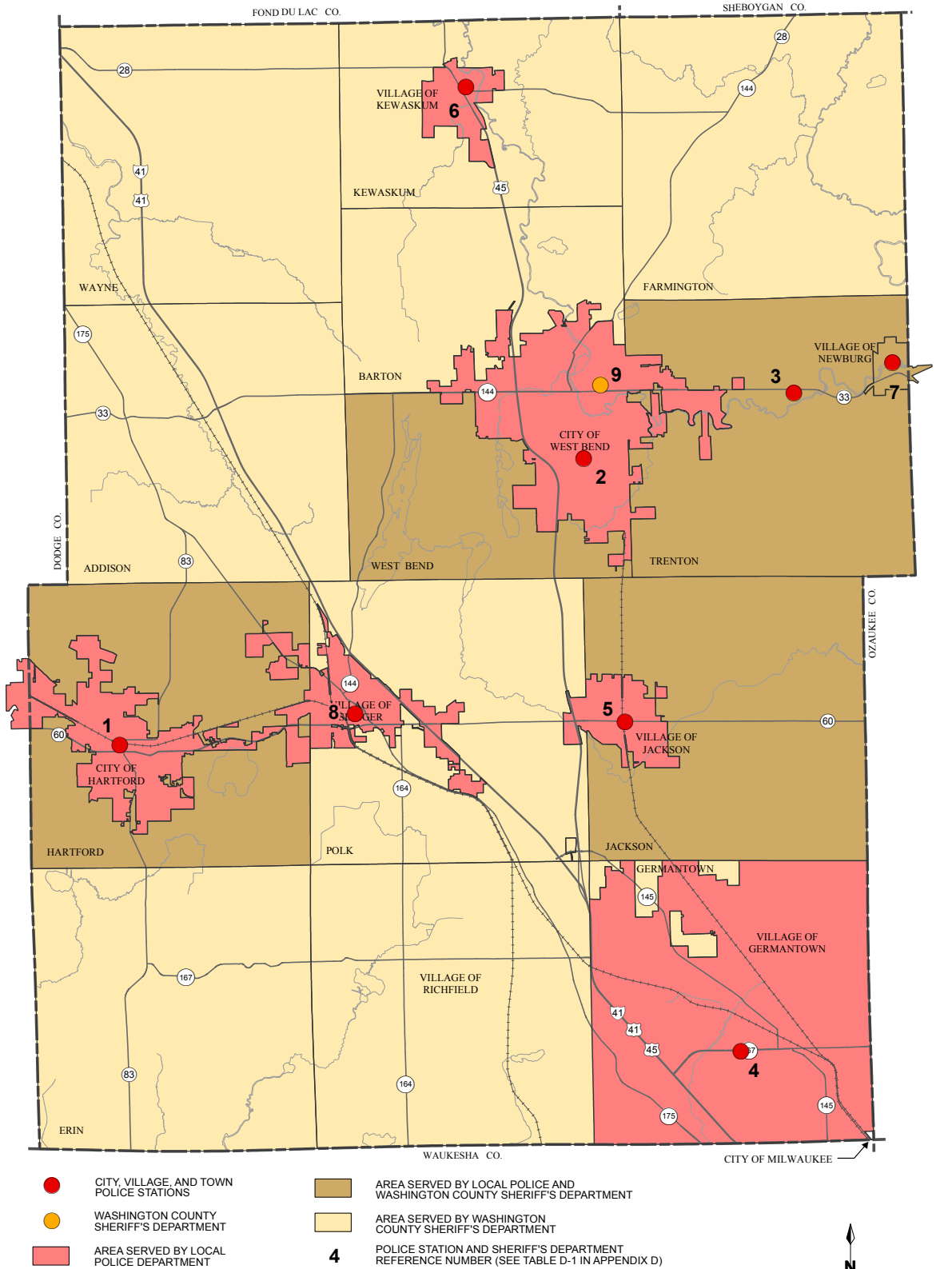


Source: Washington County and SEWRPC.

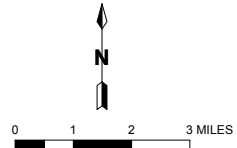


# Map 19

## POLICE STATIONS AND SERVICE AREAS IN WASHINGTON COUNTY: 2015



Source: Washington County and SEWRPC.



**Table 13**

**WORKING STATUS OF FIRE DEPARTMENTS, EMERGENCY MEDICAL SERVICE PROVIDERS,  
AND LAW ENFORCEMENT DEPARTMENTS SERVING WASHINGTON COUNTY: 2015**

<u>Fire/Rescue Department</u> Municipally Owned = M Privately Owned = P	Working Status of Fire Suppression Department	Emergency Medical Service Arrangement	Working Status of Law Enforcement Department
City of Hartford – M	Full Time and Paid On Call (Hartford Fire & Rescue)	Full Time and Paid On Call (Hartford Fire & Rescue)	Full-time (City Police Department)
City of West Bend – M	Full Time (West Bend Fire Department)	Full Time (West Bend Fire Department)	Full-time (City Police Department)
Village of Germantown – M	Full-time, Part-time, and Paid On Call (Germantown Fire Department)	Full-time, Part-time, and Paid On Call (Germantown Fire Department)	Full-time (Village Police Department)
Village of Jackson – M	Full-time, Part-time, and Paid On Call (Jackson Fire Department)	Full-time, Part-time, and Paid On Call (Jackson Fire Department)	Full-time (Village Police Department)
Village of Kewaskum – M	Full-time and Paid On Call (Kewaskum Fire Department)	Full-time, Part-time, and Paid On Call (Kewaskum Fire Department)	Full-time (Village Police Department)
Village of Newburg – P	Volunteer (Newburg Fire Department)	Volunteer (Newburg Fire Department)	County Sheriff Department Part-time (Village Police Department, limited hours)
Village of Richfield –P	Full-time and Paid On Call (Richfield Volunteer Fire Company)	Full-time and Paid On Call (Richfield Volunteer Fire Company)	Contracts with the County Sheriff Department
Village of Slinger –P	Volunteer (Slinger Volunteer Fire Department)	Volunteer (Slinger Volunteer Fire Department)/Full-time (Lifestar EMS)	Full-time (Village Police Department)
Town of Addison – P	Contracts with Allenton Volunteer Fire Department (Volunteer) and St. Lawrence Fire Company (Volunteer)	Contracts with Allenton Volunteer Fire Department (Volunteer) and St. Lawrence Fire Company (Volunteer)	County Sheriff Department
Town of Barton – P, M	Contracts with Kohlsville Fire Department (Volunteer) and West Bend Fire Department (Full-time)	Contracts with Kohlsville Fire Department (Volunteer), Kewaskum Fire Department (Full-time, Part-Time, and Paid On Call), and West Bend Fire Department (Full-time)	County Sheriff Department
Town of Erin – P, M	Contracts with Ashippun Volunteer Fire Department (Volunteer), Hartford Fire & Rescue (Full-time and Paid On Call), and Richfield Volunteer Fire Company (Full-time and Paid On Call)	Contracts with Ashippun Volunteer Fire Department (Volunteer), Hartford Fire & Rescue (Full-time and Paid On Call), and Richfield Volunteer Fire Company (Full-time and Paid On Call)	County Sheriff Department
Town of Farmington –P, M	Contracts with Boltonville Fire Department (Volunteer) and Fillmore Fire Department (Volunteer)	Contracts with Boltonville Fire Department (Volunteer), Fillmore Fire Department (Volunteer), Kewaskum Fire Department (Full-time, Part- time, and Paid On Call), and Newburg Fire Department (Volunteer)	County Sheriff Department
Town of Germantown – P	Contracts with Richfield Volunteer Fire Company (Full- time and Paid On Call)	Contracts with Richfield Volunteer Fire Company (Full- time and Paid On Call)	County Sheriff Department
Town of Hartford – M, P	Contracts with Hartford Fire & Rescue (Full-time and Paid On Call) and St. Lawrence Volunteer Fire Company (Volunteer)	Contracts with Hartford Fire & Rescue (Full-time and Paid On Call) and St. Lawrence Volunteer Fire Company (Volunteer)	County Sheriff Department Part-time (Town Police Department, limited hours)

**Table 13 (continued)**

<u>Fire/Rescue Department</u> Municipally Owned = M Privately Owned = P	Working Status of Fire Suppression Department	Emergency Medical Service Arrangement	Working Status of Law Enforcement Department
Town of Jackson – M	Contracts with Jackson Fire Department (Full-time, Part-time, and Paid On Call)	Contracts with Jackson Fire Department (Full-time, Part-time, and Paid On Call)	County Sheriff Department Part-time Constable
Town of Kewaskum – M	Contracts with Kewaskum Fire Department (Full-time and Paid On Call)	Contracts with Kewaskum Fire Department (Full-time and Paid On Call)	County Sheriff Department
Town of Polk –M, P	Contracts with Jackson Fire Department (Full-time, Part-time, and Paid On Call), Richfield Volunteer Fire Company (Full-time and Paid On Call), and Slinger Volunteer Fire Department (Volunteer)	Contracts with Jackson Fire Department (Full-time, Part-time, and Paid On Call), Richfield Volunteer Fire Company (Full-time and Paid On Call), and Slinger Volunteer Fire Department (Volunteer), and Lifestar EMS (Full-time)	County Sheriff Department
Town of Trenton – M	Contracts with Newburg Fire Department (Volunteer)	Contracts with Newburg Fire Department (Volunteer)	County Sheriff Department Part-time (Town Police Department, limited hours)
Town of Wayne – P, M	Contracts with Kohlsville Fire Department (Volunteer)	Contracts with Kohlsville Fire Department (Volunteer), Kewaskum Fire Department (Full-time, Part-time, and Paid On Call), and Allenton Fire Department (Volunteer)	County Sheriff Department
Town of West Bend – M, P	Contracts with Allenton Volunteer Fire Department (Volunteer), Slinger Volunteer Fire Department (Volunteer), and West Bend Fire Department (Full-time)	Contracts with Allenton Volunteer Fire Department (Volunteer), Slinger Volunteer Fire Department (Volunteer), and West Bend Fire Department (Full-time)	County Sheriff Department Part-time (Town Police Department, limited hours)

Source: Washington County Emergency Management Office and SEWRPC.

agreement, departments render assistance without charge to the extent of available resources not required for the protection of their own service areas. This agreement enables individual departments to significantly supplement their own personnel, apparatus, and equipment with that from other departments in responding to emergencies. Importantly, the agreement allows individual departments to access equipment, such as tankers, aerial trucks, and extrication equipment, which they themselves do not possess and which they may need infrequently.

In addition to the County mutual aid and the MABAS agreements, each fire and rescue department has reciprocal mutual aid agreements with one or more neighboring departments. Some of these are formal, written agreements; others are unwritten. Many departments have indicated that they would respond to any request for mutual aid, whether or not there is a mutual aid agreement, provided that they are able to do so without jeopardizing their own services.

Fire departments in the County also participate in two special-purpose emergency response teams. The Washington County Hazardous Materials Response Team consists of members from six fire departments in the County. This team is designated as a Type III hazardous materials response team within the State hazardous materials response task force system and is equipped and trained to respond to all known industrial chemical hazards in liquid, aerosol, powder, and solid forms. The Washington County Dive Team is comprised of members of the Kewaskum, Richfield, Slinger, and West Bend Fire Departments and Washington County Sheriff’s Deputies. It provides a coordinated response to rescue and recovery efforts in waters within the jurisdiction of Washington

County, and under a mutual aid request from any jurisdiction outside Washington County. It operates under the authority of the Sheriff's Department.

### **Law Enforcement**

Six of the 20 municipalities in Washington County provide for law enforcement through full-time police departments. The Village of Newburg and the Town of Trenton provide law enforcement through part-time police departments with limited hours and through the Washington County Sheriff's Department. In the remaining municipalities primary law enforcement is provided through the Washington County Sheriff's Department. In addition, the Town of West Bend provides limited law enforcement through a Town constable. The location of local law enforcement stations in Washington County is shown on Map 19.

The law enforcement agencies with in Washington County have several special-purpose units and teams. As previously described, the Washington County Dive Team operates under the authority of the Sheriff's Department. The Sheriff's Department also has accident reconstruction, canine, mobile command post, recreational enforcement, and commercial and private motor vehicle enforcement units. There are two special weapons and tactics (SWAT)-type teams within the County. The Sheriff's Department's SWAT team is comprised of Sheriff's Deputies and Officers from the Germantown and Hartford Police Departments and operates under the command of the Washington County Sheriff. In addition, the City of West Bend has a special response team.

### **CRITICAL COMMUNITY FACILITIES**

In addition to fire stations and law enforcement stations, as described above, other community facilities which are of importance in hazard mitigation planning include schools, government administration buildings, hospitals and major clinics, child day care centers, and nursing homes. Maps 20 through 25 show the locations of selected types of critical community facilities within Washington County. Because of the need for access to and from these facilities, the hazard mitigation plan includes their location. This access need is discussed in detail in Chapter III. A listing of the critical community facilities is included in Appendix E.

### **HAZARDOUS MATERIAL STORAGE AND USE**

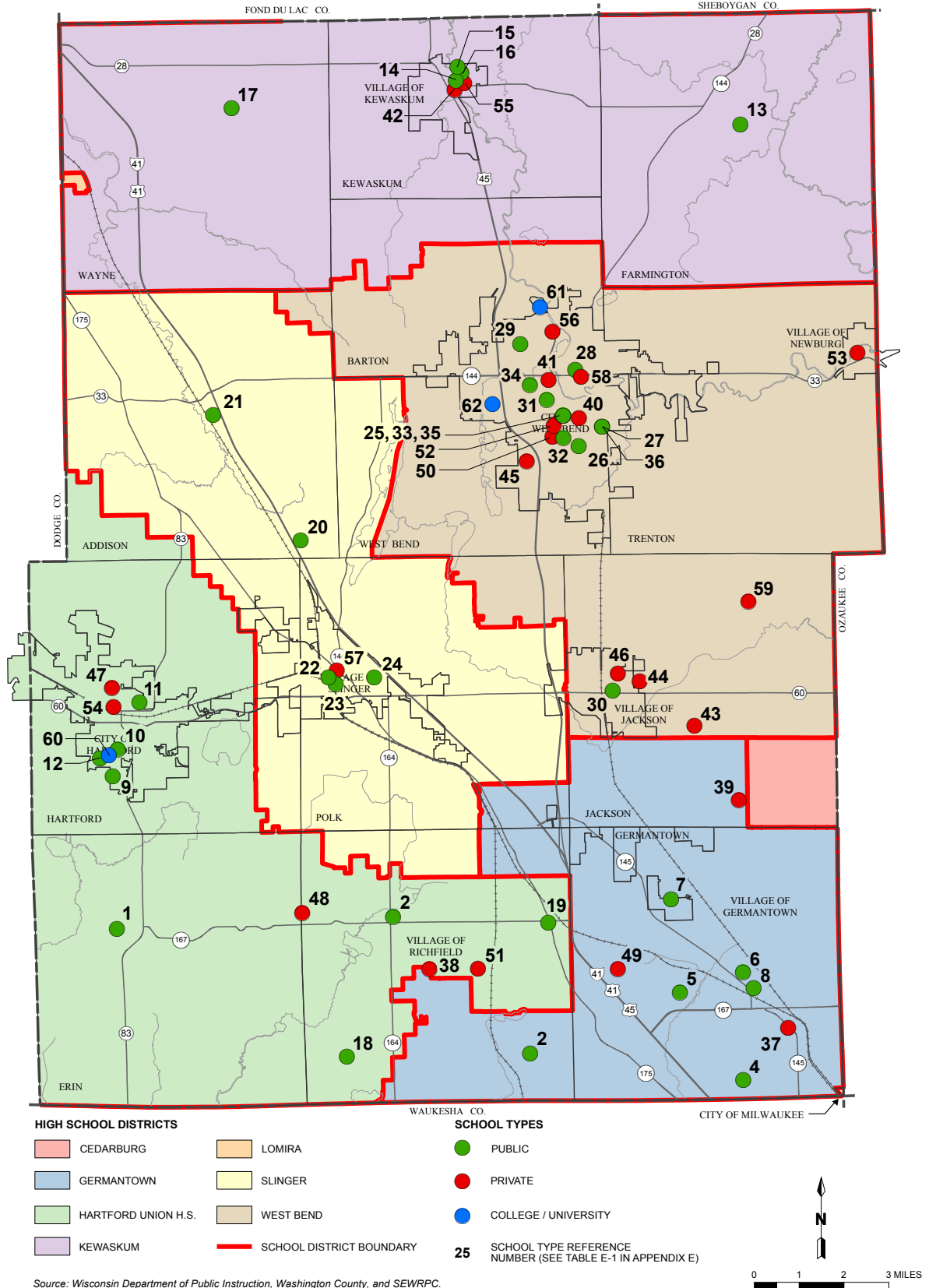
Public Law 99-499, the Superfund Amendment and Reauthorization Act (SARA/Title III) of 1986, and Wisconsin Act 342 set forth requirements for hazardous material reporting and safety planning. The primary reporting and centralized record-keeping related to hazardous materials is carried out under a partnership program involving the industries and other users of hazardous materials, the Wisconsin Division of Emergency Management, county emergency management departments/local emergency planning committees, and the local fire departments. In 2015, there were 141 identified users of extremely hazardous substances in Washington County. Of these facilities, three were classified as planning facilities, 88 were classified as reporting facilities, and 50 were classified as both planning facilities and reporting facilities. Reporting facilities are any facility that uses, stores, or produces chemicals at or above 10,000 pounds. Because there is no "hazardous chemical" list, the general assumption is that anything requiring the completion of a material safety data sheet (MSDS) is included as a reporting requirement. Reporting facilities include manufacturers, warehouses, and petroleum storage site operators. Planning facilities include a wide range of users of limited amounts of hazardous materials. In addition to industrial materials, the agricultural industry routinely uses materials considered extremely hazardous. These uses range from individual farm use materials to large chemical storage facilities.

The 141 facilities which are noted above as storing or producing hazardous materials are located throughout Washington County, as summarized in Table 14. A detailed listing of these facilities and location by address is available at the Washington County Office of Emergency Management.

Between 2010 and 2014, Washington County averaged about 16 hazardous material spills or releases per year, almost all of which were minor. The majority of these incidents involved vehicle fluids such as gasoline, diesel

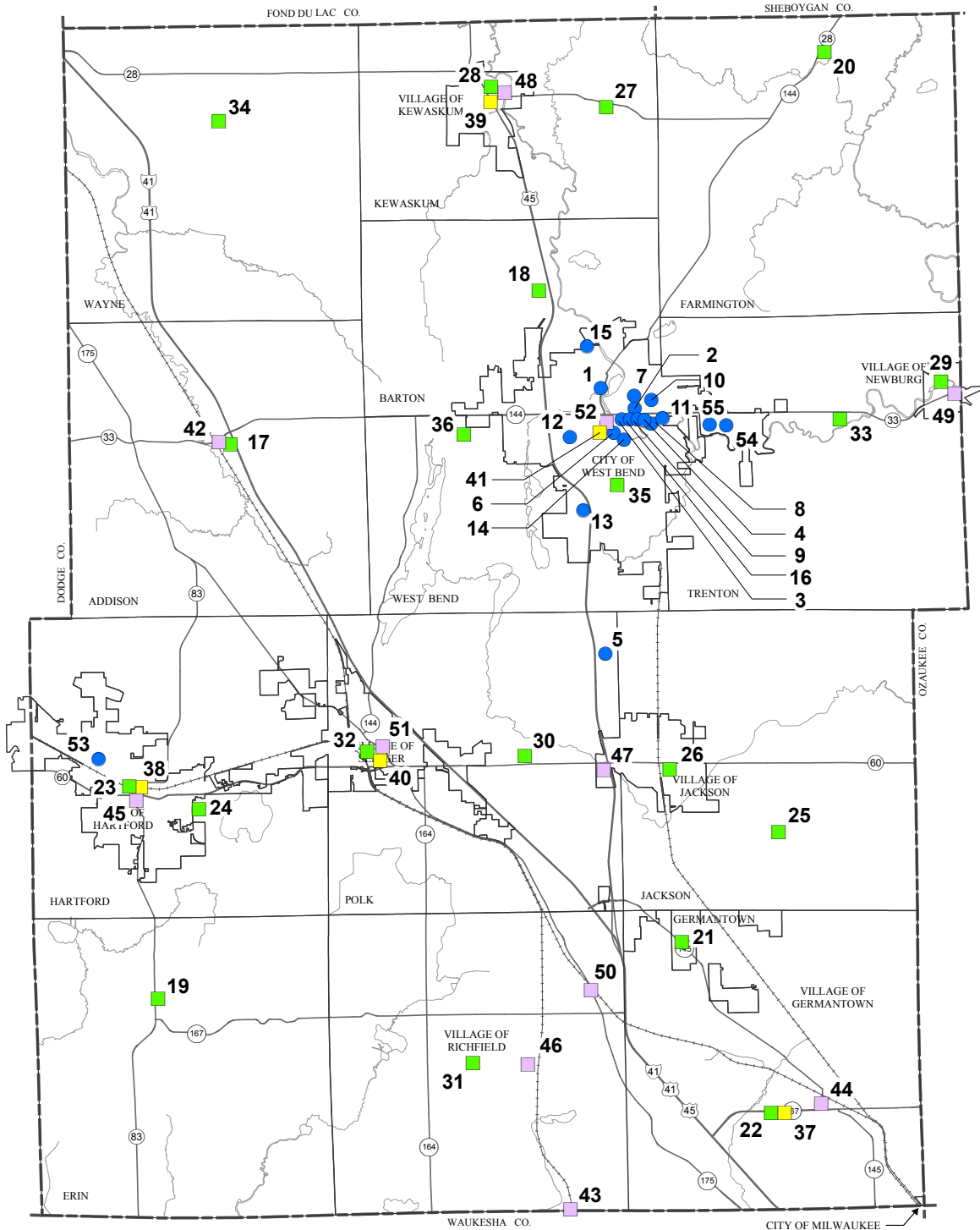
Map 20

**PUBLIC AND PRIVATE SCHOOLS AND PUBLIC HIGH SCHOOL DISTRICTS IN WASHINGTON COUNTY: 2015**



Map 21

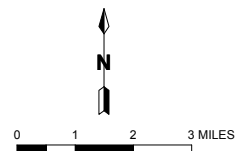
GOVERNMENT AND PUBLIC INSTITUTIONAL BUILDINGS IN WASHINGTON COUNTY: 2015



GOVERNMENT AND PUBLIC INSTITUTIONAL BUILDINGS

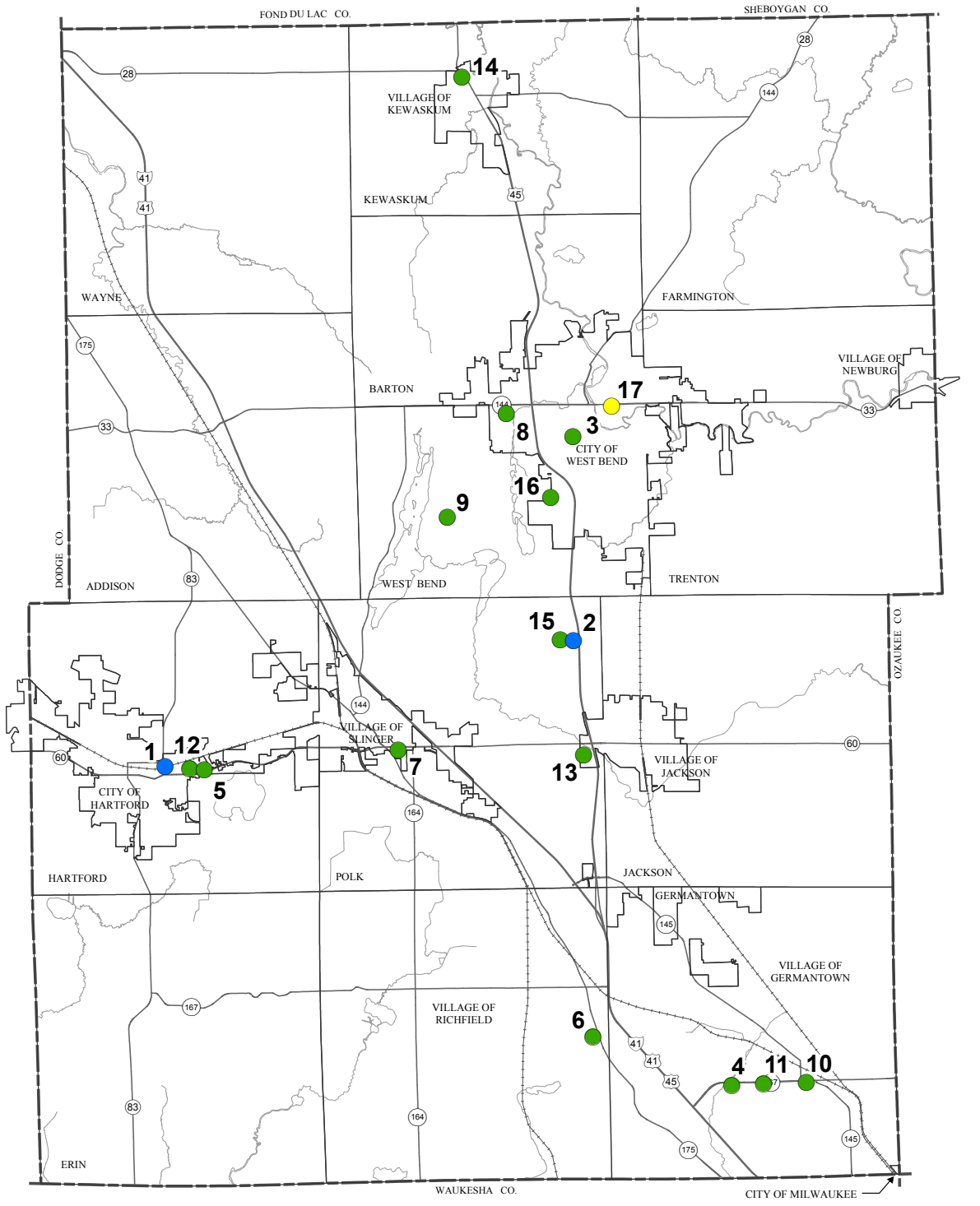
- REGIONAL OR COUNTY
- MUNICIPAL HALL
- LIBRARY
- POST OFFICE
- 4** REFERENCE NUMBER  
(SEE TABLE E-2 IN APPENDIX E)

Source: Washington County and SEWRPC.



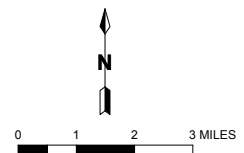
# Map 22

## HOSPITALS AND CLINICS IN WASHINGTON COUNTY: 2015



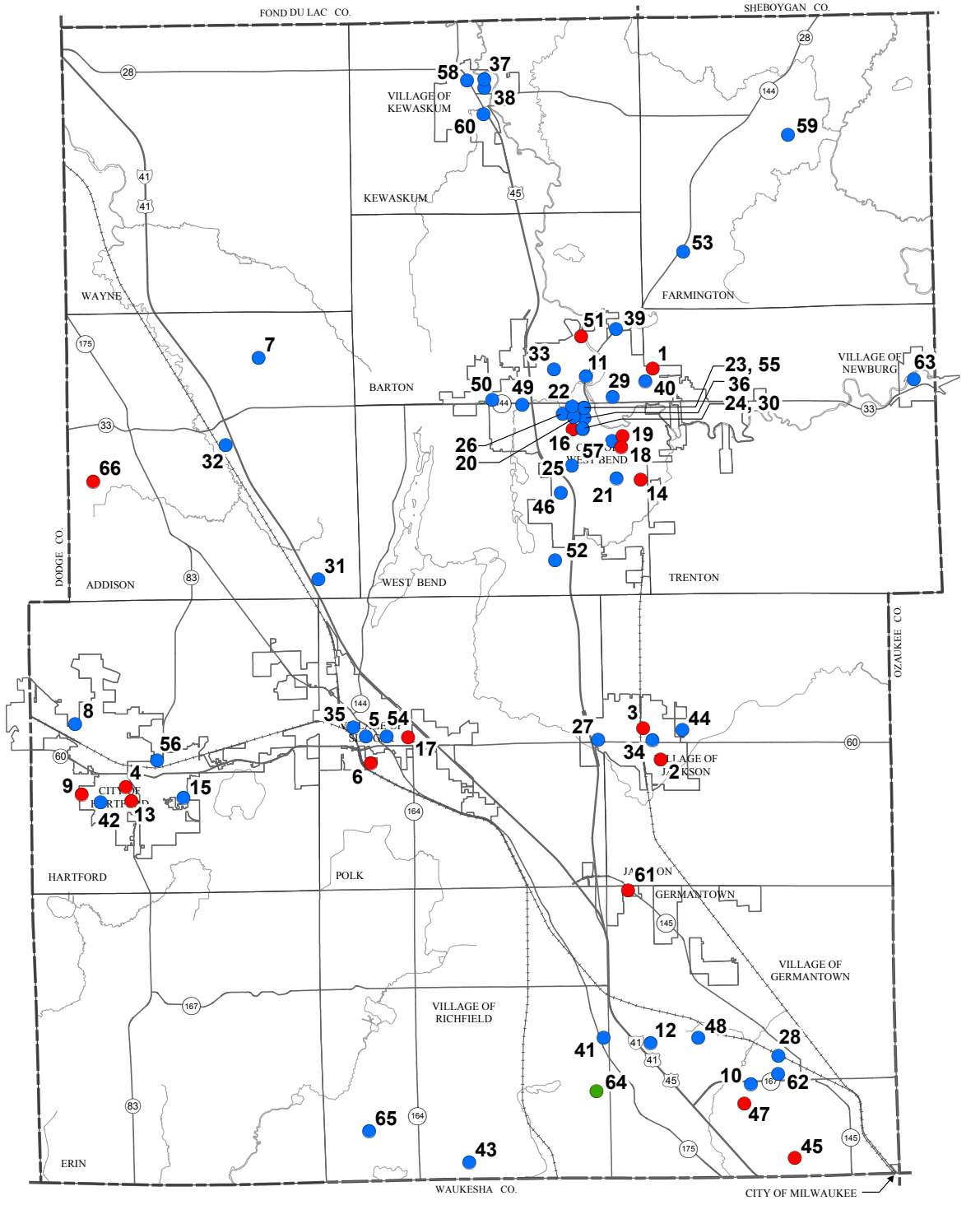
- HOSPITAL
- CLINIC
- HEALTH DEPARTMENT
- 4** REFERENCE NUMBER  
(SEE TABLE E-3 IN APPENDIX E)

Source: Washington County and SEWRPC.



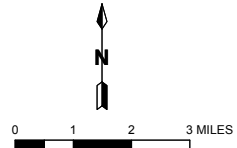
Map 23

CHILD CARE CENTERS IN WASHINGTON COUNTY: 2015



- LICENSED FAMILY CHILD CARE
- LICENSED GROUP CHILD CARE CENTER
- LICENSED CAMP CHILD CARE CENTER
- 25** REFERENCE NUMBER  
(SEE TABLE E-4 IN APPENDIX E)

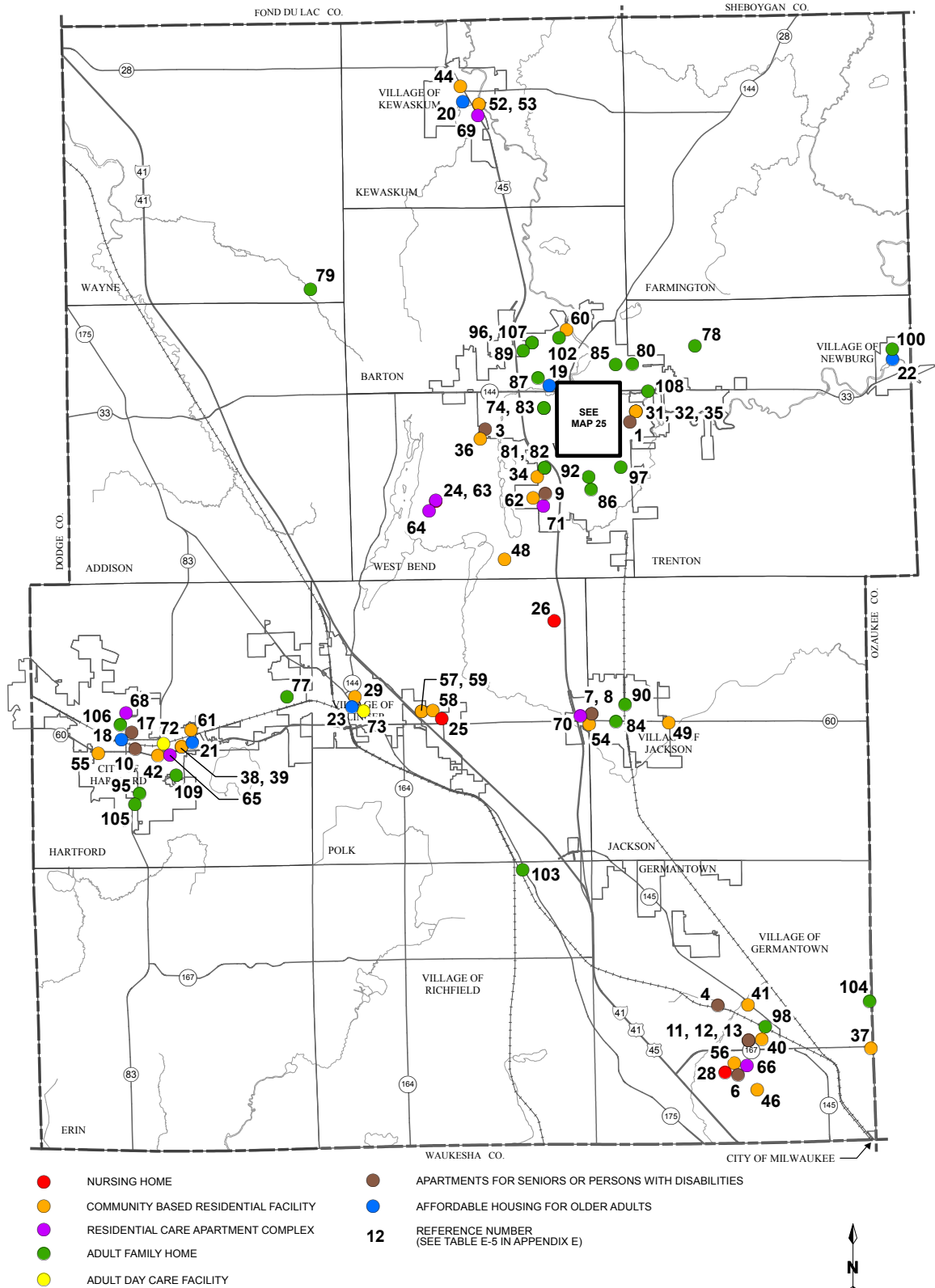
Source: Wisconsin Department of Health and Family Services, Washington County, and SEWRPC.



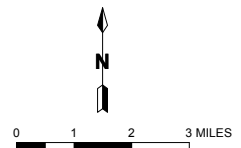


Map 24

**NURSING HOMES, ASSISTED LIVING FACILITIES, INDEPENDENT HOUSING,  
AND SENIOR APARTMENTS IN WASHINGTON COUNTY: 2015**

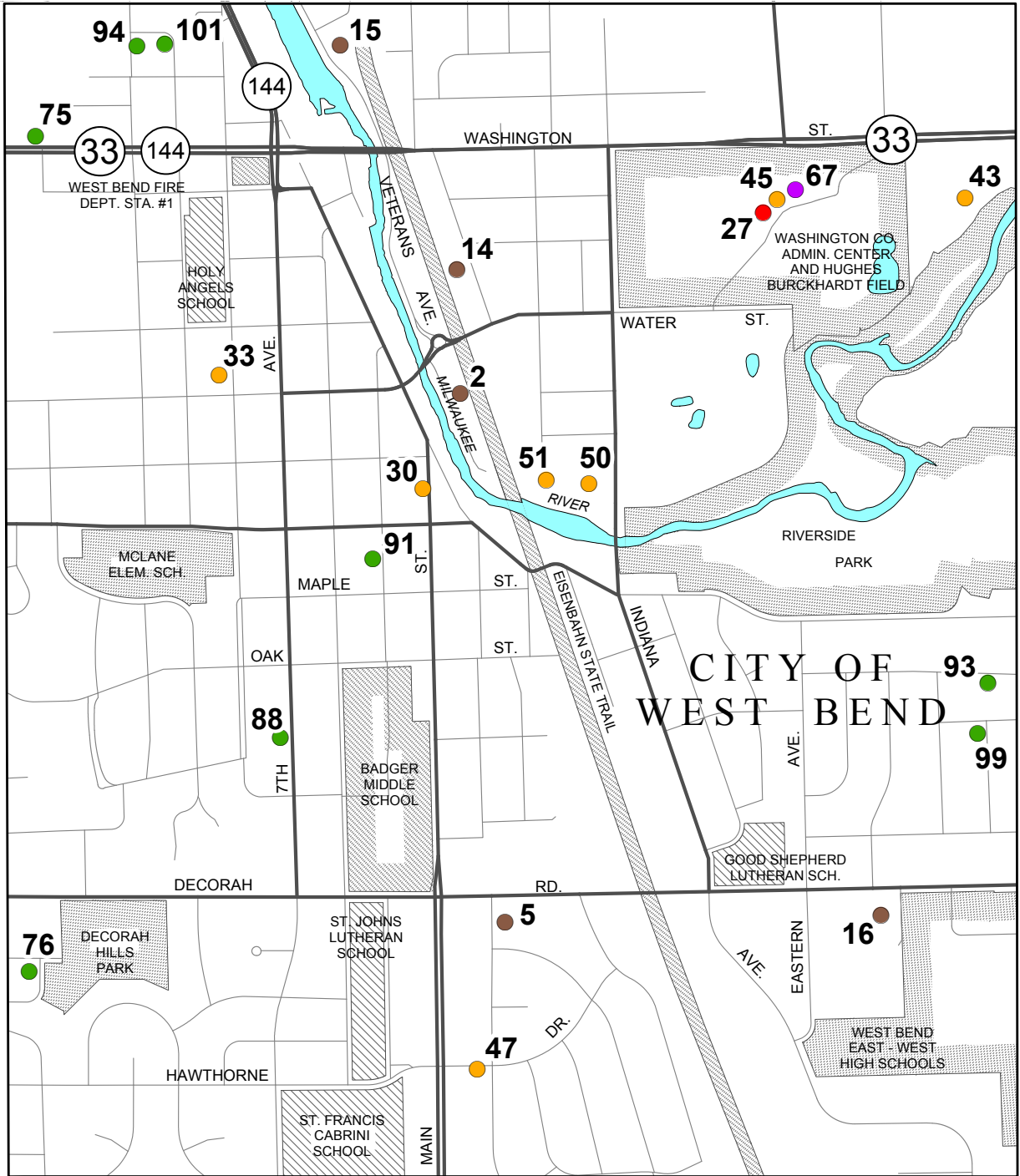


Source: Wisconsin Department of Health and Family Services, Washington County, and SEWRPC.

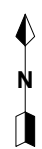


Map 25

**NURSING HOMES, ASSISTED LIVING FACILITIES, INDEPENDENT HOUSING,  
AND SENIOR APARTMENTS IN THE CITY OF WEST BEND CITY CENTER: 2015**



- NURSING HOME
- COMMUNITY BASED RESIDENTIAL FACILITY
- RESIDENTIAL CARE APARTMENT COMPLEX
- ADULT FAMILY HOME
- APARTMENTS FOR SENIORS OR PERSONS WITH DISABILITIES
- 93** REFERENCE NUMBER (SEE TABLE E-5 IN APPENDIX E)



Source: Wisconsin Department of Health and Family Services, Washington County, and SEWRPC.

fuel, antifreeze, hydraulic fluid, or other petrochemical substances. Other releases have included mineral oils, paints, solvents, propane or natural gas, and industrial process and wastewater. A complete file on all spills is maintained by the Washington County Office of Emergency Management. These spills have typically been properly handled through local emergency response actions.

## HISTORIC SITES

Historic sites in Washington County often have important recreational, educational, and cultural value. In 2014 there were 26 historic places and districts listed on the National Register of Historic Places and the State Register of Historic Places, as shown on Map 26 and in Table 15. In most cases, historic places or districts listed on the National Register are also listed on the State Register. Since the State Register was created in 1991, all properties nominated for the National Register must first go through the State Register review process. Upon approval by the State review board, a site is listed on the State Register of Historic Places and recommended to the National Park Service for review and listing on the National Register of Historic Places. The only exceptions to this process are federally-owned properties, which may be nominated for the National Register directly by the National Park Service. Of the 26 historic places and districts listed on the National and State Registers, 20 are historic buildings or structures, five are historic districts, and one is a historic site. Sites and districts listed on the National and State Registers of Historic Places have an increased measure of protection against degradation and destruction. Listing on the National or State Register requires government agencies to consider the impact of their activities, such as the construction or reconstruction of a highway, or a permit which they issue, on the designated property. If the property would be adversely affected, the agency must work with the State Historic Preservation Officer to attempt to avoid or reduce adverse effects.

**Table 14**

### CIVIL DIVISION LOCATION OF FACILITIES THAT STORE HAZARDOUS MATERIALS: 2015

Municipality	Number of Facilities		
	Reporting Only	Planning Only	Reporting and Planning
<b>Cities</b>			
Hartford .....	10	1	8
West Bend.....	16	1	8
Subtotal	26	2	16
<b>Villages</b>			
Germantown.....	17	1	14
Jackson .....	4	0	9
Kewaskum.....	4	0	1
Newburg.....	0	0	1
Richfield.....	8	0	1
Slinger .....	4	0	0
Subtotal	37	1	26
<b>Towns</b>			
Addison .....	4	0	3
Barton.....	2	0	2
Erin.....	1	0	0
Farmington .....	1	0	0
Germantown.....	1	0	0
Hartford .....	0	0	2
Jackson .....	6	0	1
Kewaskum.....	1	0	0
Polk .....	4	0	0
Trenton .....	1	0	0
Wayne .....	1	0	0
West Bend.....	3	0	0
Subtotal	25	0	8
<b>Total</b>	<b>88</b>	<b>3</b>	<b>50</b>

Source: Washington County Emergency Management Office.

## REGULATIONS AND PROGRAMS RELATED TO HAZARD MITIGATION

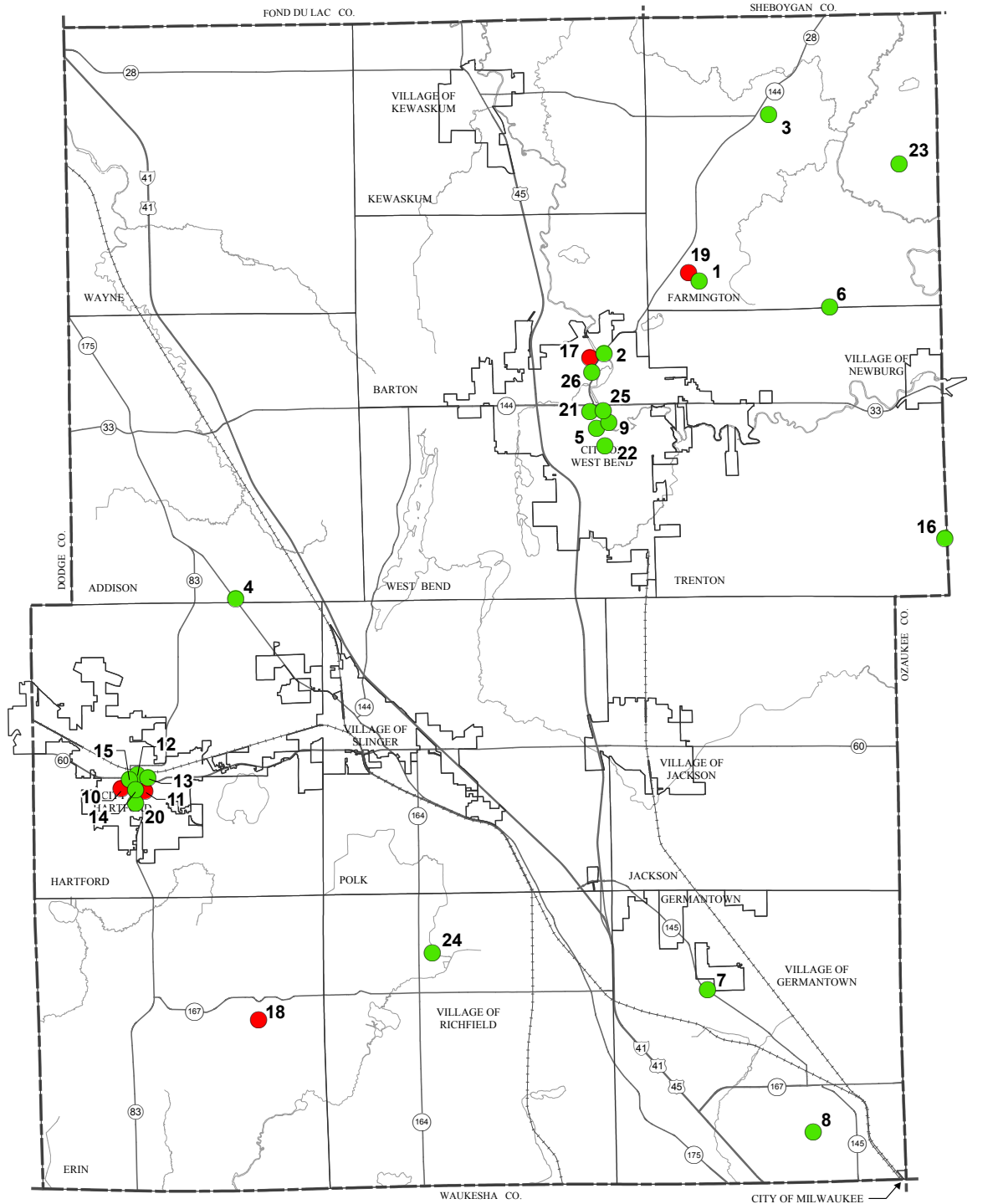
The current ordinances and programs which are most directly related to hazard mitigation and plan implementation include general zoning, floodplain zoning, shoreland and shoreland-wetland zoning regulations, stormwater management, and emergency operations programs. The zoning ordinances and operations programs most related to hazard mitigation administered by Washington County and the local units of government in the County are summarized in Table 16, and below.

### General Zoning

Cities in Wisconsin are granted general, or comprehensive, zoning powers under Section 62.23 of the *Wisconsin Statutes*. The same powers are granted to villages under Section 61.35 of the *Wisconsin Statutes*. Counties are granted general zoning powers within their unincorporated areas under Section 59.69 of the *Wisconsin Statutes*.

Map 26

HISTORIC SITES AND DISTRICTS IN WASHINGTON COUNTY LISTED ON THE NATIONAL AND STATE REGISTERS OF HISTORIC PLACES: 2015



- HISTORIC DISTRICTS
- HISTORIC SITES
- 16** REFERENCE NUMBER (SEE TABLE II-13)

Source: State Historical Society of Wisconsin, Washington County and SEWRPC.

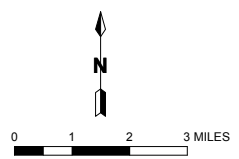


Table 15

**HISTORIC SITES AND DISTRICTS IN  
WASHINGTON COUNTY ON THE NATIONAL REGISTER OF HISTORIC PLACES: 2014**

Number on Map II-23	Site Name	Location <sup>a</sup>	Municipality	Year Listed
1	Lizard Mound Park .....	T12N, R20E, Section 32	Town of Farmington	1970
2	Gadow's Mill .....	1784 Barton Avenue	City of West Bend	1974
3	St. John of God Roman Catholic Church, Convent and School .....	1488 Highland Drive	Town of Farmington	1979
4	Ritger Wagonmaking and Blacksmith Shop .....	4928 STH 175	Town of Addison	1982
5	Washington County Courthouse and Jail .....	320 S. 5th Avenue	City of West Bend	1982
6	St. Peter's Church .....	1010 Newark Drive	Town of Farmington	1983
7	Christ Evangelical Church .....	W188 N12808 Fond du Lac Avenue	Village of Germantown	1983
8	Jacob Schunk Farmhouse .....	Donges Bay Road	Village of Germantown	1983
9	Leander F. Frisby House .....	304 S. Main Street	City of West Bend	1985
10	Kissel's Addition Historic District .....	T10N, R18E, Section 20	City of Hartford	1988
11	Kissel's Wheelock Addition Historic District .....	T10N, R18E, Section 21	City of Hartford	1988
12	George A. Kissel House .....	215 E. Summer Street	City of Hartford	1988
13	Louis Kissel House .....	407 E. Summer Street	City of Hartford	1988
14	Otto P. Kissel House .....	124 South Street	City of Hartford	1988
15	William L. Kissel House .....	67 South Street	City of Hartford	1988
16	St. Augustine Catholic Church and Cemetery .....	CTH Y	Town of Trenton	1990
17	Barton Historic District .....	T11N, R19E, Section 11	City of West Bend	1992
18	Holy Hill .....	1525 Carmel Road	Town of Erin	1992
19	Washington County "Island" Effigy Mound District .....	T12N, R20E, Sections 29, 32, 33	Town of Farmington	1996
20	Schwartz Ballroom .....	150 Jefferson Avenue	City of Hartford	1998
21	West Bend Post Office .....	607 Elm Street	City of West Bend	2000
22	Amity Leather Products Company Factory .....	723-735 S. Main Street	City of West Bend	2002
23	Saxonia House .....	421 CTH H	Town of Farmington	2006
24	Messer-Mayer Mill .....	4399 Pleasant Hill Road	Village of Richfield	2007
25	West Bend Chicago and Northwestern Depot .....	Veterans Avenue at Willow Lane	City of West Bend	2008
26	St. Agnes Convent and School .....	1386 Fond du Lac Street	City of West Bend	2010

<sup>a</sup>In some instances, location is given in U.S. Public Land Survey Township, Range, and Section.

Source: State Historical Society of Wisconsin, Washington County, and SEWRPC.

However, a county zoning ordinance becomes effective only in those towns that ratify the county ordinance. Towns that have not adopted a county zoning ordinance may adopt village powers and subsequently utilize the city and village zoning authority conferred in Section 62.23 of the *Wisconsin Statutes*. Town zoning, however, is subject to county board approval where a general county zoning ordinance exists. Alternatively, towns may adopt a zoning ordinance under Section 60.61 of the *Wisconsin Statutes* where a general county zoning ordinance has not been adopted, but only after the county board fails to adopt a county ordinance at the petition of the governing body of the town concerned. Each city, village, and town in Washington County has adopted and enforces its own zoning ordinance. In Washington County, the County shoreland and floodplain zoning ordinance applies to shoreland areas in addition to Town general zoning.

**Floodplain Zoning, Shoreland, and Shoreland-Wetland Zoning**

Section 87.30 of the *Wisconsin Statutes* requires that counties, with respect to their unincorporated areas, cities, and villages adopt floodplain zoning to regulate activities within the floodplain and to prevent the location of new flood-damage-prone development in flood hazard areas. The minimum standards that such ordinances must meet are set forth in Chapter NR 116, "Wisconsin's Floodplain Management Program," of the *Wisconsin Administrative Code*. The required regulations govern filling and development within a regulatory floodplain, which is defined as the area subject to inundation by the one-percent-annual-probability (100-year recurrence interval) flood event. Under Chapter NR 116, local floodplain zoning regulations must prohibit nearly all forms of development within the

Table 16

REGULATIONS AND PROGRAMS WITHIN WASHINGTON COUNTY RELATED TO HAZARD MITIGATION

Municipality	Type of Ordinance or Program					
	General Zoning	Floodplain Zoning	Stormwater Management	Shoreland or Shoreland Wetland Zoning	Emergency Operations Plan	Floodplain and Shoreland Zoning Reference Data
Washington County	--	Adopted	Adopted	Adopted	Adopted	Washington County Code Chapter 23, Shoreland, Wetland and Floodplain Zoning
City of Hartford	Adopted	Adopted	Adopted	Adopted	Adopted	City of Hartford Municipal Code Chapter 16 Floodplain Zoning Ordinance, updated March 12, 2012; Sections 13.0332-13.0333
City of West Bend	Adopted	Adopted	Adopted	Adopted	Adopted	City of West Bend Municipal Code Chapter 17 Zoning Code, updated February 21, 2015. Sections 17.50 through 17.60, 17.70 through 17.77
Village of Germantown	Adopted	Adopted	Adopted	Adopted	Adopted	Germantown Code of Ordinances updated May 2, 2014 Chapter 23 Floodplain Zoning Ordinance; Chapter 24 Shoreland-Wetland Zoning Code
Village of Jackson	Adopted	Adopted	-- <sup>a</sup>	Adopted	--	Village of Jackson Municipal Code Chapter 14 Zoning Code, Section 14.08, Floodland and Shoreland-Wetland Ordinance; Chapter 23, FEMA Floodplain Ordinance
Village of Kewaskum	Adopted	Adopted	Adopted	Adopted	Adopted	Municipal Code of Kewaskum, Wisconsin, Chapter 40, Floods, Sections 40-26 through 40-147, Floodplain Zoning; Chapter 74 Shoreland-Wetland Zoning
Village of Newburg	Adopted	Adopted	-- <sup>b</sup>	--	Adopted	Village of Newburg Zoning Ordinance, adopted 1991 and revised 1994.
Village of Richfield	Adopted	Adopted	Adopted	Adopted	Adopted	Village of Richfield Municipal Code Chapter 70, Zoning: Sections 70.210, Floodland District; 70.211 Shoreland-Wetland District; 70.213 Floodplain District
Village of Slinger	Adopted	Adopted	Adopted	Adopted	Adopted	Village of Slinger Code of Ordinances Article 31, Zoning Ordinance, Section 3.22 Appendix A Floodplain Zoning Ordinance
Town of Addison	Adopted	County Ordinance	Adopted	County Ordinance	--	Washington County Ordinance
Town of Barton	Adopted	County Ordinance	County Ordinance	County Ordinance	--	Washington County Ordinance
Town of Erin	Adopted	County Ordinance	County Ordinance	County Ordinance	Adopted	Washington County Ordinance
Town of Farmington	Adopted	County Ordinance	County Ordinance	County Ordinance	Adopted	Washington County Ordinance
Town of Germantown	Adopted	County Ordinance	County Ordinance	County Ordinance	--	Washington County Ordinance
Town of Hartford	Adopted	County Ordinance	County Ordinance	County Ordinance	--	Washington County Ordinance
Town of Jackson	Adopted	County Ordinance	County Ordinance	County Ordinance	Adopted	Washington County Ordinance
Town of Kewaskum	Adopted	County Ordinance	Adopted	County Ordinance	Adopted	Washington County Ordinance

**Table 16 (continued)**

Municipality	Type of Ordinance or Program					
	General Zoning	Floodplain Zoning	Stormwater Management	Shoreland or Shoreland Wetland Zoning	Emergency Operations Plan	Floodplain and Shoreland Zoning Reference Data
Town of Polk	Adopted	County Ordinance	County Ordinance	County Ordinance	--	Washington County Ordinance
Town of Trenton	Adopted	County Ordinance	Adopted	County Ordinance	Adopted	Washington County Ordinance
Town of Wayne	Adopted	County Ordinance	County Ordinance	County Ordinance	County Ordinance	Washington County Ordinance
Town of West Bend	Adopted	County Ordinance	County Ordinance	County Ordinance	County Ordinance	Washington County Ordinance

<sup>a</sup>Erosion control is addressed in Section 14.09 of the Village's zoning ordinance and Section 15.06 of the Village's land division and subdivision ordinance.

<sup>b</sup>The Village of Newburg has adopted and administers an erosion control ordinance, but has not adopted a stormwater management ordinance.

Source: Washington County Emergency Management Office, Washington County Planning and Parks Department, and SEWRPC.

floodway, which is that portion of the floodplain required to convey the one-percent-annual-probability peak flood flow. Local regulations must also restrict filling and development within the flood fringe, which is that portion of the floodplain located outside of the floodway that would be covered by floodwater during the one-percent-annual-probability flood. Permitting the filling and development of the flood fringe area reduces the floodwater storage capacity of the natural floodplain, and may thereby increase adjacent flood flows and stages.

Under Section 59.692 of the *Wisconsin Statutes*, counties in Wisconsin are required to adopt zoning regulations within statutorily defined shoreland areas, or, those lands that are within 1,000 feet of the ordinary highwater mark (OHWM) of a navigable lake, pond, or flowage; or 300 feet of the OHWM of a navigable stream or to the landward side of the floodplain along a navigable stream, whichever distance is greater, within their unincorporated areas. Standards for county shoreland zoning ordinances are set forth in Chapter NR 115, "Wisconsin's Shoreland Protection Program," of the *Wisconsin Administrative Code*. Chapter NR 115 sets forth requirements regarding lot sizes and building setbacks; restrictions on cutting of trees and shrubbery; and restrictions on filling, grading, lagooning, dredging, ditching, and excavating that must be incorporated into county shoreland zoning regulations. In addition, Chapter NR 115 requires that counties place all wetlands within the statutory shoreland zoning jurisdiction area into a wetland conservancy zoning district to ensure their preservation after completion of appropriate wetland inventories by the Wisconsin Department of Natural Resources.

In 1982, the State Legislature extended shoreland-wetland zoning requirements to cities and villages in Wisconsin. Under Sections 62.231 and 61.351 of the *Wisconsin Statutes* cities and villages, respectively, in Wisconsin are required to place wetlands five acres or larger and located wholly or partially in statutory shorelands into a shoreland-wetland conservancy zoning district to ensure their preservation. Standards for city and village shoreland-wetland zoning ordinances are set forth in Chapter NR 117, "Wisconsin's City and Village Shoreland-Wetland Protection Program," of the *Wisconsin Administrative Code*. Under Sections 62.233 and 61.353 of the *Wisconsin Statutes* cities and villages, respectively are required to establish shoreland setback areas of at least 50 feet from the OHWM and specify conditions under which a principal building may be constructed or placed within these setback areas.

The Washington County Shoreland, Wetland, and Floodplain zoning ordinance is set forth in Chapter 23 of the Washington County Code of Ordinances and applies to shorelands, shoreland-wetlands, and floodplains in all towns within the County. The County generally protects these areas from intensive development. The shoreland zoning ordinance includes restrictions on uses in wetlands of located within the shoreland, limits the types of uses that can

occur in the 1-percent-annual probability floodplain zoning district to prevent damage to structures and property and to protect the floodwater conveyance and storage capacity of floodplains. The ordinance also includes restrictions on the removal of vegetation and filling, grading, and excavation within the shoreland area.

The 2015-1017 State Budget (Act 55) changed State law relative to shoreland zoning. Under Act 55 a shoreland zoning ordinance may not regulate a matter more restrictively than it is regulated by a State shoreland-zoning standard unless the matter is not regulated by a standard in Chapter NR 115, “Wisconsin’s Shoreland Protection Program,” of the *Wisconsin Administrative Code*. (Examples of unregulated matters may involve wetland setbacks, bluff setbacks, development density, and stormwater standards.) In addition, under Act 55, a local shoreland zoning ordinance may not require establishment or expansion of a vegetative buffer on already developed land and may not establish standards for impervious surfaces unless those standards consider a surface to be pervious if its runoff is treated or is discharged to an internally drained pervious area.

### **Emergency Operations Planning**

Washington County has developed a comprehensive emergency management plan (CEMP)<sup>8</sup> which sets forth an all-hazards action plan. The CEMP provides the framework for the Washington County government and partner entities to respond to public emergencies within the local jurisdiction and regionally. The CEMP establishes a unified command and control structure for emergency response operations to ensure a coordinated and effective response. The CEMP also incorporates the concepts and processes of the National Incident Management System as the standard for emergency response operations.

In addition, many of the local units of government have developed emergency operations plans and/or programs which complement the County plan and which also set forth procedures and actions to deal with a range of situations and events. Washington County’s emergency operations plan notes that the County is exposed to many hazards that have the potential for disrupting the community, causing damage, and creating casualties. In addition to flooding, the plan recognizes that the County is vulnerable to other natural hazards, including tornadoes and severe weather; technological hazards; accidents involving hazardous materials; terrorism and civil disorder; and utility hazards, such as power failure and water shortages or contamination.

The County plan includes procedures and protocols to respond to disasters or large-scale emergencies. The purpose and goal of the County emergency operations plan is to assist government in protecting lives, property, and the environment from major emergencies through addressing the areas of mitigation, preparedness, response, and recovery. This basic plan is intended as the core of the Washington County emergency operations program. It provides policies for department and agency managers and emergency management professionals to use in planning and actual operations. In response to a disaster or large-scale emergency, all local government forces, including law enforcement, fire, medical, health, public works, and others, will be considered a part of the County’s emergency management organization, and will be the first line responders to such an emergency. When the emergency or disaster exceeds the capability of the local governments and the County to respond, the County will request assistance from the State of Wisconsin on behalf of the County and the affected municipalities. The Federal government will provide assistance to the State of Wisconsin when all local and State resources have been exhausted.

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<sup>8</sup> *Washington County, Comprehensive Emergency Management Plan (CEMP) for Washington County, Wisconsin, February 2013.*



## **Chapter III**

# **ANALYSIS OF HAZARD CONDITIONS**

In order to evaluate various potential hazard mitigation alternatives for Washington County and select the most effective and feasible hazard mitigation strategies, the existing potential hazard problems in the County must first be analyzed and the vulnerability to such hazards documented. Accordingly, this chapter provides the following:

- Identification of the hazards likely to affect Washington County;
- Profiles of the extent and severity of hazard events that have occurred in the County;
- Assessment of the vulnerability and risk associated with each type of hazard; and
- Identification of the potential for changes in hazard severity and risk under future conditions.

The vulnerability assessments focus on the County and community assets described in Chapter II.

### **HAZARD IDENTIFICATION**

The process of identifying those hazards that should be specifically addressed in the Washington County hazard mitigation plan was based upon consideration of a number of factors. The process included input from the Washington County Hazards Mitigation Plan Local Planning Team, including an evaluation of the risks posed to the County by various hazards using a hazard and vulnerability assessment tool; review of the hazard identification set forth in the State hazard mitigation plan; review of documentation of past hazard events; and review of related available mapping, plans, and assessments.

#### **Local Input**

The Washington County Hazard Mitigation Plan was developed through a collective effort of a number of agencies, organizations, and business representatives under the guidance of the Washington County Hazards Mitigation Plan Local Planning Team, which was created by the County specifically for plan development purposes. That committee is comprised of elected and appointed officials and business representatives from throughout the County knowledgeable about, and directly involved in, hazard mitigation matters.

During the drafting of the plan, the first two meetings of the Local Planning Team were devoted, in part, to hazard identification. At the first meeting, the Local Planning Team evaluated potential hazards using a hazard and vulnerability assessment tool. A copy of this tool is included in Appendix A. Members of the Local Planning Team indicated the likelihood of each hazard occurring in Washington County and evaluated the severity of each hazard on the basis of possible impacts to people, property, and business and government agencies. Finally, the Local Planning Team evaluated the relative state of preparedness for each hazard. The ratings given by the Local Planning

Team for each hazard were used to derive a perceived level of risk posed by each hazard. Following this, the hazards were ranked by perceived level of risk.

### ***Summary of Hazard and Vulnerability Assessment Tool Results***

#### ***Methods***

The assessment tools were completed at the April 16, 2015, meeting of the Washington County Hazard Mitigation Plan Local Planning Team, with 26 surveys being returned and analyzed. For each of 45 hazards in each survey, a risk was computed using the formula:

$$\text{Risk(in \%)} = [(\text{Probability}/3) \times (\text{Human impact} + \text{Property impact} + \text{Business impact} + \text{Preparedness})/(4*3)] * 100$$

Where Probability (likelihood that an event would occur), Human impact (possibility of death or injury), Property impact (physical losses and damages), Business and agency impact (interruption of services), and Preparedness (preplanning) were each assigned a number from 0 to 3, with 0 indicating “not applicable”, 1 indicating low, 2 indicating moderate, and 3 indicating high.

The interpretation of the result returned by this formula is that the perceived threat increases with increasing percentage risk.

For each hazard, an average risk was calculated using the results of all the returned surveys. The hazards were then ranked by average perceived risk, with a rank of 1 indicating the highest perceived risk. For each hazard, minimum and maximum perceived risks were calculated. The results from the assessment tool were analyzed for 45 hazards.

In order to determine the degree of agreement among Local Planning Team members in the assessment of average perceived risk, the interquartile range was calculated for each hazard. This quantity indicates the range of the half of the responses that are in middle. A smaller interquartile range indicates greater agreement among Local Planning Team members as to the level of risk, while a larger interquartile range indicates less agreement. In those instances where two or more hazards had the same average risk, lower rank (and higher perceived risk) was assigned to the hazard with the smaller interquartile range.

#### ***Results***

The results from the assessment tool are summarized in Table 17. The average level of perceived risk for hazards ranged from 9.7 percent for the lowest ranked hazards (dust storms and earthquakes) to 46.0 percent for the highest ranked hazard (roadway transportation accidents), with a mean value of 27.9 percent. Interquartile ranges ranged between 8 and 39, with a mean value of 25.2.

Nine of the 10 highest average perceived risks belonged to natural hazards related to meteorological causes, mostly associated with either winter weather or severe storms (Table 17). The remaining member of the 10 highest average perceived risks belongs to technological or human-induced hazards. The interquartile ranges for most of the 10 hazards with the highest perceived average risks tended to be relatively large, indicating a diversity of opinion among Local Planning Team members as to the level of risk posed by each of these hazards. In some instances, such as the hazards posed by roadway transportation accidents, there was general agreement among Local Planning Team members that the level of risk was relatively high, but disagreement as to just how high. The results also showed relatively strong agreement among Local Planning Team members as to the level of risk posed by three of the top 10 ranked hazards: heavy snow storms, high straight-line winds, and lightning. The interquartile ranges associated with these hazards were quite low.

As shown in Table 17, the highest perceived risk was associated with roadway transportation accidents. The high interquartile range associated with this hazard indicates considerable diversity among members of the Local Planning Team as to the level of risk posed by this hazard. The next highest perceived risk was associated with tornadoes. As with roadway transportation accidents, there was considerable diversity among team members as to the level of

Table 17

PERCEIVED RISKS OF HAZARDS AS DETERMINED BY HAZARD AND VULNERABILITY ASSESSMENT TOOL: 2015

Event	Minimum (percent) <sup>a</sup>	Maximum (percent) <sup>a</sup>	Average (percent) <sup>a</sup>	Rank	Interquartile Range (percent) <sup>b</sup>
Roadway Transportation Accidents	0.0	83.3	46.0	1	39
Tornado	0.0	91.7	45.7	2	31
Heavy Snow Storm	11.1	66.7	44.9	3	11
Thunderstorm	0.0	75.0	44.3	4	25
High Straight-line Wind	5.6	75.0	41.9	5	11
Lightning	0.0	75.0	41.9	6	17
Hail	0.0	75.0	40.9	7	22
Ice Storm	8.3	91.7	39.0	8	22
Extreme Cold	11.1	66.7	38.9	9	25
Blizzard	11.1	66.7	36.6	10	28
Stormwater Flooding	2.8	100.0	35.0	11	36
Hazardous Materials Fixed Facilities	0.0	100.0	33.0	12	28
Hazardous Materials Pipeline Incident	0.0	100.0	33.0	13	36
Hazardous Materials Roadway Incident	0.0	75.0	32.9	14	28
Fog	0.0	66.7	32.4	15	36
Electrical System Outage	11.7	75.0	31.2	16	22
Large Structure Fires	0.0	83.3	31.2	17	28
Hazardous Materials Railroad Incident	0.0	75.0	29.6	18	44
Riverine Flooding	0.0	100.0	29.0	19	25
Loss of Telecommunication	0.0	100.0	28.8	20	33
Computer System Incident/Cyber Attack	0.0	75.0	28.6	21	22
Drought	0.0	66.7	27.8	22	25
Wildfire	0.0	83.3	27.6	23	25
Contamination or Loss of Water Supply	0.0	66.7	25.3	24	33
Mass Casualty Incident	0.0	61.1	25.1	25	33
Explosion	0.0	61.1	25.0	26	17
Workplace Violence	0.0	55.6	25.0	27	33
Communicable Disease Outbreak or Epidemic	0.0	58.3	24.9	28	31
Extreme Heat	0.0	50.0	24.4	29	25
Railroad Transportation Accidents	0.0	75.0	24.0	30	28
Terrorism Incident	0.0	61.1	23.7	31	28
School Violence	0.0	75.0	23.0	32	28
Loss of Sewerage System	0.0	66.7	22.6	33	28
Building Collapse or Cave-In	0.0	61.1	21.9	34	20
Aviation Accidents	0.0	44.4	21.8	35	20
Fuel Shortage	0.0	50.0	21.0	36	17
Large-scale Food Contamination	0.0	66.7	20.3	37	17

**Table 17 (continued)**

Event	Minimum (percent) <sup>a</sup>	Maximum (percent) <sup>a</sup>	Average (percent) <sup>a</sup>	Rank	Interquartile Range (percent) <sup>b</sup>
Dam Failure	0.0	55.6	17.5	38	25
Lake Flooding	0.0	75.0	17.1	39	33
Civil Unrest	0.0	44.4	13.9	40	8
Correctional Center Incident	0.0	83.3	11.1	41	14
Landslide	0.0	25.0	11.3	42	17
Land Subsidence	0.0	25.0	11.2	43	17
Earthquake	0.0	30.6	9.7	44 <sup>c</sup>	17
Dust Storm	0.0	44.4	9.7	44 <sup>c</sup>	17

<sup>a</sup>Perceived threat increases with percentage.

<sup>b</sup>Interquartile range acts as a measure of agreement upon the perceived level of threat with a smaller interquartile range indicating stronger agreement and a larger interquartile range indicating weaker agreement.

<sup>c</sup>Earthquake and dust storm were tied for rank 44.

Source: SEWRPC.

risk posed by this hazard. Hazards related to winter weather conditions were heavily represented among the top 10 ranked risks. Heavy snow storms, ice storms, extreme cold, and blizzards were ranked third, eighth, ninth, and tenth, respectively. The interquartile ranges showed relatively strong agreement among members of the Local Planning Team as to the level of perceived risk associated with heavy snow storms. For the other three winter weather hazards, the interquartile ranges were near the mean value. Hazards related to thunderstorms were also heavily represented among the top 10 ranked risks. Thunderstorms, high straight-line winds, lightning, and hail were ranked fourth, fifth, sixth, and seventh, respectively. The interquartile ranges showed relatively strong agreement among members of the Local Planning Team as to the levels of perceived risk associated with high straight-line winds and lightning. For thunderstorms and hail, the interquartile ranges were near the mean value.

Stormwater-related flooding ranked eleventh in the level of perceived risk. Lower perceived risks were associated with flooding related to other causes, with riverine flooding ranking nineteenth and lake flooding ranking thirty-ninth.

The Local Planning Team also assigned relatively high average levels of risk to hazardous material incidents, with incidents related to fixed facilities, pipelines, roadways, and railroads ranking twelfth, thirteenth, fourteenth, and eighteenth, respectively.

The 10 lowest average perceived risks belonged to hazards related to a variety of causes, including natural hazards related to geological events, some weather-related hazards, some human-induced or technological hazards, and hazards related to human behavior. The interquartile ranges for the 10 hazards with the lowest average risks were mostly low, indicating strong agreement among Local Planning Team members as to the level of risk posed by most of these hazards.

### **Past Hazard Experience**

Past experiences with disasters are indications of the potential for future disasters to which Washington County would be vulnerable. Accordingly, a review was made of the hazards that have impacted Washington County in the past and a ranking by risk was made based upon disaster history and emergency management experience.

**Table 18**

**SUMMARY OF ESTIMATED DISASTER DAMAGES AND ASSISTANCE IN WASHINGTON COUNTY FOR SELECTED FEDERALLY DECLARED AND NONDECLARED DISASTERS AND EMERGENCIES: 1976-2014**

Date of Disaster	Estimated Damages (property and crop)	State and Federal Assistance		
		Public Assistance <sup>a</sup>	Individual Assistance <sup>b</sup>	Total Assistance
1976 – Severe Storms, Icing, Wind, Flooding (DR-496) .....	\$17,200,000	\$ 0	\$ 0	\$ 0
1976 – Drought (EM-3014) .....	N/A	0	0	0
1986 – Severe Storms, Flooding (DR-775) .....	2,750,000	0	0	0
1991 – Hail, Severe Storm (DR-912) .....	3,163,000	134,731	0	134,731
1997 – Severe Storms, Flooding (DR-1180) .....	2,700,000	62,241	21,163	83,404
2004 – Severe Storms, Flooding (DR-1526) .....	9,503,000	0	0	0
2005 – Hurricane Katrina Evacuation (EM-3249) .....	N/A	0	0	0
2008 – Snow (EM-3285) .....	N/A	502,335	0	503,335
2008 – Severe Storms, Tornadoes, Flooding (DR-1768) .....	8,630,000	761,701	503,100	1,264,801
2011 – Severe Winter Storm, Snowstorm (DR-1966) .....	N/A	461,502	0	461,502
2012 – Drought <sup>c</sup>	4,070,366	0	0	0
2013 – Excessive Rain and Snow, Freeze and Thaw <sup>c</sup>	1,217,265	0	0	0
<b>Total</b>	<b>\$49,233,631</b>	<b>\$1,922,510</b>	<b>\$524,263</b>	<b>\$2,447,773</b>

NOTE: N/A indicates data not available.

<sup>a</sup>Public assistance includes assistance to local units of government and nonprofit organizations.

<sup>b</sup>Individual assistance includes disaster assistance through FEMA programs and disaster loans from the U.S. Small Business Administration to individuals, households, and businesses.

<sup>c</sup>Secretarial disaster declarations issued by the U.S. Secretary of Agriculture.

Source: Federal Emergency Management Agency, National Climatic Data Center, U.S. Department of Agriculture Risk Management Agency, U.S. Small Business Administration, Wisconsin Emergency Management, and SEWRPC.

If disaster damages exceed the capabilities of local communities and State agencies, Federal assistance will be requested. Federal disaster assistance may be offered through a variety of programs. Assistance may be directed to individuals and families, businesses, agricultural producers, or local governments. Table 18 provides a summary of estimated damages and public assistance from disasters and emergencies in Washington County from 1976 through 2014. This includes those disasters and emergencies for which Presidential disaster or emergency declarations were issued and some for which no such declaration were made.

Between 1976 and 2014, Washington County had seven presidential disaster declarations, two secretarial disaster declarations by the U.S. Department of Agriculture, and three presidential emergency declarations. In addition, the total documented estimated damages of these 12 events exceeded \$49 million. It should be noted that the damage estimates generally underestimate the actual damages that occurred. For these events, about \$2.4 million in State and Federal assistance was provided to Washington County communities, businesses, individuals, and farmers. In addition, an undetermined amount of damages may have been covered by insurance. Almost every year, significant weather events occur causing millions of dollars of damage for which no request is made for Federal disaster assistance. Thus, losses that were sustained from hazards in Washington County over the period 1976 through 2014 are likely to have been significantly greater than the \$49 million estimate shown in Table 18.

Major indicators of hazard severity are the deaths, injuries, and economic losses resulting from natural hazards and disasters. The National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) publishes National Weather Service (NWS) data describing recorded weather events and resulting deaths, injuries, and damages. For damages to crops, these data can be supplemented with records of crop insurance indemnities

**Table 19**

**WEATHER HAZARD EVENTS RECORDED IN WASHINGTON COUNTY, WISCONSIN  
FROM AUGUST 1958 THROUGH DECEMBER 2014 (SORTED BY NUMBER OF EVENTS)**

Event	Total	Deaths <sup>a</sup>	Injuries <sup>a</sup>	Property Damage <sup>b</sup>	Crop Damage <sup>b</sup>
Dust Storms.....	0	0	0	\$ 0	\$ 0
Wild Fires/Forest Fires .....	0	0	0	0	0
Drought.....	8	0	0	0	19,024,796
Tornado.....	16	3	56	72,687,186	200,140
Flood .....	17	0	0	20,889,857	15,900,501
Lightning.....	37	0	4	5,064,470	44,763
Temperature Extremes.....	57	1	0	83,364	364,094
Hail .....	78	0	0	12,113,023	2,012,375
Fog .....	79	0	0	0	0
Winter Storms, Snow, and Ice.....	154	0	0	74,968,398	165,024
Thunderstorms/High Winds.....	218	1	6	27,508,664	8,977,811
<b>Total</b>	<b>664</b>	<b>5</b>	<b>66</b>	<b>\$213,314,962</b>	<b>\$46,689,504</b>

<sup>a</sup>Deaths and injuries reported were, in some cases, based upon a geographic area impacted by the hazard event that affected Washington County and had a larger area of impact than the County itself.

<sup>b</sup>Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.

Source: The National Climatic Data Center (NCDC) a part of the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), the National Environmental Satellite, Data and Information Service (NESDIS), the U.S. Department of Agriculture Risk Management Agency, and SEWRPC.

that are available from the U.S. Department of Agriculture Risk Management Agency (USDA RSA). Since 1959, Washington County has experienced 644 weather hazard events, as summarized in Table 19. Those hazard events were the direct cause of five deaths and 66 injuries. In addition, those hazard events were estimated to have caused over \$260 million in damages, with 18 percent of those damages being crop damages.

It is also important to note that the amount of estimated losses reported from weather hazard events has been generally increasing over time. Based upon the dates of the occurrence of events summarized in Table 19, there were about \$5.5 million<sup>1</sup> in hazard-related property and crop damages were reported for hazards that took place in the years 1965 through 1974. There were over \$144.4 million in hazard-related property and crop damages reported for hazards that took place in the years 1975 through 1984; however, the bulk of these damages were associated with two catastrophic events—the 1976 county-wide ice storm which caused over \$71.5 million in reported damages and the 1981 West Bend tornado which caused \$65.1 million in reported damages. The other weather hazard events that occurred during this period caused about \$7.8 million in reported damages. Over \$31.9 million in hazard-related property and crop damages were reported for hazards that took place in the years 1985 through 1994. About \$39.4 million in hazard-related property and crop damages were reported for hazards that took place in the years 1995 through 2004 and about \$32.4 million in hazard-related property and crop damages were reported for hazards that took place in the years 2005 through 2014. These data indicate that the amount of damages associated with weather hazard events reported for the period 1995 through 2004 were about seven times the damages reported for the period 1965 through 1974. While the damages reported for the period 2005 through 2014 were somewhat lower than those reported during the period 1995 through 2004, they still represent almost six times the damages reported during the 1965 through 1975 period. Three trends may account for the increase over time in losses from meteorological hazards in Washington County.

<sup>1</sup> All damage amounts have been converted to 2014 dollars using the U.S. Bureau of Labor Statistics Consumer Price Index.

First, the County has experienced considerable development over the last 50 years. The County's population more than doubled between 1970 and 2010. Similarly, the percentage of land in the County devoted to urban land uses doubled between 1975 and 2010. A greater amount of development in the County presents more potential for damage due to weather hazards. Second, since 1950 the incidence of several meteorological conditions that can produce damages has increased. Between 1950 and 2006 average annual precipitation in Washington County increased by between 3.0 and 7.0 inches per year with the greatest increase occurring in the southeast section of the County and the smallest increase occurring in the extreme western portion of the County.<sup>2</sup> Over this same period, the amount of precipitation delivered in heavy storms has increased. In Washington County, the number of days per decade in which two or more inches of precipitation fall has increased by between 0.5 to 3.5 days, with the largest change occurring in the southwestern portion of the County and the smallest change occurring in the northeastern portion of the County. The amount of precipitation falling in very heavy events, defined as the heaviest 1 percent of all daily events, in the upper Midwest increased by 37 percent between 1958 and 2012.<sup>3</sup> Some of the changes in hazard conditions have been complex. The incidence of tornadoes and tornado outbreaks is an example of this.<sup>4</sup> The mean number of tornadoes per year in the United States remained constant over the period 1955 through 2009. Over this same period, the average number of days per year in which at least one tornado with a strength rating on the Fujita Scale of F1 or EF1 or greater occurred in the United States decreased. This was accompanied by an increase in the average number of days per year in which more than 30 tornadoes with strength ratings on the Fujita Scale of F1 or EF1 or greater occurred in the United States. As a result, there is a greater likelihood that when tornadoes occur, they occur as part of an outbreak consisting of numerous tornadoes than there was about 50 years ago. These examples illustrate that some weather conditions with the potential to cause damages to property or crops are occurring more frequently than they did in the past. Third, the increase in reported damage estimates may reflect improvements in how local community and County officials report damages. It should be noted that all three of these trends could be contributing to the increase over time in the level of reported damages associated with weather hazards.

The NWS data summarized in Table 19 shows that thunderstorms and high winds, followed by winter storms, snow, and ice; fog; hail, and temperature extremes, are the most frequent weather hazards. Winter storms, snow, and ice, followed by tornadoes; floods, thunderstorms and high winds; drought; and hail are the most damaging weather hazards and tornadoes followed by thunderstorms and high winds, lightning, and extreme temperatures are the most deadly and injuring weather hazards that have occurred over the past 57 years. In addition, it should be acknowledged that weather events are often complex and damages may occur from multiple hazards, such as when hail, rain, wind, and tornadoes strike during a single storm.

To illustrate the potential frequency of thunderstorms and tornadoes, a review was made of the warnings historically issued by the National Weather Service, as shown on Table 20. Over the period 1982 through 2014, there have been 464 thunderstorm-related watches or warnings and 134 tornado-related watches or warnings.

A similar review can be performed for human-induced and technological hazards. As with the meteorological hazards summarized in Table 19, the major indicators of hazard severity are the deaths, injuries, and economic losses resulting from hazard events and disasters. Several agencies compile data on individual human-induced and technological hazards and make it publicly available. For example, the Wisconsin Department of Transportation

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<sup>2</sup> *Wisconsin Initiative on Climate Change Impacts, Wisconsin's Changing Climate: Impacts and Adaptation, Nelson Institute for Environmental Studies, University of Wisconsin-Madison, Wisconsin Department of Natural Resources, 2011.*

<sup>3</sup> *Jerry M. Melillo, Terese C. Richmond, and Gary W. Yohe (editors), Climate Change Impacts in the United States: The Third National Climate Change Assessment, U.S. Global Change Research Program, 2014.*

<sup>4</sup> *Harold E. Brooks, Gregory W. Carbin, and Patrick T. Marsh, "Increased Variability of Tornado Occurrence in the United States," Science, volume 346, pages 349-352, 2014.*

Table 20

WASHINGTON COUNTY SEVERE WEATHER HISTORY: 1982-2014

Year	Severe Thunderstorm		Tornado	
	Watch	Warning	Watch	Warning
1982	1	2	1	0
1983	6	1	1	1
1984	6	6	7	4
1985	5	6	4	0
1986	9	2	5	2
1987	6	5	2	1
1988	1	3	2	1
1989	8	6	2	0
1990	4	6	4	0
1991	8	4	3	2
1992	3	2	2	0
1993	9	3	4	0
1994	9	4	4	0
1995	14	5	1	1
1996	6	7	8	4
1997	6	6	2	0
1998	13	6	3	0
1999	9	9	2	0
2000	5	7	3	1
2001	9	12	2	2
2002	5	7	1	0
2003	7	3	3	2
2004	12	5	2	2
2005	12	8	3	0
2006	19	17	1	2
2007	3	7	1	3
2008	20	7	1	6
2009	1	5	1	1
2010	9	5	7	7
2011	13	11	2	2
2012	9	7	0	0
2013	14	5	2	2
2014	7	7	1	1
Total	268	196	87	47

Source: National Weather Service.

(WDOT) compiles and publishes data on roadway traffic accidents on an annual basis.<sup>5</sup> Based upon the four technological hazards for which data are available, since 1975 Washington County has experienced 39,289 technological hazard events. These events are summarized in Table 21. They were estimated to have caused almost \$397 million in economic losses.

The data summarized in Table 21 show that roadway traffic accidents constitute the most frequent, damaging, and deadly technological hazard occurring in Washington County. This hazard accounts for over 99 percent of the incidents and injuries, about 92 percent of the economic losses, and about 94 percent of all of the deaths attributed to

<sup>5</sup> For example, Wisconsin Department of Transportation, 2013 Wisconsin Traffic Crash Facts, July 2015.



**Table 21**

**TECHNOLOGICAL HAZARD EVENTS RECORDED IN WASHINGTON COUNTY,  
WISCONSIN FROM 1975 THROUGH DECEMBER 2014 (SORTED BY NUMBER OF EVENTS)**

Event <sup>a</sup>	Total	Deaths	Injuries	Property Damage <sup>b</sup>	Crop Damage <sup>b</sup>
Hazardous Material Events (Pipeline) .....	7	0	3	\$ 24,643,119	\$0
Hazardous Material Events (Transportation) .	32	0	0	51,812	0
Railroad Accidents .....	143	14	46	8,404,896	0
Roadway Traffic Accidents <sup>c</sup> .....	39,107	206	15,356	363,677,747	0
Total	39,289	220	15,405	\$396,777,574	\$0

<sup>a</sup>The table lists only those hazards for which data were available.

<sup>b</sup>Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.

<sup>c</sup>Data for roadway traffic accidents were only available for the years 1999 through 2013.

Source: U.S. Department of Transportation Office of Pipeline Safety, Federal Railroad Administration, Wisconsin Department of Transportation, and SEWRPC.

technological hazards. Hazardous material events involving pipelines, railroad accidents, and transportation-related hazardous material events accounted for the other reported incidents, deaths, injuries, and economic losses.

**Summary and Ranking of Hazards**

There are several ways that Washington County hazards can be ranked and summarized to be specifically considered in the County hazard mitigation plan. Current guidance for all hazard mitigation plans promotes comprehensive consideration of all natural hazards. These hazards have been ranked by consideration of their frequency, amount of damage, and death and injuries incurred, as well as by the concerns of, and degree of importance assigned by, the Washington County All Hazards Mitigation Plan Local Planning Team.

In addition, selected hazards other than natural hazards have been identified for consideration in the Washington County hazard mitigation plan based upon input from the Local Planning Team. The hazards to be specifically considered in the plan are summarized in Table 22, along with qualitative information on the hazard severity.

Hazard severity can be assessed and ranked in a variety of ways. The purpose of ranking hazards is to help set priorities and direct more resources to address those hazards of the greatest severity. However, the kinds of mitigation actions that will be needed and warranted depend on the type of vulnerability to be addressed. Some hazards, such as excessive heat and lightning, are unlikely to cause a disaster, but they can be fatal and, therefore, are serious hazards. Vulnerability to such hazards can best be addressed by preventative measures, such as public information to encourage hazard awareness and personal protection. Other hazards, such as flooding, are pervasive and devastating, and may require a variety of tools—mapping, building codes, zoning laws, insurance, elevation or acquisition of floodprone structures, and public awareness—to effectively reduce the risk of disaster. However, flooding might not result in more fatalities than a heat wave. In general, ranking hazards by the number of deaths that they cause shifts the focus away from major and largely avoidable disasters, such as floods. Weather hazards that have caused past Washington County disasters, are probably the hazards that will cause future disasters. However, the types of natural hazards that result in fatalities remain a public health and safety concern.

The summary listing of hazards in Table 22 does not include some hazards, as originally considered by the Committee, which have been found to have minimal chance of occurring or offer only limited applicable mitigation options. The identified hazards listed below will either receive less emphasis in the subsequent sections of the report or were incorporated as subelements among existing categories, as summarized in Table 22.

Table 22

**SUMMARY OF HAZARDS TO BE CONSIDERED IN THE WASHINGTON COUNTY HAZARD MITIGATION PLAN**

Hazard	Risk of Occurrence (high, medium, or low)	Warning Time (short, medium, or long)	Damage to Property (high, moderate, or low)	Threat to Life Safety (high, medium, or low)	Duration of Impact (long, moderate, or short)	Size of Area Affected (large, medium, or small)
<b>Natural Hazards</b>						
Flooding and Stormwater Drainage Problems .....	High	Medium	High	Low	Moderate	Large
Thunderstorms, High-Wind, Hail, and Lightning .....	High	Short	High	High	Long	Large
Tornadoes .....	Low	Medium	High	Medium	Short	Small
Extreme Temperatures .....	Medium	Long	Low	High	Long	Large
Winter Storms .....	Medium	Medium	Low	Medium	Moderate	Large
Drought .....	Medium	Medium	Low	Low	Long	Large
<b>Technological/Human-Induced Hazards</b>						
Transportation Accidents .....	Medium	Short	Moderate	High	Short	Small
Contamination or Loss of Water Supply System .....	Low	Short	Moderate	Medium	Moderate	Medium
Loss of Sewerage System .....	Low	Short	Moderate	Medium	Moderate	Medium
Hazardous Material Incidents .....	High	Short	Low	Medium	Moderate	Small
School Violence .....	Low	Short	Low to moderate	Medium	Short	Small
Terrorism Incident .....	Low	Short	Moderate to high	High	Short	Small to medium
Cyberattack on Local Government .....	Low	Short	Moderate	Low	Moderate	Small to medium
Electrical System Outage .....	Medium	Short	Low	Low	Short	Small to medium
Communicable Disease Outbreak .....	Low	Short to medium	Low	High	Moderate to long	Small to large

Source: Washington County Division of Emergency Management, Washington County All Hazards Mitigation Plan Local Planning Team, and SEWRPC.

## *Natural Hazards*

### *Dust Storms*

No dust storm events were reported in Washington County during the period from January 1959 through December 2014. Natural hazard events that occurred in the past are likely to reoccur in the future, providing the opportunity to plan for them. A dust storm event in Washington County would be atypical, therefore, mitigation strategies will not be recommended for this hazard in the current plan.

### *Earthquakes*

An earthquake is a shaking or sometimes violent trembling of the earth that results from the sudden shifting of rock beneath the earth's crust. This sudden shifting releases energy in the form of seismic waves or wave-like movement of the earth's surface. Earthquakes can strike without warning and may range in intensity from slight tremors to great shocks lasting a few seconds to over five minutes. The actual movement of the ground during earthquakes is seldom the direct cause of injury or death. Casualties may result from falling objects and debris, and disruption of communications, electrical power supplies, and gas, sewer, and water lines should be expected from earthquakes. The severity of an earthquake can be measured by comparing the peak acceleration associated with the horizontal shaking it produces to the normal acceleration a falling object experiences due to the force of gravity. This is usually expressed as a percentage of  $g$ , the acceleration due to gravity. The level of risk due to earthquake can be expressed as the percentage of  $g$  for which there is a 2 percent probability of being exceeded in a 50-year period. Depending on location, sites in Washington County have a 2 percent probability of experiencing earthquakes in a 50-year period in which the peak acceleration associated with horizontal shaking exceeds between 4 percent and 8 percent of  $g$ .<sup>6</sup> These are low values. While these levels of shaking can be noticeable, they are rarely associated with damages to structures. The earthquake threat to the State and Washington County is considered low, therefore this aspect will not be considered further in subsequent sections of this report.

### *Fog*

Fog is low-level moisture caused by many contributing factors, including ice or snowmelt, moist air from waterbodies, or rain evaporation with light winds. Dense fog is often seen with clearing skies the day following a rainstorm. Fog can be a widespread natural hazard that covers several counties during an episode. It can also occur locally in specific locations. Dense fog occurs during every month of the year in Wisconsin. It is more common during the cooler months of September through April. During the fall and spring months, dense fog favors the early morning hours, while during the winter months dense fog can occur at any time if the requisite weather conditions occur. Dense fog can be hazardous because it can restrict visibility. According to the National Weather Service, fog becomes hazardous when it reduces visibility to one-quarter mile or less. This results in decreased response time for operators of motor vehicles. Severe fog incidents can close roads, cause vehicle accidents, cause airport delays, and impair the effectiveness of emergency response. Between November 13, 1999 and December 31, 2014, 79 dense fog events were reported in and around Washington County. No fatalities, injuries, or damages to property or crops were attributed to these events. Because this natural hazard does not offer significant mitigation opportunities, it will not be profiled and addressed as an individual hazard in this hazard mitigation plan. It will be discussed as a factor in the discussion of transportation accident hazards.

### *Landslides*

A landslide is a relatively sudden movement of soil and bedrock downhill in response to gravity. The movement of soil can cause damage to structures by removing the support for the foundation of a building or by falling soil and debris colliding with or covering a structure. Landslides can be triggered by heavy rain, bank or bluff erosion, or other natural causes. In Wisconsin landslides generally are not dramatic. Due to the limited threat from physical injury and death incidences from landslides in Washington County, this hazard will not be considered further in subsequent sections of this report.

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<sup>6</sup> U.S. Geological Survey, "2008 United States National Seismic Hazard Maps," USGS Fact Sheet 2008-3018, April 2008.

### *Land Subsidence*

Land subsidence is the lowering of the land-surface elevation from changes that take place underground. Common causes of land subsidence from human activity are pumping water, oil, and gas from underground reservoirs; dissolution of limestone aquifers (sinkholes); collapse of underground mines; drainage of organic soils; and initial wetting of dry soils (hydrocompaction). Due to the limited threat from physical injury and death incidences from subsidence in Washington County, this aspect will not be considered further in subsequent sections of this report.

### ***Human-Induced Hazards***

#### *Nuclear Power Plant*

Nuclear power plant incidents involve the uncontrolled release of potentially dangerous radioactive materials into the environment from a commercial nuclear power plant. In 2013 nuclear energy provided approximately 7 percent of the energy consumed in Wisconsin.<sup>7</sup> This amount of energy is produced by one nuclear power plant, with two reactors, that is located in the State. This power plant, Point Beach Unit 1 and Unit 2, is located in Two Rivers, Wisconsin, which is approximately 13 miles north by northwest of Manitowoc. There are also two nuclear power plants, each with two reactors, located in close proximity to Wisconsin, which produce electrical power for Illinois and Minnesota. The Illinois power plants Byron Unit 1 and Unit 2 are located in Byron, Illinois, which is approximately 17 miles southwest of Rockford. The Prairie Island Nuclear Power Plants Unit 1 and 2 are located in Red Wing, Minnesota, which are approximately 28 miles southeast of Minneapolis. It is likely that a greater threat posed by the plants involves the transportation of radioactive fuel and wastes to and from the plant. The interim and terminal storage of these wastes is an issue that Federal, State, and local officials are working to resolve. No commercial nuclear power plant incidents have occurred that have affected the State.

The Kewaunee Nuclear Power Plant that is located in Carlton, Wisconsin, approximately 35 miles southeast of Green Bay, was permanently shut down on May 7, 2013. Current planning is to transfer the entire spent fuel pool inventory to dry cask storage by December 2016 and enter the safe storage (SAFSTOR) period in January 2017. Major decommissioning and dismantlement activities are scheduled to begin in 2069. License termination is scheduled for 2073. There are two additional nuclear power plant (Units 1 and 2 in Zion, Illinois) that were permanently shut down on February 13, 1998.<sup>8</sup> The fuel was transferred to the spent fuel pool, and the owner submitted the certification of fuel transfer on March 9, 1998. A public meeting was held on June 1, 1998, to inform the public of the shutdown plans. The owner has converted the turbine-generators into synchronous condensers and has isolated the spent fuel pool within a fuel building “nuclear island.” The owner submitted the post-shutdown decommissioning activities report (PSDAR), site-specific cost estimate, and fuel management plan on February 14, 2000. A public meeting to discuss the PSDAR was held on April 26, 2000. In September 2010, the facility license was transferred from Exelon to ZionSolutions for the express purpose of expediting the decommissioning of the site. Decontamination and dismantlement began in 2011. Completion of fuel transfer to the independent spent fuel storage isolation facility was completed in January 2015. Submittal of the License Termination Plan occurred in December 2015 and a public meeting was held in April 2015. License termination is slated for 2020.<sup>9</sup>

A 10-mile Primary Emergency Planning Zone (EPZ) radius and a 50-mile Secondary EPZ radius were established to determine which areas could potentially suffer the greatest consequences of an incident at a nuclear power plant

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<sup>7</sup> U.S. Energy Information Administration, *Wisconsin State Profile and Energy Estimates*, <http://www.eia.gov/state?sid=WI>, accessed January 26, 2016.

<sup>8</sup> U.S. Nuclear Regulatory Commission, *Fact Sheet on Decommissioning Nuclear Power Plants*, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.html#table1>, May 2004.

<sup>9</sup> U.S. Nuclear Regulatory Commission, “Zion Units 1 & 2,” <http://www.nrc.gov/info-finder/power-reactor/zion-nuclear-power-station-units-1-2.html>, accessed March 1, 2016.

and where the State focuses its Radiological Emergency Response Planning and Exercising Program. Washington County is outside the Secondary EPZ radius extending from the Byron and Point Beach nuclear power plants

### *School Violence*

School violence is violence that occurs on school property, on the way to or from school or school-sponsored events, or during school-sponsored events. Violence is the intentional use of physical force or power against another person, group, or community, with the behavior likely to cause physical or psychological harm. While systematic data are not available on incidents of school violence in schools located in Washington County, national data suggest that there has been a long-term decrease in the levels of school violence.<sup>10</sup> Liaisons from law enforcement departments to schools in Washington County have indicated that this issue is being adequately addressed through activities conducted by the school districts and law enforcement agencies within the County. Because of this, school violence will not be considered further in subsequent sections of this report.

### *Correctional Center Incident*

Correctional center incidents are events that occur at correctional centers and institutions that affect the facility's security and might include any of the following inmate actions: protests, hunger strikes, rioting, widespread damage or destruction of institutional property, and/or the taking of hostages. The worst-case scenarios include a "takeover" of areas of the facility by inmates or the escape of dangerous inmates into the surrounding area, with subsequent criminal acts against local citizens.

Most correctional center incidents are minor and are handled by the institution's own security forces, aided by local police and county sheriff departments if requested. Correctional center incidents may occur for a variety of reasons such as overcrowding, perceived poor treatment, inadequate staffing, unpopular staff actions, racial strife, and prisoner unrest. Washington County's exposure to these incidents is limited due to the fact that there are no State or Federal correctional facilities located within the County. Due to Washington County's limited threat from correctional center incidents, it will not be considered further in subsequent sections of this report.

### *Waterway Transportation*

Washington County is an inland county. While several rivers and streams traverse the County, they do not serve as major transportation arteries for people or goods. Because of this, transportation by water in Washington County is limited to recreational boating. Due to Washington County's limited threat from waterway transportation accidents and the limited mitigation options, it will not be addressed further in subsequent sections of this report.

## **VULNERABILITY ASSESSMENT ANALYSIS METHODS AND PROCEDURES**

In the previous section of this report the hazards considered applicable to Washington County were identified and ranked. This section of the report develops a vulnerability assessment for the identified hazards, including vulnerable asset description, hazard event profiling, and estimated losses information. This vulnerability assessment provides the basis for developing mitigation strategies that address the identified vulnerabilities.

The procedures utilized in the vulnerability analyses are based upon guidance provided by Federal Emergency Management Agency (FEMA) and the Wisconsin Department of Military Affairs, Division of Emergency

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<sup>10</sup> Simone Robers, Jana Kemp, Amy Rathburn, Rachel E. Morgan, and Thomas D. Snyder, *Indicators of School Crime and Safety: 2013*, U.S. Department of Education National Center for Educational Statistics and U.S. Department of Justice Bureau of Justice Statistics, (NCES 2014-042/NCJ 243229, June 2014).

Management.<sup>11</sup> The analysis includes three components: 1) profile of hazard events, 2) inventory of assets, and 3) estimation of losses. In addition, where applicable, potential changes in vulnerability under future conditions and the variance of vulnerability among the 20 municipalities within Washington County are analyzed.

In general, the procedures utilized in this analysis focus upon the methodology consistent with the Hazard U.S. (HAZUS) software as maintained by FEMA. In many cases, the mapping of assets and problem areas was completed utilizing the detailed mapping and orthophotography available for Washington County in both hard copy and digital form, including general base maps, large-scale topographic and cadastral maps, and year 2010 and 2015 large-scale orthophotographs. All of the mapping was done utilizing geographic information system (GIS) ArcGIS software.

With regard to the community assets, the basic Washington County inventory data set forth in Chapter II have been used and supplemented with information obtained from the HAZUS software; the National Oceanic Atmospheric Administration, National Climatic Data Center; the Wisconsin Department of Military Affairs, Division of Emergency Management; U.S. Department of Agriculture Agricultural Risk Management Agency; and more hazard-specific local data, such as building-specific structure values, as the basis for the community asset data base. The profiling of hazard events was developed by utilizing the HAZUS methodology; data available on FEMA, National Oceanic and Atmospheric Administration's National Climatic Data Center (NCDC), and U.S. Department of Agriculture Agricultural Risk Management Agency web sites; data provided by the Wisconsin Department of Military Affairs, Division of Emergency Management; and file data provided by the Washington County Emergency Management Office and the Southeastern Wisconsin Regional Planning Commission (SEWRPC). Except where otherwise noted, summary descriptions of meteorological hazard events are largely taken from the descriptions in the NCDC Storm Events Database.

Data and estimated losses and vulnerability were developed utilizing standard risk assessment methodology as set forth in FEMA and State Division of Emergency Management guidelines for hazard mitigation planning where hazards can be estimated spatially and by order of magnitude over a range of events. For hazards that cannot be quantified, alternative approaches have been used relying on qualitative measures.

A vulnerability description has been included for each of the applicable hazards listed in Table 22.

### **Assessments of Potential Future Changes in Hazard Conditions Relative to Climate Change**

The risks posed by many of the natural hazards profiled in this plan to Washington County have been estimated based largely upon the history of occurrence of and impacts attributed to the hazards within the County. For example, the estimates given below for the number of thunderstorms and thunderstorm-related hazards that would be expected to impact the County and the amount of damages to property and crops in the County reflect the average number of occurrences of these storms and the associated damages that were reported over a recent 25-year period. Over the short term, such as the five-year period covered by this plan, estimates of risk and damages derived in this manner should serve as reasonably reliable indicators of the degree of risk associated with various hazards. Over longer periods of time, climate change may render estimates of risk based on historical occurrences and impacts unreliable. Recent assessments have documented changes in Wisconsin's climate over the late 20th century.<sup>12</sup> Projections of Wisconsin's climate based on downscaled data from 14 global climate models indicate that additional changes will

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<sup>11</sup> *Federal Emergency Management Agency, State and Local Mitigation Planning How-to Guide, "Understanding Your Risks, Identifying Hazards and Estimating Losses," Publication No. FEMA 386-2, August 2001; Federal Emergency Management Agency, Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008. See also Federal Emergency Management Agency, State and Local Plan Interim Criteria under the Disaster Mitigation Act of 2000, July 11, 2002.*

<sup>12</sup> *For example, Christopher J. Kucharik, Shawn P. Serbin, Steve Vavrus, Edward J. Hopkins, and Melissa M. Motew, "Patterns of Climate Change across Wisconsin from 1950 to 2006," Physical Geography, Volume 31, pages 1-28, 2010.*

occur through the 21st century.<sup>13</sup> The following subsections describe the changes that have occurred in Wisconsin's climate since 1950 and the changes that are projected to occur by the middle of the 21st century. For those hazards whose frequency of occurrence or impacts are likely to be affected by the changes in climate, these descriptions will form the basis of evaluating potential long-term changes in hazard conditions.

Average annual temperatures in Wisconsin increased over the last half of the 20th century. Between 1950 and 2006, average annual temperature in the State increased by an average of 1.1°F.<sup>14</sup> In Washington County the increase was between 0.5°F and 1.5°F. Much of this increase in average temperature occurred in the form of higher night-time low temperatures. For example over the period 1950 through 2006, the average number of days in Washington County in which the daily low temperature fell below 0°F decreased by about 6 days per year. The greatest increase in temperatures occurred during winter and spring months. Depending on location, average winter temperatures in Washington County increased by 1.5-3.5°F over this period.

The consensus from downscaled results of climate models projects that average annual temperatures will continue to increase through the 21st century.<sup>15</sup> Depending on location, it is projected that average temperatures in the State of Wisconsin will increase by between 4.0°F and 9.0°F over the period 1980 through 2055. This increase is projected to be on the order of 6.0°F to 6.5°F in Washington County. The greatest changes are projected to occur during winter months, with average winter temperatures being projected to increase by about 7.5°F in Washington County. By contrast, average temperatures in Washington County during the summer are projected to increase by about 5.5°F. Changes in extreme temperatures will accompany these changes in average temperature. The frequency of extreme daily high temperatures is projected to increase. The average number of days per year with daily high temperatures greater than 90°F is currently about 12 in southern Wisconsin. This is likely to double to about 25 days per year by 2055. By contrast, the frequency of extreme daily low temperatures is projected to decrease. The average number of days per year with daily low temperatures below 0°F is currently about 15 in southern Wisconsin. This is projected to decrease to about nine days per year by 2055.

Average annual precipitation in Wisconsin increased over the last half of the 20th century. Between 1950 and 2006, average annual precipitation in the State increased by an average of about 3.1 inches.<sup>16</sup> It should be noted that there was substantial variability in the change in precipitation across the State, with some areas experiencing increases of up to 7.0 inches and some areas in northern Wisconsin experiencing decreases. In Washington County precipitation increased over this period by between 1.5 inches and 7.0 inches, with smaller increases occurring in the northwestern portion of the County and larger increases occurring in the southeastern portion of the County. The largest increases in Washington County occurred during spring months. Depending on location, these ranged between 0.5 inch and 3.5 inches. Much of the increase in average precipitation also occurred during autumn months. In Washington County, average precipitation during the autumn increased by between 1.0 inches and 1.5 inches between 1950 and 2006. Increases also occurred during winter in most of the County. Throughout the State, the changes in average precipitation during summer months were highly variable. In Washington County, average precipitation during summer months increased between 1950 and 2006. This increase was on the order of 0.5 inch to 1.0 inch. The frequency and magnitude of heavy precipitation events has also been increasing in Wisconsin.

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<sup>13</sup> *Wisconsin Initiative on Climate Change Impacts, 2011*, op. cit.

<sup>14</sup> *Kucharik and others, 2010*, op. cit.

<sup>15</sup> *Wisconsin Initiative on Climate Change Impacts, 2011*, op. cit. *Downscaling is an analysis approach that enables climatological data generated by Intergovernmental Panel on Climate Change general circulation models developed at a relatively coarse geographic scale (e.g., climate change data for several large regions in an entire state) to be modified to represent a finer geographic scale (e.g., at the scale of a county or smaller).*

<sup>16</sup> *Kucharik and others, 2010*, op. cit.

Extreme rainfall patterns in the City of Madison illustrate this trend. In the decade between 2001 and 2010, there were 24 days per decade in which 2.0 inches or more of precipitation fell. This is twice the previous maximum of 12 days in the 1950s.

The consensus from downscaled results of climate models projects several changes in precipitation through the 21st century.<sup>17</sup> Most of the models project an increase in average annual precipitation in southeastern Wisconsin of about 1.5 inches to 2.0 inches. The projections indicate that the amount of precipitation falling during winter is likely to increase by about 25 percent. Due to the projected increase in temperatures, it is projected that a greater amount of precipitation occurring during the winter will fall as rain rather than snow.<sup>18</sup> This will be accompanied by both an increase in the likelihood of freezing rain events and decreases in snow depth and snow cover. Model projections also show that Wisconsin will receive more precipitation and more frequent intense precipitation events during the spring, especially during early spring. As in winter, it will become more likely for early spring precipitation to fall as rain rather than snow. The amount of precipitation occurring during the summer is not projected to change significantly. The projections also indicate that the frequency of intense rainfall events will increase. In southern Wisconsin, the frequency of precipitation events in which two or more inches fall in a 24-hour period is expected to increase from about 12 events per decade to 15 events per decade by the middle of the 21st century. These changes will be concentrated in the spring and fall. The projections indicate that the magnitude of the heaviest precipitation events will also increase. The shift to more heavy rainfall events but little change in total summertime precipitation implies that more dry days will occur in Wisconsin during the summer. More dry days, coupled with higher summer temperatures and the increases in evapotranspiration that are likely to result from higher temperatures, will lead to an increase in the likelihood of summer droughts.

## **VULNERABILITY ASSESSMENT FOR FLOODING AND ASSOCIATED STORMWATER DRAINAGE PROBLEMS**

Flooding is a significant hazard in Washington County. As described in Chapter II, there are approximately 220 miles of major streams in the County, located within four watersheds: the Fox (Illinois) River, the Menomonee River, the Milwaukee River, and the Rock River watersheds.

Floodplains are the wide, gently sloping areas contiguous to, and usually lying on both sides of, a stream channel. For planning and regulatory purposes, floodplains are normally defined as the areas subject to inundation by the one-percent-annual-probability (100-year recurrence interval) flood event. The floodplains shown on Map 7 in Chapter II of this report have been identified by Washington County, the Wisconsin Department of Natural Resources (WDNR), and FEMA. Approximately 38,850 acres, not including surface water in lakes and existing stream channels, or about 14 percent of the total area of the County, are located within the one-percent-annual-probability flood hazard area. There are also 14 major lakes in Washington County. Some of the one-percent-annual-probability floodplains in the County are associated with these lakes.

A consideration in flood hazard mitigation is the potential for increased flooding due to dam failures. As indicated in Table 10 in Chapter II, there are 57 existing dams in Washington County. Hazard ratings have been assigned by the WDNR for 28 of these. One of those dams has been assigned a high hazard rating, two have been assigned

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<sup>17</sup> *Wisconsin Initiative on Climate Change Impacts, 2011*, op. cit.

<sup>18</sup> *Michael Notaro, David J. Lorenz, Daniel Vimont, Stephen Vavrus, Christopher Kucharik, and Kristie Franz, "21st Century Wisconsin Snow Projections Based on an Operational Snow Model Driven by Statistically Downscaled Climate Data," International Journal of Climatology, Volume 31, pages 1615-1633, 2011.*



significant hazard ratings, and the remaining 25 have been assigned low hazard ratings.<sup>19</sup> Both dams built according to accepted engineering standards at the time of construction and dams built without application of engineering principles can fail. When a dam fails or is subject to overtopping, large quantities of water can rush downstream with great destructive force. Because of the presence of one high hazard and two significant hazard dams in the County, future evaluation of floodplain areas related to dam failure should be considered. It should be noted that between 1990 and 2014 there was no loss of life associated with dam failures in Washington County.

Floodplain areas for the portions of the Rock River watershed in western Washington County were mapped using geographical information system (GIS) techniques through FEMA's Risk Mapping, Assessment and Planning (RiskMAP) Program. The floodplain mapping for this portion of the County is shown on the FEMA digital flood insurance rate maps for Washington County which were finalized in October 2015 and are available as a digital file layer for the Washington County cadastral mapping system which covers the entire County. The floodplain in the eastern portions of the County have been mapped on large-scale topographic mapping prepared at a scale of one inch equals 200 feet, with a contour interval of two feet. The floodplain mapping is shown on the FEMA digital flood insurance rate maps for Washington County which were finalized in 2013 and are available as a digital file layer for the Washington County cadastral mapping system which covers the entire County.

In addition to flooding, stormwater drainage problems exist on a scattered basis throughout Washington County. The distinction between stormwater drainage, stormwater management, and flood control is not always clear. For the purpose of this report, flood control is defined as the prevention of damage from the overflow of natural streams and watercourses. Drainage is defined as the control of excess stormwater on the land surface before such water has entered stream channels. The term "stormwater management" encompasses both stormwater drainage and nonpoint source pollution control measures. While the focus of this section is on the flooding hazard, the related stormwater drainage hazards are also considered because of the interrelationship between those two hazard conditions.

### **Historical Flooding Problems**

As noted earlier in this chapter, a number of major flooding events, including several that caused significant damage, have been recorded in Washington County, as well as in the watershed areas partly encompassed within the County.

#### ***Rock River Watershed***

The Rock River watershed is located in the western half of Washington County. The headwaters of the Rock River are located northwest of the City of Waupun in Dodge and Fond du Lac Counties, Wisconsin. From Wisconsin, the River flows into the State of Illinois and southwest through Illinois to its confluence with the Mississippi River. The total watershed encompasses about 3,750 square miles of surface water drainage area in Wisconsin, including about 178 square miles, or about 41 percent of the total land area of Washington County. Major streams of the Rock River watershed that are located in Washington County include the Ashippun River, the Bark River, the Coney River, the East Branch of the Rock River, the Kohlsville River, Limestone Creek, Mason Creek, the Little Oconomowoc River, the Oconomowoc River, and the Rubicon River. A floodland information report was completed for the Rubicon River in 1974.<sup>20</sup>

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<sup>19</sup> Chapter NR 333, "Dam Design and Construction," of the Wisconsin Administrative Code states that 1) a high hazard "rating must be assigned if loss of human life during failure or mis-operation of the dam is probable," 2) a significant hazard rating would be assigned if "failure or mis-operation of the dam would result in no probable loss of human life but can cause economic loss, environmental damage, or disruption of lifeline facilities," and 3) a low hazard rating would be assigned if "failure or mis-operation of the dam would result in no probable loss of life, low economic losses (losses are principally limited to the owner's property), low environmental damages, (and) no significant disruption of lifeline facilities."

<sup>20</sup> SEWPRC Community Assistance Planning Report No. 4, Floodland Information Report for the Rubicon River, City of Hartford, Washington County, Wisconsin, December 1974.

Much of the reported historical flooding in the portion of the Rock River watershed in Washington County has occurred along the Rubicon River.

Major flooding occurred along the Rubicon River in the City of Hartford on or around March 23, 1929. This late winter flood was attributed to the simultaneous occurrence of snowmelt and light rainfall. The River rose very rapidly and much of the area that is now Wilson Street was washed out. Floodwaters attained a peak stage of two feet above the top of a footbridge at the Hartford Mill Dam that is no longer in existence. Floodwaters overtopped the Rural Street Bridge which is located about 1,000 feet downstream of the dam. Flood stages dropped rapidly, and the river returned to its banks on the following day. This flood reflected major flooding that was probably widespread throughout the Wisconsin portion of the Rock River watershed during March 1929. An instantaneous peak discharge of 13,000 cubic feet per second (cfs) was recorded by the USGS stream gaging station on the Rock River at Afton in Rock County (No. 05430500), which is located about 100 miles downstream of Hartford. That flow is the second largest flow ever recorded in the 101-year (1914-2015) operation of that gaging station.

A rainfall-snowmelt combination caused flooding along the Rubicon River in Hartford on the night of April 2, 1959. This flood was not as severe as the 1929 event in that the floodwaters were, with a few exceptions, contained within river banks. The floodwaters, however, surrounded and entered the Jordan Engineering Company—located immediately downstream of Rural Street on the north bank of the Rubicon River—so that the first floor of the building was under two feet of water. Some flooding of city park lands was also reported. As was the case with the March 1929 flood, major flooding appears to have been widespread throughout the Wisconsin portion of the Rock River watershed during April of 1959. The USGS stream gaging station (No. 05430500) on the Rock River at Afton in Rock County recorded an instantaneous peak flow of 12,100 cfs. That flow was the fourth largest flow recorded in the 101-year period of record for that monitoring station. An instantaneous peak discharge of 4,970 cfs was recorded by the USGS gaging station (No. 05425500) on the Rock River at Watertown in Jefferson County, about 45 miles downstream of Hartford. This flood flow, which had a recurrence interval of 56 years, was the third largest recorded in the 73-year (1932-2014) operation of the station. The USGS stream gaging station (No. 05426000) on the Crawfish River—a Rock River tributary—at Milford in Jefferson County, which is located about 28 miles southwest of Hartford, recorded a peak flow of 6,140 cfs on April 6, 1959, which was the second greatest discharge observed in the 73-year (1932-2014) period of record.

Showers and thunderstorms developed in Wisconsin on September 9, 1986 and saturated the ground by depositing between one and two inches of rain along a path stretching from La Crosse and Eau Claire eastward through Fond du Lac and Sheboygan. Heavy rains began on the evening of September 10 and continued into the following morning, with a 24-hour rainfall of 6.72 inches being recorded at the NWS station at Holy Hill. These rains produced severe flooding and flash flooding throughout east-central and southeastern Wisconsin, including Washington County. A presidential disaster declaration was issued as a result of these floods. This declaration covered nine counties, including Washington County.

Several instances of minor flooding of the Rubicon River, in some cases in conjunction with scattered stormwater drainage and sewer backup problems in areas far removed from the riverine area, have occurred in the City of Hartford. For example, melting snow in the Rubicon River watershed caused minor flooding in March 1965, with floodwaters covering parts of the playground area in Hartford's Willowbrook Park on the east side of the City. About 2.38 inches of rainfall were recorded within a 24-hour period at Hartford on September 21, 1972, and while scattered instances of sewer backup and flooded basements occurred, no problems directly attributable to overland flooding of the Rubicon River were reported. Widespread flooding—some of it quite serious—occurred at numerous locations throughout southeastern Wisconsin on April 21 and 22, 1973, as a result of intense rainfall. While only 1.52 inches of rainfall were recorded on April 21 in Hartford, another 0.23 inch fell on the following day. As a result, a few instances of minor sewer backups were reported in the City. Hartford's Willowbrook Park was partially flooded in early March 1974 as a result of light rain and melting snow. West Side Park was partially flooded in late May 1974 as a result of a moderate storm—a total of 2.76 inches of rain were recorded at Hartford on May 16 and 17. During the May 1974 high water, stormwater entered and damaged the West Side Dairy. This

flood damage was not directly related to high water on the Rubicon River, however, since the dairy is far removed, both horizontally and vertically, from the riverine area.

### ***Milwaukee River Watershed***

The Milwaukee River watershed is located in the northeastern half of Washington County. The headwaters of the mainstem of the Milwaukee River are located in southeastern Fond du Lac County. From its source, the Milwaukee River flows through Fond du Lac, Washington, Ozaukee, and Milwaukee Counties to its confluence with Lake Michigan in the City of Milwaukee. Tributaries of the Milwaukee River extend into Dodge, Fond du Lac, Milwaukee, Ozaukee, Sheboygan, and Washington Counties. The total watershed encompasses about 700 square miles of surface water drainage area, including about 223 square miles that are located within Washington County. This watershed accounts for about 52 percent of the total land area of Washington County. Major streams of this watershed that are located in Washington County include the Milwaukee River, the East Branch of the Milwaukee River, the North Branch of the Milwaukee River, Kewaskum Creek, Cedar Creek, Little Cedar Creek, the North Branch of Cedar Creek, Evergreen Creek, Quaas Creek, Silver Creek, Stony Creek, and Wallace Creek. A comprehensive watershed plan was completed for the watershed in 1971<sup>21</sup> under the direction of the SEWRPC Milwaukee River Watershed Committee. The plan was subsequently amended in 1983 and 1987.<sup>22</sup> The plan described major flood events that occurred within the watershed in March 1918, August 1924, March 1929, and March 1960. While, most of these events occurred downstream from Washington County, the 1924 event caused significant damages in and around the City of West Bend.

The flood of August 1924 was caused by a severe rainstorm. This storm was centered over West Bend, where a total rainfall of 9.31 inches was recorded over the four-day period of August 3 through August 6, of which 7.58 inches fell on August 4. This unusual rainfall resulted in a runoff of 3.85 inches over the watershed. Discharge measured at the stream gage at Estabrook Park in the City of Milwaukee rose from 105 cfs on August 3 to a peak of 15,100 cfs on August 6. This is the third highest peak discharge reported at this gage over its 101-year period of record (1915-2015). Three additional days were required for the flood to subside to a moderate flood stage discharge of 6,400 cfs and about three more days to recede to a moderate discharge of about 3,000 cfs. The floods resulting from this event caused substantial damage in Washington County. The flood destroyed 18 bridges within the County and flooded many businesses and houses in West Bend. The Schmidt and Stork Wagon Factory on what is now Washington Street was flooded with the factory yard being inundated to a depth of five feet. The factory was closed for several days to dry out.<sup>23</sup> It was also reported that the old “Plating Mill” of the West Bend Company was flooded to a depth of three feet during this flood. No monetary damage estimates were available for the Washington County portion of the watershed for this 1924 flood.

### ***Menomonee River Watershed***

The Menomonee River watershed is located in the southeastern corner of Washington County. The headwaters of the Menomonee River are located in the northeastern corner of the Village of Germantown. From its source, the Menomonee River flows through the Village and into Waukesha and Milwaukee Counties to its confluence with the Milwaukee River about 0.9 mile upstream from where the Milwaukee River joins Lake Michigan. The total

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<sup>21</sup> *SEWRPC Planning Report No. 13, A Comprehensive Plan for the Milwaukee River Watershed, Volume One, Inventory Findings and Forecasts, December 1970; Volume Two, Alternative Plans and Recommended Plan, October 1971.*

<sup>22</sup> *SEWRPC Community Assistance Planning Report No. 13, Flood Control Plan for Lincoln Creek, Milwaukee County, Wisconsin, (2nd edition), December 1982; SEWRPC Planning Report No. 37, A Water Resources Management Plan for the Milwaukee Harbor Estuary, Volume One, Inventory Findings, March 1987; Volume Two, Alternative and Recommended Plans, December 1987.*

<sup>23</sup> *Janean Mollet-Van Beckum, The City of West Bend, Washington County Historical Society, 2015.*

watershed encompasses about 136 square miles of surface water drainage area, including about 32 square miles that are located within Washington County. This watershed accounts for about 7 percent of the total land area of Washington County. The Menomonee River is the major stream of this watershed that is located in Washington County. Other streams of this watershed that are located in Washington County include Goldenthal Creek, the Nor-X-Way Channel, the North Branch of the Menomonee River, the West Branch of the Menomonee River, and Willow Creek. A comprehensive watershed plan was completed for the watershed in 1976<sup>24</sup> under the direction of the SEWRPC Menomonee River Watershed Committee. The plan was subsequently amended in 1987.<sup>25</sup> The plan described major flood events that occurred within the watershed in March 1897, June 1917, June 1940, March 1960, July 1964, September 1972, and April 1973. Most of these events occurred downstream from Washington County.<sup>26</sup> The April 1973 event, however, had impacts in the Village of Germantown.

The April 1973 flood event caused severe damage and disruption over most of the Menomonee River watershed. Extensive portions of the natural floodplains within the watershed were inundated, with damage and disruption concentrated in those riverine areas that had been converted to urban uses. The immediate cause of this flooding was widespread rainfall that occurred throughout southeastern Wisconsin during the period April 18 through April 21, with most of the rainfall being deposited on April 20 and 21. In downstream portions of the watershed, weather stations located in the Village of West Allis and at Mt. Mary College in the City of Milwaukee reported 4.11 inches of rain and 3.96 inches of rain, respectively, over the four-day period, with 3.52 and 3.85 inches of rain, respectively, being reported at the West Allis and Mt. Mary stations on April 21. At the Village of Germantown, in the upstream portion of the watershed, 2.35 inches of rain were observed over the April 18 through April 21 period, with 2.23 inches having fallen on April 21. Average rainfall over the watershed for the four-day period was 3.16 inches. Although the rainfall was not as severe as that preceding some previous major floods, the resulting direct runoff discharges and volumes were surprisingly large. Based on data from the USGS stream gage on the Menomonee River at Wauwatosa (No. 04087120), the direct runoff from this flood was determined to be 3.06 inches.<sup>27</sup> The instantaneous peak flow of 13,500 cfs, which occurred on April 21, is tied for being the largest such discharge recorded at this gage during its 54-year period of record (1962-2015). When this event is compared to previous major flood events in the Menomonee River watershed, it appears that this was an instance in which a relatively moderate rainfall caused high runoff leading to a severe flood event. The explanation for this lies in the moisture conditions within the watershed prior to the April 18 through April 21 period. These conditions were influenced by a heavy snowfall that occurred over the period of April 8 through April 12. During this period, 15.7 inches of snow fell at the Milwaukee NWS station and 14.0 inches fell at West Bend, with most of the snowfall at both stations occurring on April 9. This snowfall was followed by several days of warm weather so that the snow cover had melted away by about April 15. Because of this snow melt, soil conditions in the watershed were very wet, causing a relatively moderate rainfall to lead to severe flooding.

Considerable flooding occurred in the Village of Germantown as a result of the April 1973 flood. Floodwaters occupied large portions of the river corridor along a 4.45-mile-long reach of the mainstem of the Menomonee River from County Line Road to the Chicago and Northwestern Railroad Bridge. Flooding also occurred along a

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<sup>24</sup> *SEWRPC Planning Report No. 26, A Comprehensive Plan for the Menomonee River Watershed, Volume One, Inventory Findings and Forecasts, October 1976; Volume Two, Alternative Plans and Recommended Plan, October 1976.*

<sup>25</sup> *SEWRPC Planning Report No. 37, A Water Resources Management Plan for the Milwaukee Harbor Estuary, Volume One, Inventory Findings, March 1987; Volume Two, Alternative and Recommended Plans, December 1987.*

<sup>26</sup> *It should be noted that the 1987 plan amendment dealt largely with water quality issues and did not include descriptions of flood events subsequent to those described in the comprehensive watershed plan.*

<sup>27</sup> *SEWRPC Planning Report No. 26, op. cit.*

2.21-mile-long reach of the West Branch of the Menomonee River extending upstream from its confluence with the Menomonee River to Dalebrook Road. Overland flooding was also reported along Willow Creek near State Trunk Highway (STH) 175 and along the upper reaches of the Nor-X-Way Channel northeast of STH 145. At the time of this event, no major structures were located within the areas impacted by flooding. Interviews were conducted with the owners or occupants of 15 structures located adjacent to the flooded areas.<sup>28</sup> The results of these interviews indicated that two of these structures experienced basement flooding as a result of this 1973 event. Other than this, no significant structure flood problems related to this event were reported in the Village of Germantown. Although much of the Village was in agricultural land uses at the time of this event, no significant agricultural loss or disruption was incurred. This was primarily because farming activities were not being carried out in the floodplains areas within the Village at that time. In 1973, many of the floodplains in the Village were composed of woodland and wetland areas. The relatively mild impacts of the April 1973 flood within the Village of Germantown were largely due to fact that these floodplains were not occupied by structures or used for agricultural purposes and to the fact that the rainfall amounts measured in the Germantown portion of the watershed immediately prior to and during this flood were somewhat less than that observed in the remainder of the basin.

### **Description of Recent Flood Events**

Since 1980, there have been 17 flood events reported by the National Climatic Data Center affecting Washington County. Those flood events were reported to have caused property damages totaling about \$20.9 million and crop damages totaling about \$15.9 million, in 2014 dollars. The most severe recent events occurred in 1996, 1997, 2004, 2007, and 2008. These flood events, which are significant with regard to the current hazard mitigation planning effort for the County, include the following:

- June 7, 1996: Overnight heavy rains of around two inches on top of saturated ground resulted in flooding in several locations in Washington County. Highway shoulders were washed out as roads became covered with water in the Town of Farmington. Flooding of residential and business buildings was reported in the Villages of Jackson and Slinger. In addition, a 24-hour rainfall total of 2.21 inches resulted in flooding of Cedar Creek in the Village of Jackson. A garden center in the Village sustained structural damage and had many plants destroyed. This flooding was estimated to have caused about \$105,600 in property damages and \$754,400 in crop damages (2014 dollars).
- June 17-18, 1996: Heavy rains caused flooding in Washington County on June 17 and 18, 1996. In the 24-hour period ending at 6:00 a.m. on June 18, 3.21 inches of rain were reported in the City of West Bend. Two-day rains totaled between four and five inches over many other parts of the County. The result was a slow rise in water levels in many rivers, streams, and creeks, with some exceeding flood stage. Flooding of basements in residences and business was reported across the County. Several roads were closed due to high water levels in low spots. Sewers backed up, and there were scattered reports of road shoulder washouts. Soil erosion and crop damage were reported in rural areas. Property damages resulting from this flooding were estimated at \$679,000. Crop damages were estimated at \$3,017,600 (2014 dollars).
- June 21, 1997: Heavy rainfall over a 30-hour period caused flash flooding in southern Washington County. Between early morning on June 20 and noon on June 21, rainfall totals in excess of six inches occurred over portions of the County, with 7.50 inches reported as falling in the extreme southeast corner of Germantown, 6.26 inches reported as falling near the Germantown Village Hall, 3.56 inches reported in West Bend, 3.40 inches reported in Hubertus, and 2.51 inches reported in Hartford. This rainfall resulted in flash flooding, with the greatest impacts in the Village of Germantown. Damages reported in the Village included two homes that experienced severe structural damage. In addition, about 70 homes experienced basement damage, wall damage, and/or loss of personal property. Some car dealerships and repair shops in the Village suffered damage to new and used vehicles. Water depths of three feet that resulted in soil erosion were reported

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<sup>28</sup> Ibid.

at a golf course in the Village. Several roads in and around the Village had portions of asphalt washed away by the flood waters. There were reports of additional flood damage scattered across the southern part of the County. Several roads and underpasses across the southern part of the County were flooded with several feet of water, resulting in many road closures. USH 41 was covered with five feet of water at the CTH Q overpass. Some drivers had to be rescued after their vehicles were swept away by deep, fast water currents over roads. Property damages resulting from this 1997 flood were estimated at \$3.98 million (2014 dollars). A Presidential disaster declaration was issued as a result of this event, making County residents and business owners eligible for Federal disaster aid.

- May 21, 2004: A morning round of severe thunderstorms affected parts of south-central and most of southeast Wisconsin, resulting in areas of urban and low lying flooding in Washington County. Many of the impacts were centered about the Village of Slinger. Water was reported to have covered STH 60 in the Village. Floodwaters were reported as causing damage to basements, roads, water control systems, public buildings, and public utilities in the County. Two local emergencies were declared by the County Board Chairman and voluntary evacuations were ordered. Property damages were estimated at \$442,000 and crop damages were estimated at \$188,000 (2014 dollars).
- June 1-30, 2004: Scattered to widespread heavy rains across south-central and southeast Wisconsin during the period of June 9-12, 2004 kept many rivers and streams at or above flood stage for much or most of the month. Monthly rainfall totals generally ranged from four to seven inches across south-central and southeast Wisconsin, with some scattered spots picking up between seven and 9.5 inches. Depending on the location, this was between 50 and 100 percent above normal rainfall for the month. These heavy rains came at a time when reaches of some rivers were still high due to the rains that caused the flood and flash flood events of the previous month. The high water levels during June kept much of the low, bottom-land near rivers and streams inundated; closed some major state highways; forced water into basements; damaged corn, soy bean, and alfalfa crops; delayed planting of entire fields; washed out gravel road shoulders; and damaged foundations of homes and businesses. Property damages in Washington County resulting from the June 2004 event were estimated at \$3.76 million. Crop damages were estimated at \$7.52 million (2014 dollars). A Presidential disaster declaration was issued for the storms, tornadoes, and flooding that occurred in south-central and southeastern Wisconsin between May 19 and July 3, 2004. Washington County was included in this declaration, making county residents and business owners eligible for Federal disaster aid.
- August 22, 2007: August 2007 was a rainy month in south-central and southeastern Wisconsin. By the end of the month, many locations in this part of the State established new August rainfall records and all-time/any month rainfall records. Many locations measured 10 inches to 20 or more inches for the month. This is between 200 percent and 400 percent of normal August rainfall. Two rounds of thunderstorms across south-central and southeast Wisconsin on August 22 deposited heavy rains that triggered flash flooding. Hourly rainfall rates peaked around two inches per hour. Heavy rain from these storms resulted in flash flood conditions northeast of the City of Hartford. A flower farm reported substantial damage due to the heavy rains, along with some small hail. Soil erosion and crop damage also occurred on several other farms in that area. Fast-flowing water covered some roads, with depths of six inches to one foot being reported. In addition, basement flooding was reported from a few locations. Property damages resulting from this event were estimated at \$114,200 and crop damages were estimated at \$571,900 (2014 dollars).
- June 2008: The severe flooding affected much of southeastern Wisconsin in June 2008 and resulted from a combination of circumstances. Wet conditions prevailed through winter 2007-2008 and included heavy snowfalls early in 2008. This was followed by a wet spring. As a result, soils were highly saturated going into June and had little capacity to accept additional water from precipitation. In addition, June 2008 was one of the wettest Junes on record in southeastern Wisconsin. In many locations in Washington County, measurable precipitation fell on nine or more days during the first two weeks of the month. In addition, rainfall totals for the month were over 200 percent of average monthly rainfall. Rainfall totals for the first 15 days of the month exceeded nine inches at Germantown and Holy Hill, 11 inches at West Bend, 12 inches

at Allenton, and 13 inches at Hartford. A series of storms passed through southeastern Wisconsin on June 7 and 8, bringing heavy rains. This was followed by heavy rains on June 13. Because soils were still highly saturated, the majority of the precipitation from these storms went directly into streams, rivers, and lakes as runoff. This resulted in flooding and flash flooding throughout Washington County. Flooding began in early June and lingered in some areas for several weeks. In some locations, flooding occurred outside of the one-percent-annual-probability flood hazard area. The extent of flooding as estimated from satellite imagery taken between June 15 and June 30 is shown on Map 27. Examples of the impacts of the flooding include the following: Rising lake levels caused flood-related problems on several lakes. This resulted in the mandatory evacuation of two homes and voluntary evacuation of several others on Friess Lake. Residents of several homes on Druid Lake also voluntarily evacuated. Numerous roads were closed due to flooding or high water. Water depths on road surfaces reached or exceeded three feet, resulting in gravel washouts. Several roads and bridges sustained damage. Shoreline roads along Bark and Friess Lakes were sandbagged and sandbags were provided to property owners along lakes. Sewer backups and flooding of basements were reported in the City of West Bend. About 632 homes were affected by the flooding, with about 560 experiencing minimal damage, 60 experiencing minor damage, and 12 experiencing major damage. In addition, about 50 businesses were affected, with 45 experiencing minor damage and five experiencing major damage. This June 2008 flooding was estimated to have caused \$5.64 million in property damages and \$3.85 million in damages to crops (2014 dollars). Washington County was included in a Presidential disaster declaration that was issued as a result of this event.

- July 22, 2010: Parts of south-central and southeast Wisconsin experienced several rounds of record-setting torrential heavy rains during the afternoon and evening hours of July 22, 2010 that led to flash flooding and damage. During the afternoon, a persistent band of strong to severe thunderstorms developed and moved very slowly over south central and southeast Wisconsin through the evening hours. The individual storms were moving quite fast, about 40 to 50 mph, but the slow southward movement of the boundary these storms were developing along resulted in storms repeatedly training, or moving, over the same area. The NWS reported 24-hour rainfall totals exceeding 2.10 inches for the period ending at 7:00 a.m. on July 23 at several stations in Washington County, with 3.13 inches being reported at Germantown, 4.51 inches being reported at Holy Hill, and 4.60 inches being reported at Richfield. Some of this rain fell in a very short time. A trained spotter in West Bend recorded 1.77 inches of rain falling in 25 minutes. Similarly, another spotter in Barton recorded 2.03 inches falling in about 45 minutes. The storm caused numerous impacts, with flooding reported on roads in and around West Bend. In Kewaskum, police officials closed Clinton Street west of USH 45 due to flooding. In Barton, a spotter reported six inches of standing water covering yards in his neighborhood. This led to flooding of basements in the area. Sandbagging operations were needed on Little Cedar Lake due to rapidly rising lake levels from the heavy rain. About 32,000 We Energy utility customers lost electrical power throughout southeast Wisconsin due to the flooding and lightning. This July 2010 event was reported to have caused about \$22,000 in property damages and \$2,200 in crop damages (2014 dollars).

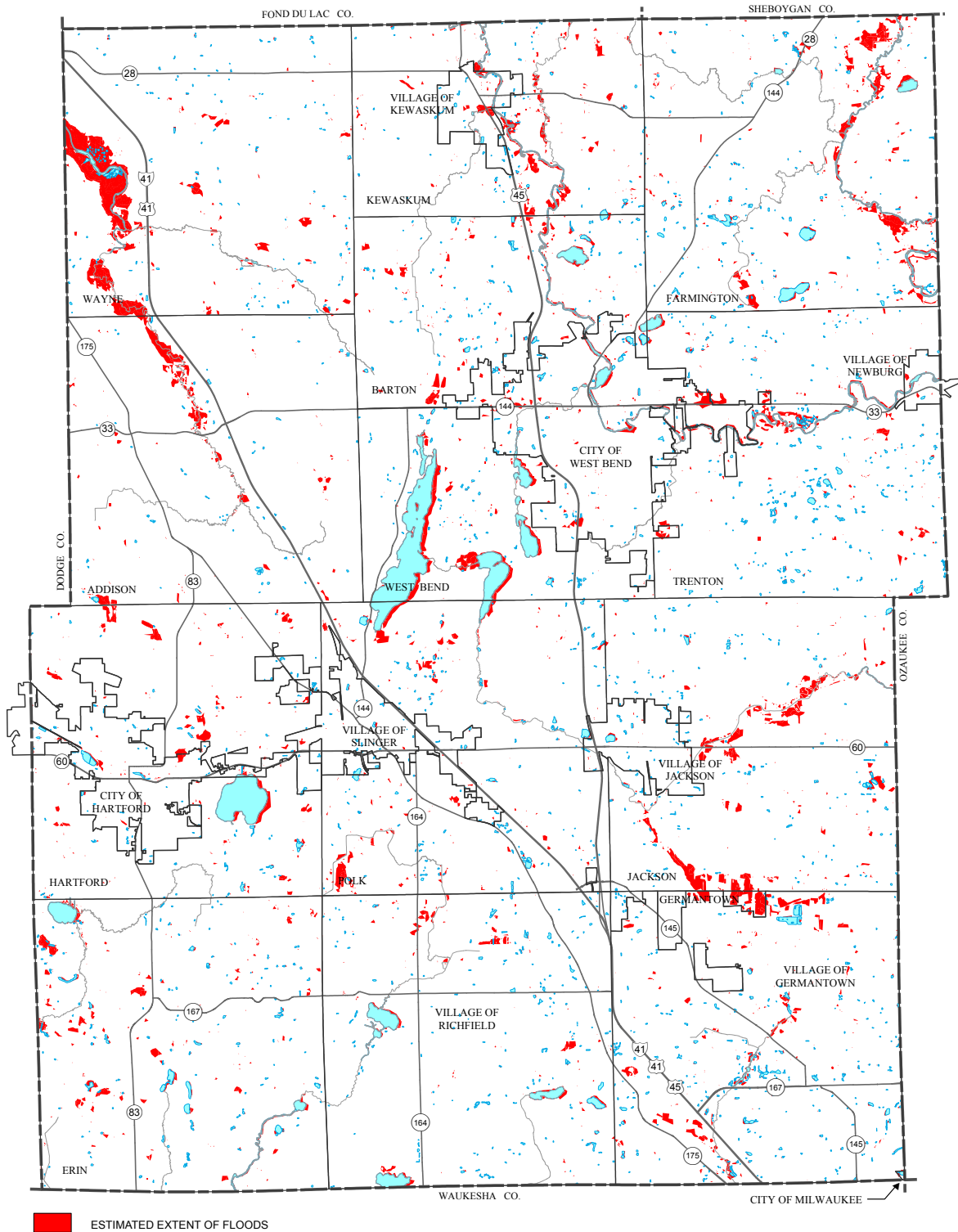
### **Vulnerability and Community Impacts Assessment**

In order to assess the vulnerability of Washington County to flooding hazards and related stormwater drainage problems, applicable basic inventory asset data described in Chapter II were refined and analyzed. For this purpose, consideration was specifically given to potential structure flooding, including critical facilities, and cropland flood damages.

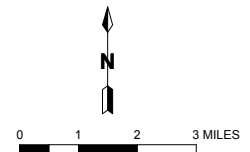
The floodplain areas, as well as the watershed boundaries, within Washington County are shown on Map 7 in Chapter II of this report. These areas are generally located along the major stream system throughout the County. The level of detail of the hydrologic and hydraulic data for each stream reach is shown on Map 28. Floodplain areas for which detailed studies are available were either mapped using GIS techniques through FEMA's RiskMAP program or were mapped on large-scale topographic mapping prepared at a scale of one inch equals 200 feet with a contour interval of two feet. Flood flows and stages are currently readily available for 259 miles of the total stream

Map 27

ESTIMATED EXTENT OF JUNE 2008 FLOODS IN WASHINGTON COUNTY



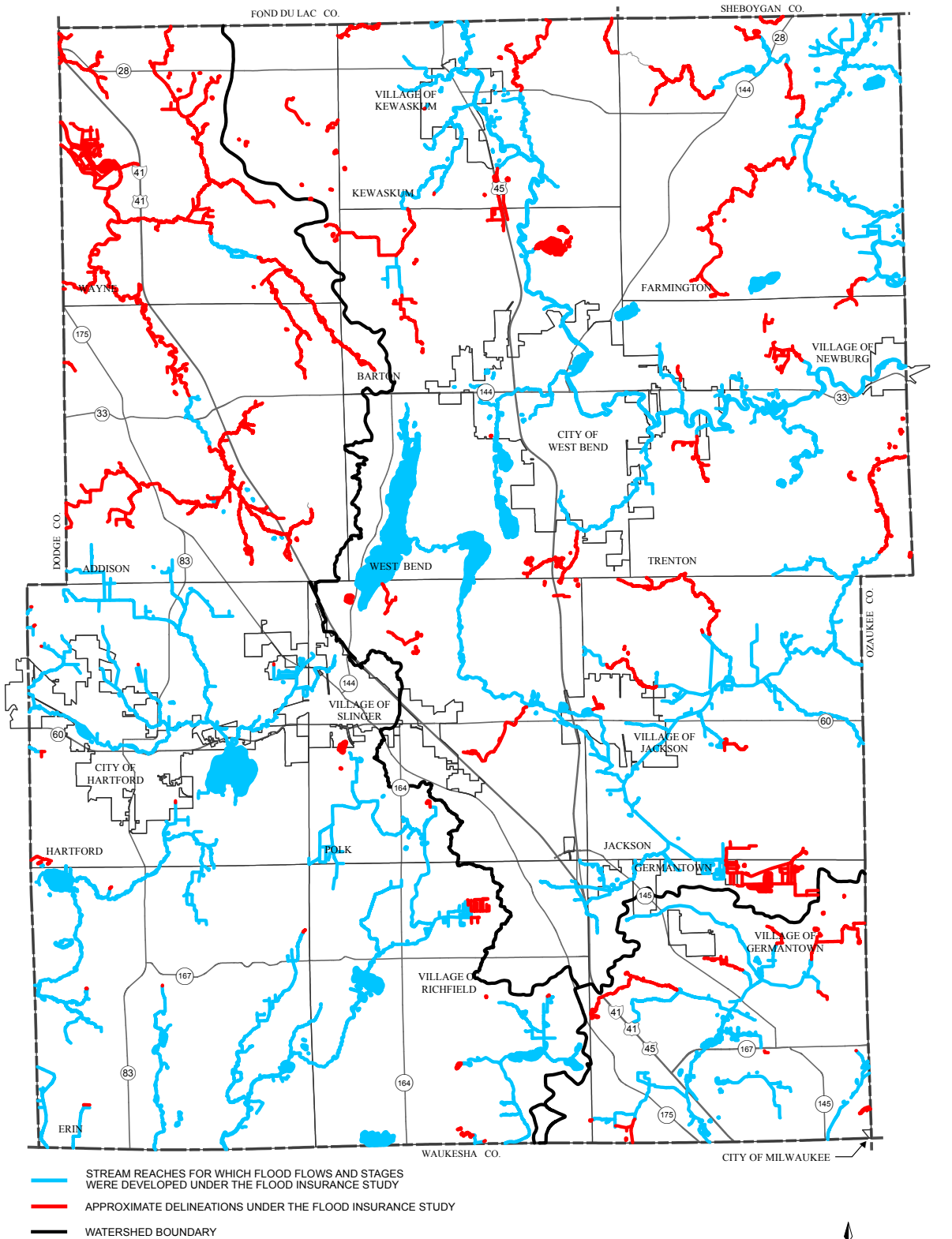
Source: Wisconsin Division of Emergency Management, University of Wisconsin-Madison, Dartmouth College, U.S. Geological Survey, Canadian Space Agency, American View, Wisconsin View, and SEWRPC.





Map 28

AVAILABLE FLOOD HAZARD DATA FOR STREAM REACHES IN WASHINGTON COUNTY: 2015



Source: Federal Emergency Management Agency and SEWRPC.

reaches, while the floodplain for about 151 miles of stream is delineated by approximate methods under the Federal Flood Insurance Study for the County.

The analyses estimating the damages that would result from a one-percent-annual-probability flood were based on the floodplains that were available at the time the analyses were conducted. Several floodplain mapping projects are being conducted in Washington County which would refine these floodplains and associated data and could potentially change the damage estimates. These projects are described in Chapter V of this report.

### ***Damage Estimation Methods***

Two approaches were taken to estimate the damages resulting from a one-percent annual probability flood event affecting Washington County: an analysis using HAZUS-MH<sup>29</sup> and a parcel-based loss analysis.

#### *HAZUS-MH Analysis*

HAZUS is a nationally applicable software package developed by FEMA that uses standardized methodology for estimating potential losses from earthquakes, floods, and hurricanes. In its default mode, HAZUS-MH generates its damage estimates through proration of the value of buildings within a U.S. Census block based upon the fraction of the Census block that is located within the floodplain. It should be noted that this methodology assumes that development occurs evenly across Census blocks. This may not be a valid assumption, especially around waterbodies. In addition, HAZUS-MH requires that a predetermined amount of square footage of a typical building sustain damage in order to produce a damaged building count. If only a minimal amount of damage to buildings is predicted, it is possible to see zero damaged building counts while also seeing economic losses. Because of these aspects of the HAZUS-MH methodology, it is important to recognize that the results of the analysis represent planning-level information that indicate potential damages and do not represent detailed scenarios.

The Wisconsin Division of Emergency Management (WEM) performed an analysis for Washington County using HAZUS-MH. The analysis utilized a flood depth grid developed by the WDNR. Because the development of this grid required detailed estimates of flood elevations, this analysis encompassed only those floodplain areas in the County for which detailed studies (Zone AE) were available.

#### *Parcel-Based Loss Analysis*

SEWRPC staff conducted a parcel-based analysis to estimate the damages that would be sustained by buildings as the result of a one-percent-annual probability flood event. GIS was used to identify those parcels that are wholly or partially located in the one-percent annual probability floodplain. The parcels were then examined using 2010 aerial photographs to determine whether a principal building, such as a house, a commercial building, or an industrial building was located within the floodplain. For those parcels in which a principal building was located wholly or partially in the floodplain, the 2015 assessed value of improvements was obtained from the Washington County Assessor's Office through the County's GIS portal. The information in the assessment was used to classify each principal building as residential, commercial, mobile home, governmental, or other. For each principal building, the elevation of the ground at the building was determined from the 2007 two-foot contour topographic maps.

Standard assumptions were made as to the elevation of the first floors of the principal buildings. For residential buildings, it was assumed that the first floor was 1.0 feet above the ground elevation. It was also assumed that residential buildings have basements. For mobile homes, it was assumed that the first floor is 2.0 feet above ground elevation and have no basements. For all other building types, it was assumed that the first floor is 0.5 feet above ground elevation.

Flood elevations for the one-percent-annual-probability flood event were derived from information in the Flood Insurance Study for the County. For those buildings located in floodplains that were developed using detailed

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<sup>29</sup> *Federal Emergency Management Agency, HAZUS-MH, Version 2.2, SPI, Release 13.1.0.*

methods (Zone AE on the digital flood insurance rate map (DFIRM)), the flood elevation at the closest upstream cross section on the DFIRM was used as the elevation. Slightly different methodology was used for those buildings located in floodplains that were developed using approximate methods (Zone A on the DFIRM). A transect was drawn at the building through the floodplain perpendicular to the stream. In most cases, the higher contour elevation at the floodplain margin was used to estimate the elevation. In cases where the difference between the elevations at the two margins of the floodplain was greater than 10 feet, the average of the contour elevations at the floodplain margins was used to estimate the flood elevation.

For each building, the first floor elevation and flood elevation were compared. The extent of direct damage—such as the costs associated with cleaning, repairing, or replacing the structure, its contents, the land—for each principal building was estimated as a percent of the value of improvements based on standardized flood loss depth-damage curves prepared by the Federal Emergency Management Agency, U.S. Army Corps of Engineers, and SEWRPC (Table 23). Indirect damages—such as the costs associated with temporary evacuations, relocations, lost wages, lost production and sales, and the incremental costs of traffic detours—were estimated to be a percentage of direct damages, with indirect damages representing 15 percent of direct damages for residential buildings and 40 percent of direct damages for commercial and industrial buildings.

### ***Impacts of a One-Percent-Annual-Probability Flood***

A review of the community assets described in Chapter II indicate the potential for flooding impacts to: 1) a variety of floodprone residential, commercial, and other developed land uses; 2) agricultural lands; 3) roadway transportation facilities; and 4) critical community facilities. No significant impacts are expected to other infrastructure or utility systems, solid waste disposal sites, or hazardous material storage sites.

The Zone AE or detailed flood analysis performed using HAZUS-MH estimated that 196 buildings would be affected by a one-percent-annual-probability flood. It estimated that 192 of these buildings would experience at least moderate damages, including 18 buildings which would be completely destroyed. Four other buildings would experience minor damages. The analysis estimated that such a flood would result in about \$84.50 million in direct damages to buildings and an additional \$155.53 million in damages to building contents and inventories, for total economic losses of \$240.33 million. In the event of a one-percent-annual-probability flood, the HAZUS-MH analysis estimates that about 5,780 persons would be displaced with about 3,400 of these requiring temporary shelter.

It should be noted that the numbers produced by HAZUS-MH are most likely inflated. The analysis suggests that the average amount of direct damages experienced by buildings affected by a one-percent-annual-probability flood would be on the order of \$431,000 per building. The parcel-based analysis found that the average assessed value of improvements on parcels wholly or partially within the floodplain was about \$213,000. One cause of this discrepancy may be that the HAZUS-MH analysis is done assuming that development occurs evenly across Census blocks. It is possible that other default assumptions used in the analysis are not representative of conditions in Washington County. In any case, it would probably be best to consider the flood damage estimates generated by the HAZUS-MH analysis as representing an absolute upper bound of possible damages resulting from a one-percent-annual-probability flood event.

The parcel-based loss analysis refined the property value data presented by community in Chapter II to reflect specific floodprone structure information. There are currently 987 structures estimated to be located within the one-percent-annual-probability (100-year recurrence interval) flood hazard areas of Washington County. The locations of these structures are shown on Map 29 and 30. There are 667 residential structures; 106 industrial, business, and commercial structures; 64 agricultural buildings; 137 residential mobile homes; 11 governmental structures; and 2 other structures. The specific location of each structure and its relationship to the floodplain is shown on the FEMA digital flood insurance rate maps for Washington County which for eastern portions of the County were finalized in 2013 and western portions of the County were finalized in 2015. It should be noted that as of June 30, 2015, there were 224 flood insurance policies in effect in Washington County under the National Flood Insurance Program.

Table 23

PERCENTAGE OF BUILDING DAMAGED BASED ON FIRST FLOOR FLOOD DEPTH

Depth of Inundation Relative to the First Floor (Feet)	Residential Buildings				Commercial Buildings	
	One Story		Two Story		Basement	No Basement
	Basement	No Basement	Basement	No Basement		
-8.0	0.000	--	0.000	--	0.000	--
-7.0	0.050	--	1.425	--	2.000	--
-6.0	1.000	--	2.850	--	4.000	--
-5.0	1.500	--	4.275	--	6.000	--
-4.0	2.040	--	5.700	--	8.500	--
-3.0	3.000	--	7.000	--	10.500	--
-2.0	4.080	--	8.500	--	12.500	--
-1.9	4.440	--	8.600	--	12.700	--
-1.8	4.900	--	8.800	--	12.900	--
-1.7	5.300	--	8.900	--	13.100	--
-1.6	5.600	--	9.000	--	13.300	--
-1.5	6.100	--	9.200	--	13.500	--
-1.4	6.500	--	9.300	--	13.700	--
-1.3	6.900	--	9.500	--	13.900	--
-1.2	7.300	--	9.600	--	14.100	--
-1.1	7.700	--	9.800	--	14.300	--
-1.0	8.110	0.000	9.900	0.000	14.500	0.000
-0.9	8.400	0.800	10.000	0.700	14.700	0.700
-0.8	8.800	1.600	10.200	1.300	14.900	1.400
-0.7	9.300	2.500	10.400	2.000	15.000	2.100
-0.6	9.600	3.300	10.500	2.700	15.300	2.800
-0.5	10.000	4.200	10.700	3.400	15.500	3.500
-0.4	10.400	5.000	10.800	4.000	15.600	4.200
-0.3	10.700	5.900	11.000	4.700	15.800	4.900
-0.2	11.200	6.700	11.100	5.500	16.000	5.600
-0.1	11.500	7.500	11.300	6.100	16.200	6.300
0.0	11.930	8.370	11.400	6.820	16.400	7.000
0.1	12.200	9.100	11.700	7.000	16.700	7.500
0.2	12.500	9.800	12.100	7.300	17.000	8.000
0.3	12.800	10.500	12.400	7.600	17.400	8.600
0.4	13.100	11.200	12.700	7.900	17.700	9.100
0.5	13.400	12.000	13.100	8.100	18.000	9.700
0.6	13.700	12.700	13.400	8.400	18.300	10.200
0.7	14.000	13.500	13.700	8.700	18.600	10.700

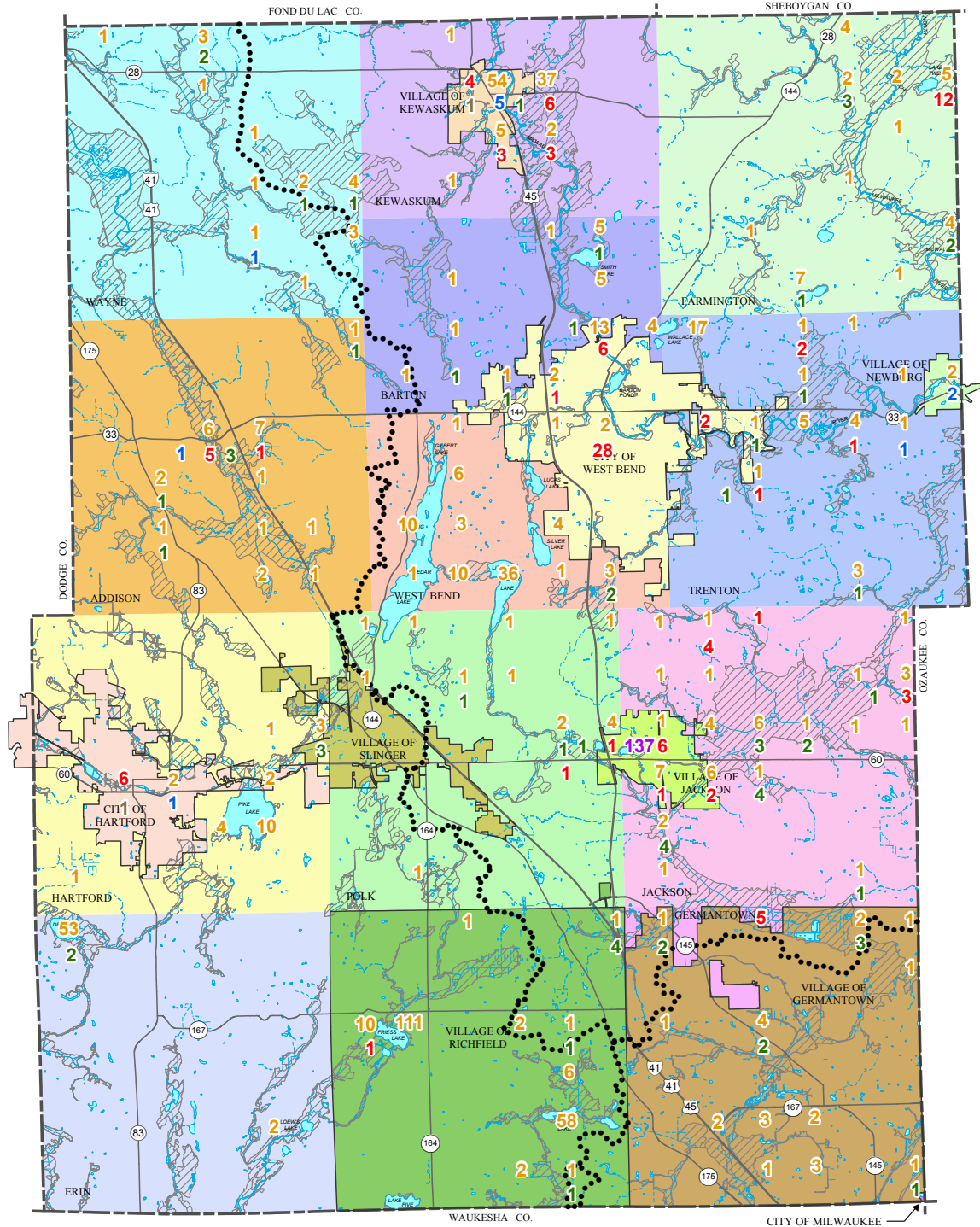
**Table 23 (continued)**

Depth of Inundation Relative to the First Floor (Feet)	Residential Buildings				Commercial Buildings	
	One Story		Two Story		Basement	No Basement
	Basement	No Basement	Basement	No Basement		
0.8	14.300	14.100	14.000	8.900	19.000	11.200
0.9	14.700	14.900	14.400	9.200	19.300	11.800
1.0	14.960	15.650	14.700	9.460	19.600	12.300
1.1	15.500	16.500	15.200	9.800	20.100	12.800
1.2	16.000	17.300	15.600	10.200	20.600	13.400
1.3	16.600	18.200	16.100	10.600	21.100	13.900
1.4	17.100	19.000	16.500	10.900	21.600	14.400
1.5	17.700	19.900	17.000	11.300	22.100	15.000
1.6	18.100	20.700	17.500	11.700	22.600	15.500
1.7	18.700	21.500	17.900	12.000	23.100	16.000
1.8	19.200	22.400	18.400	12.500	23.600	16.500
1.9	19.800	23.200	18.800	12.800	24.100	17.100
2.0	20.350	24.140	19.300	13.220	24.600	17.600
2.1	20.600	24.500	19.800	13.700	25.100	18.100
2.2	20.900	24.800	20.200	14.200	25.600	18.600
2.3	21.100	25.100	20.700	14.600	26.100	19.200
2.4	21.400	25.400	21.100	15.100	26.600	19.700
2.5	21.800	25.700	21.600	15.600	27.200	20.200
2.6	22.000	26.100	22.100	16.000	27.700	20.700
2.7	22.300	26.400	22.500	16.500	28.200	21.200
2.8	22.600	26.700	23.000	17.000	28.700	21.800
2.9	22.900	27.000	23.400	17.500	29.200	22.300
3.0	23.160	27.420	23.900	17.920	29.700	22.800
3.1	23.600	27.600	24.400	18.100	30.200	23.300
3.2	24.000	27.800	24.800	18.300	30.700	23.900
3.3	24.500	28.000	25.300	18.500	31.200	24.400
3.4	24.900	28.200	25.700	18.700	31.700	24.900
3.5	25.400	28.400	26.200	18.900	32.200	25.500
3.6	25.800	28.700	26.700	19.100	32.700	26.000
3.7	26.300	28.900	27.100	19.300	33.200	26.500
3.8	26.700	29.000	27.600	19.500	33.700	27.000
3.9	27.200	29.200	28.000	19.800	34.200	27.600
4.0	27.610	29.500	28.500	19.960	34.700	28.100
8.0	48.470	44.680	47.000	30.000	48.000	44.000

Source: Federal Emergency Management Agency, U.S. Army Corps of Engineers, and SEWRPC..

Map 29

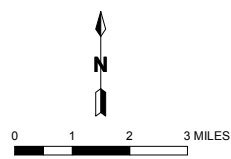
NUMBER OF STRUCTURES WITHIN FLOOD HAZARD AREAS BY CIVIL DIVISION IN WASHINGTON COUNTY: 2015



- 667** RESIDENTIAL STRUCTURES WITHIN U.S. PUBLIC LAND SURVEY SECTION
- 106** COMMERCIAL STRUCTURES WITHIN SECTION
- 64** AGRICULTURAL STRUCTURES WITHIN SECTION
- 137** MOBILE HOMES WITHIN SECTION
- 11** GOVERNMENT STRUCTURES WITHIN SECTION
- 2** OTHER STRUCTURES WITHIN SECTION

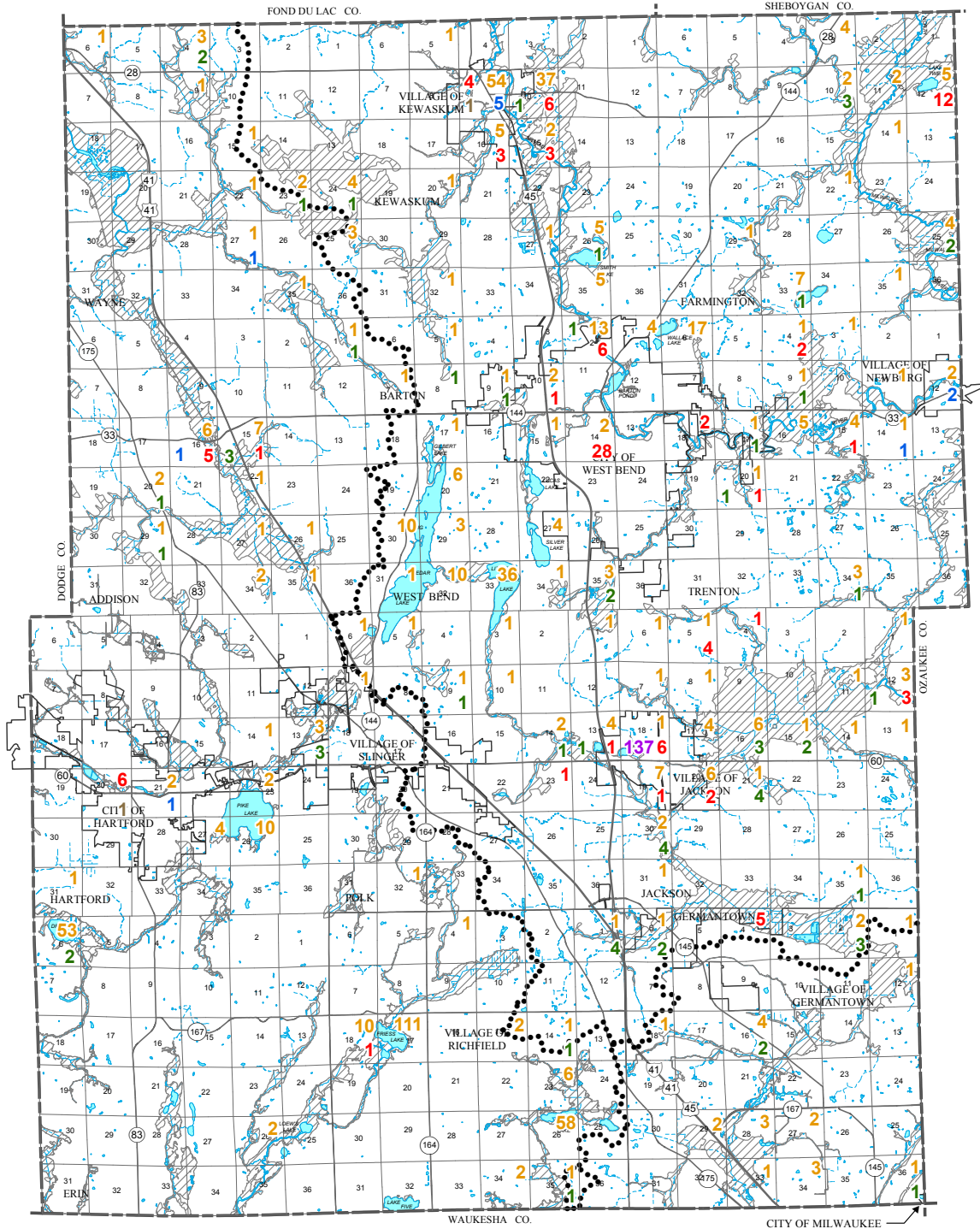
- ONE - PERCENT - ANNUAL - PROBABILITY (100 - YEAR RECURRENCE INTERVAL) FLOODPLAINS (2012)
- SURFACE WATER
- PERENNIAL STREAM
- INTERMITTENT STREAM
- MAJOR WATERSHED BOUNDARY

Source: Washington County and SEWRPC.



Map 30

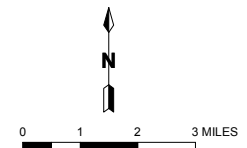
NUMBER OF STRUCTURES WITHIN FLOOD HAZARD AREAS BY U.S. PUBLIC LAND SURVEY SECTION IN WASHINGTON COUNTY: 2015



- 667** RESIDENTIAL STRUCTURES WITHIN U.S. PUBLIC LAND SURVEY SECTION
- 106** COMMERCIAL STRUCTURES WITHIN SECTION
- 64** AGRICULTURAL STRUCTURES WITHIN SECTION
- 137** MOBILE HOMES WITHIN SECTION
- 11** GOVERNMENT STRUCTURES WITHIN SECTION
- 2** OTHER STRUCTURES WITHIN SECTION

- ONE - PERCENT - ANNUAL - PROBABILITY (100 - YEAR RECURRENCE INTERVAL) FLOODPLAINS (2012)
- SURFACE WATER
- PERENNIAL STREAM
- INTERMITTENT STREAM
- MAJOR WATERSHED BOUNDARY

Source: Washington County and SEWRPC.



There are four structures in Washington County that are considered by FEMA to be repetitive- or severe repetitive-loss properties. Repetitive-loss structures are those that have two or more flood insurance claims of at least \$1,000 each. Severe repetitive-loss properties are those that either have four or more flood insurance claims for damages to building or contents of at least \$5,000 each or two or more flood insurance claims for building damages that total more than the existing value of the building. All four of these structures are residential buildings. Three of these buildings are located in the Village of Richfield. Two of them are severe repetitive-loss properties. The remaining structure is located in the Town of Erin.

Estimated damages from the parcel-based analysis are shown in Table 24 for the one-percent-annual-probability (100-year recurrence interval) flood event. In 2015, the total value of the 987 structures that are identified as being subject to flooding was about \$132.9 million. Damages expected during a one-percent-probability flood event affecting the entire County are estimated to be \$22.9 million.

It should be noted that, with a few exceptions, all of these structures were identified as being in the floodplain based upon the best available topographic mapping. Field surveys would be required to determine the precise relationship of these structures to the floodplain. Some structures may be found to be outside the flood hazard areas based upon detailed field survey data.

Maps 31 and 33 show the location of selected types of critical community facilities in Washington County, including hospitals, nursing homes, clinics, schools, childcare centers, community administration facilities (see Map 31), and fire and police stations (see Map 33) relative to the flood hazard areas. Three of these facilities appear to be located within the flood hazard areas. These consist of a community-based residential facility located in the Village of Jackson, a community-based residential facility in the Village of Kewaskum, and an apartment building for seniors and persons with disabilities in the City of West Bend. It should be noted that other facilities are located in the immediate vicinity of the flood hazard areas. Because of the need for access to and from these facilities, the hazard mitigation plan includes their location and shows the relationship to the flood hazard areas. There are 210 buildings identified as critical community facilities in Washington County. A listing of those facilities can be found in Appendix E. These buildings are geographically distributed throughout the County. However, the primary shelters are considered to be the 62 schools shown on Map 31 and listed in Appendix E. These schools are distributed throughout the County. None of these schools are located within the identified flood hazard areas.

As can be seen by review of Maps 31 and 33, the floodplain intersects a number of arterial and collector streets in the County. In some locations, this may indicate that floodwaters could potentially overtop these roads during a major flood event. This could disrupt portions of the transportation system in the County during flood events. It should be noted that discovery activities related to the FEMA RiskMap program reported some limited flooding of roads.<sup>30</sup>

A review of the location of historic sites in Washington County, as documented in Chapter II of this report, indicates that none of these sites are located within the flood hazard areas.

A review of the extent and severity of flooding conditions within Washington County indicates that there is a significant community impact, in part, as a result of the damages caused by flooding of buildings, primarily basements, and due to disruption of the transportation system during extreme flooding events.

The flooding impacts on the community infrastructure and the need to prepare for major evacuations and other emergency actions are not a significant concern given the isolated nature and the limited severity of the flooding problems. However, the ongoing coordinated Washington County and local emergency operations planning programs do have provisions for carrying out such actions if needed. Significant flood-related impacts on the

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<sup>30</sup> *Federal Emergency Management Agency, Discovery Report: Milwaukee Watershed HUC 04040003, May 16, 2012.*



Table 24

**PARCEL-BASED STRUCTURE FLOOD DAMAGES FROM A ONE-PERCENT-ANNUAL-PROBABILITY FLOOD EVENT: WASHINGTON COUNTY, WISCONSIN**

Annual Probability of Flood Occurrence	Number of Structures in Floodplain	Flood Damages		
		Direct	Indirect	Total
Detailed Studies (Zone AE) .....	826	\$16,308,860	\$3,465,590	\$19,774,450
Approximate Floodplains (Zone A) .....	161	2,695,040	484,050	3,157,590
Total	987	\$19,003,900	\$3,949,640	\$22,965,040

Source: SEWRPC.

community economy and businesses are of an infrequent and short-term nature. Likely impacts on County and local government operations involve posting and closure of roadways at locations where floodwaters overtop structures and cause short-term roadway flooding. Another potential impact is the need for emergency and police vehicles to consider the need to utilize alternative transportation routes when providing needed services during periods of flooding. In most of the County this is expected to be a rare occurrence.

**Agricultural Flood Damages**

As noted earlier in this chapter, historically flood damages to agricultural land have been significant, with crop damages totaling about \$15.9 million over the period of 1958 to 2014. Thus, the average annual damages in the County can be approximated at \$279,000 per year. There are 7,859 acres of agricultural land located within the studied floodplain areas. Thus, the average annual flood damage is about \$36 per acre.

**Stormwater Drainage Problems**

Because of the interrelationship between stormwater management and floodland management, stormwater management actions are an important consideration of the flood vulnerability assessment. Small area stormwater drainage problems are known to exist in selected urbanized portions of the County. These problems are generally addressed by local site-specific planning and stormwater facility design. Stormwater management plans are typically required by Washington County and the local municipalities for new developments. This practice should minimize the creation of new stormwater related problems. Stormwater management planning in Washington County is described in the following chapters, and this planning serves as the basis of the assessment of stormwater drainage problem vulnerability. In general, such problems impact community facilities by causing nuisance conditions and are not a concern for community health and welfare.

**Probability of Flood Occurrence in Washington County**

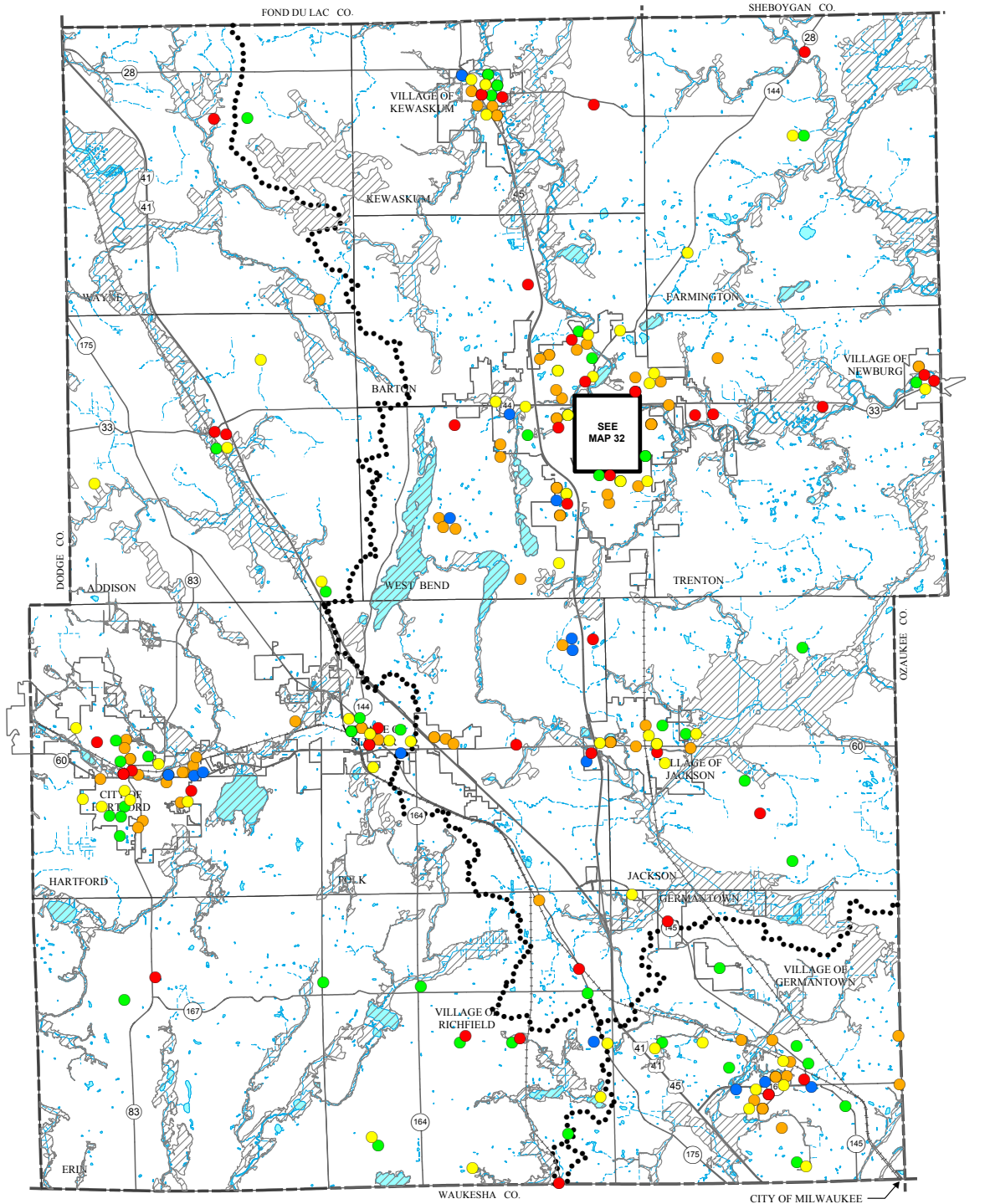
In the 35-year period from 1980 through 2014, 17 flood events were reported as affecting locations in Washington County. Based on this historical record, Washington County can expect to experience an average of 0.49 flood events per year somewhere in the County. It should be noted that the historical record shows considerable variation among years in the number of events that occurred. While it would be expected that in some years the County will experience either fewer event or more events than the average number, the average annual number of events is not expected to change.

**Potential Future Changes in Floodplain Boundaries and Problems**

Based upon the above, it can be concluded that the extent and severity of the flooding problem within the County has the potential to become more severe to a limited extent in the future. This conclusion highlights the importance of carrying out and implementing current floodplain and related ordinances and existing and ongoing stormwater management plans and regulations, as is discussed in Chapters IV and V of this report.

Map 31

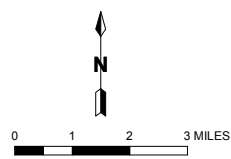
LOCATIONS OF CRITICAL FACILITIES IN RELATION TO FLOODLANDS IN WASHINGTON COUNTY: 2015



- GOVERNMENT BUILDING
- SCHOOL
- HOSPITAL, CLINIC, OR HEALTH DEPARTMENT
- CHILD - CARE CENTER
- NURSING HOME OR ASSISTED LIVING FACILITY

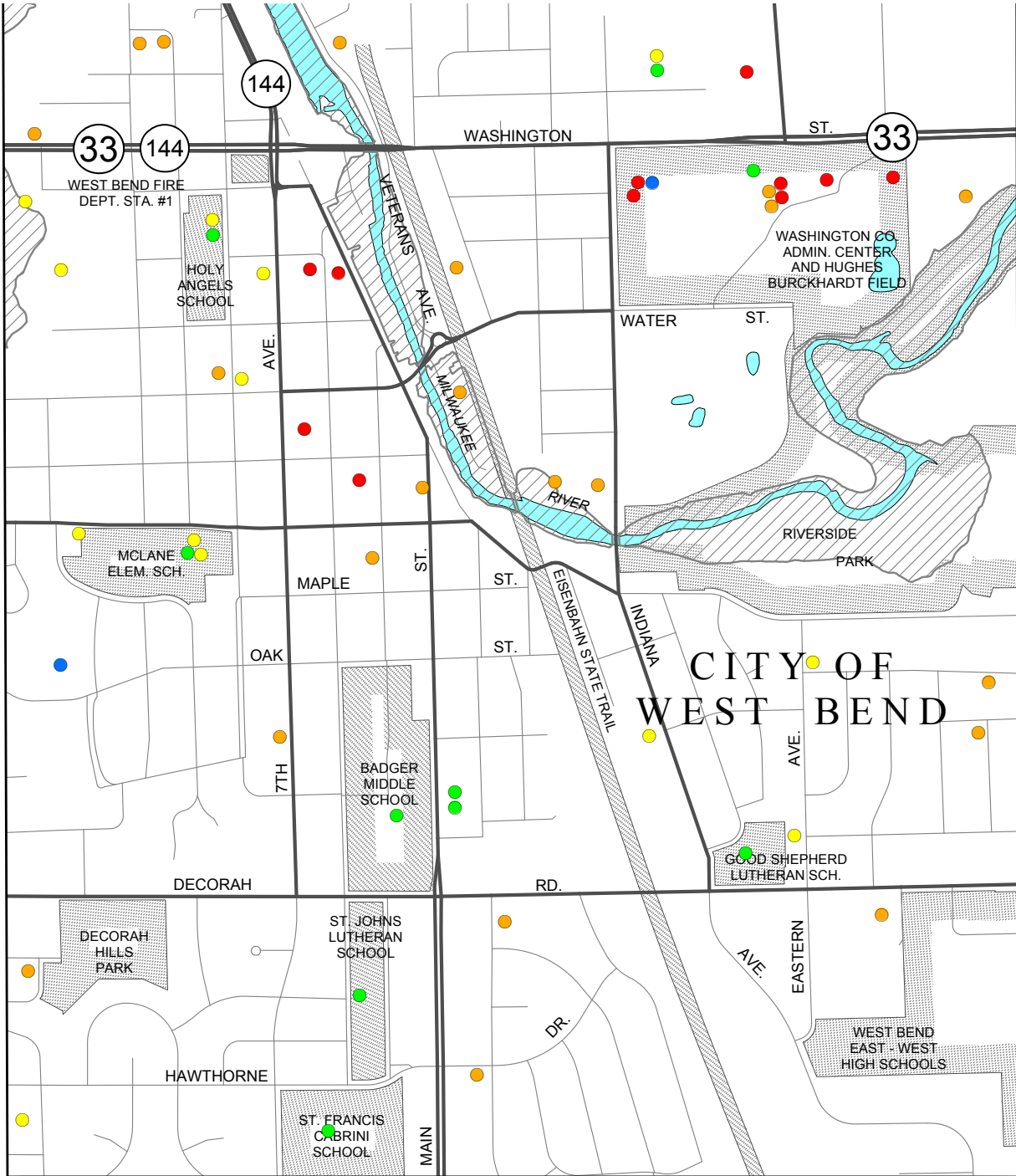
- ▨ ONE - PERCENT - ANNUAL - PROBABILITY (100 - YEAR RECURRENCE INTERVAL) FLOODPLAINS (2012)
- SURFACE WATER
- PERENNIAL STREAM
- - - - - INTERMITTENT STREAM
- MAJOR WATERSHED BOUNDARY

Source: Wisconsin Department of Children and Families, Wisconsin Department of Health Services, Wisconsin Department of Public Instruction, Washington County, and SEWRPC.





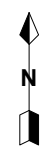
Map 32

LOCATIONS OF CRITICAL FACILITIES IN RELATION TO FLOODLANDS IN THE CITY OF WEST BEND CITY CENTER



- GOVERNMENT BUILDING
- SCHOOL
- HOSPITAL, CLINIC, OR HEALTH DEPARTMENT
- CHILD - CARE CENTER
- NURSING HOME OR ASSISTED LIVING FACILITY

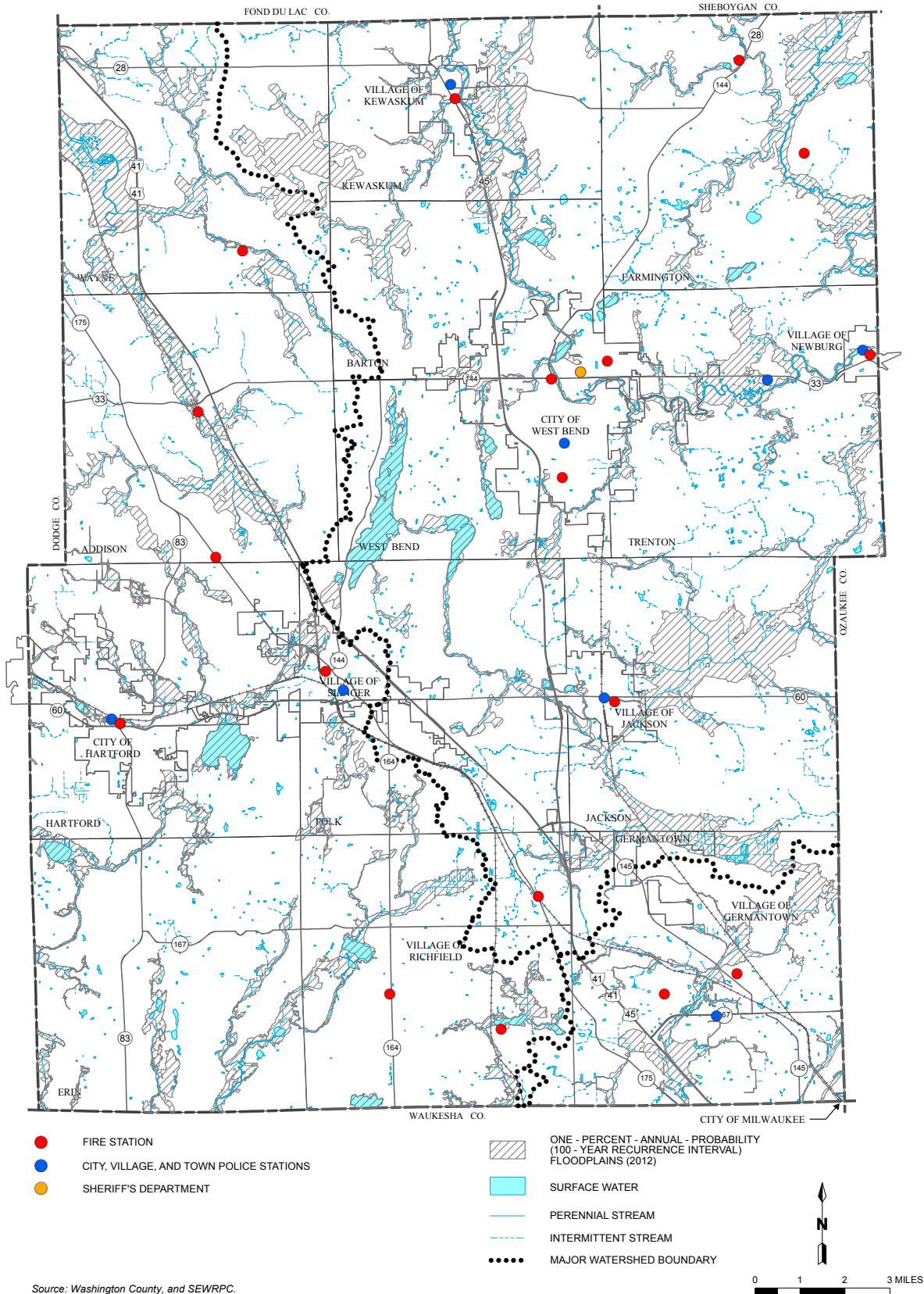
-  ONE - PERCENT - ANNUAL - PROBABILITY (100 - YEAR RECURRENCE INTERVAL) FLOODPLAINS (2012)
-  SURFACE WATER



Source: Wisconsin Department of Children and Families, Wisconsin Department of Health Services, Wisconsin Department of Public Instruction, Washington County, and SEWRPC.

Map 33

LAW ENFORCEMENT AND FIRE STATIONS IN RELATION TO FLOODLANDS IN WASHINGTON COUNTY: 2015



Changes in climate are likely to affect the potential for flooding in Washington County during the 21st century. As previously described, model projections show Wisconsin receiving more precipitation and more frequent intense precipitation events by the mid-21st century. Washington County may also receive three more precipitation events of two or more inches in 24 hours per decade, roughly a 25 percent increase in the frequency of heavy precipitation events. This is likely to increase the frequency of high flows and high water levels and potentially increase the frequency and severity of flooding. In particular, the expected increases in the magnitude and frequency of large rainfall events will likely increase flood magnitudes in streams and rivers in Wisconsin, although the amount of increase will vary from place to place. The amount of precipitation that falls as rain during winter and early spring months is expected to significantly increase. Winter rain can create stormwater management problems due to icing and runoff over frozen ground which may also lead to increased risk of flooding events.

These changes may lead to several flood and stormwater related impacts. Increased rainfall and shifting precipitation patterns that favor more rain during periods of low infiltration and evapotranspiration may lead to more frequent and severe stream and river flooding. Increased precipitation during winter and spring may result in increased occurrence of inland lake flooding. Increased cold-weather precipitation and increased variability in frost conditions may cause a rise in water tables in some areas leading to an increase in groundwater flooding.

The projected increase in the magnitude and frequency of heavy storms could also affect the performance of existing and planned stormwater management and flood mitigation systems. This increase could also expand flood hazard areas, such as the one-percent-annual-probability flood hazard area, beyond their existing boundaries, potentially encompassing more existing development. This could lead to an increase in the risk of flood damages and a need for larger stormwater management facilities and programs. The magnitudes of potential increases in flooding are unknown, and there is a complex interrelationship between the climatological factors that will be affected by climate change and the features of watersheds that produce runoff. In some cases, climate change-induced changes in certain climatological factors may offset the changes in other factors relative to their effects on flood flows. In other cases, the effects will reinforce one another. Thus, it is very important to continue to improve methods for downscaling climatological data, to expand the climatological parameters for which downscaled data can be developed, and to apply hydrologic and hydraulic simulation models to quantify the potential effects on flooding resulting from climate change.

### **Multi-Jurisdictional Flooding and Stormwater Management Risk Assessment**

Flooding and associated stormwater drainage problems have been identified as a significant risk in Washington County. As noted earlier and shown on Map 7 in Chapter II, flood hazard areas have been identified within all general-purpose local units of government in the County. In addition, there are related stormwater drainage problems in selected areas of many communities. Based upon the number of structures potentially impacted (see Maps 29 and 30), the extent of the agricultural flood damage potential, and the extent of roadway flooding, 19 communities will require special consideration with regard to the selection of mitigation measures for flooding and related stormwater problems. Those communities are noted in Table 25, along with the basis of special consideration over and above the countywide consideration.

## **VULNERABILITY ASSESSMENT FOR THUNDERSTORMS, HIGH WINDS, HAIL, AND LIGHTNING**

### **Thunderstorms**

Compared to other natural hazards within the State of Wisconsin, thunderstorms are the most common type of severe weather event. A thunderstorm is defined as a severe and violent form of convection produced when warm, moist air is overrun by dry, cool air. As the warm air rises, thunderheads (cumulonimbus clouds) form. These thunderheads produce the strong winds, lightning, thunder, hail, and heavy rain that are associated with these storm events. The thunderheads formed may be a towering mass averaging 15 miles in diameter and reach up to 40,000 to 50,000 feet in height. These storm systems may contain as much as 1.5 million tons of water and enormous amounts of energy. The water and energy are often released in one of several destructive forms, such as high winds, lightning,

hail, excessive rains, and tornadoes. This section covers thunderstorms and their related high winds, lightning, and hail hazards. Tornadoes and flooding caused by excessive rains are covered separately in other sections of this hazard analysis (see Vulnerability Assessment for Flooding and Associated Stormwater Drainage Problems and Vulnerability Assessment for Tornadoes).

A thunderstorm often lasts approximately 30 minutes in a given location, since an individual thunderstorm cell frequently moves at an average velocity that ranges between 30 to 50 miles per hour. However, strong frontal systems may produce more than one squall line composed of many individual thunderstorm cells. In Wisconsin, these fronts can often be tracked across the entire State from west to east.<sup>31</sup> Thunderstorms may occur individually, form clusters, or as a portion of a large line of storms. Therefore, it is possible that several thunderstorms may affect one particular area in the course of a few hours, as well as affecting larger areas of the State or County, within a relatively short period of time.

All thunderstorms are potentially dangerous. However, only about 10 percent of the thunderstorms that occur each year nationwide are classified as severe. According to the National Weather Service, a thunderstorm is considered severe if it produces hail sizes at least one-inch in diameter, wind speeds equal to or greater than 58 miles per hour (measured or implied by tree and/or structural damage), or a tornado.<sup>32</sup> A thunderstorm with wind speeds equal to or greater than 40 miles per hour or hail at least 0.5 inch in diameter is defined as approaching severe. Severe weather event statistics in the State of Wisconsin for the period 1982-2008 indicate that about 56 percent of these storm events are characterized by damaging straight-line winds, 38 percent are hail events, and the remaining 6 percent are made up of tornadoes. Severe thunderstorms can cause injury or death and can also result in substantial property and crop damage. They may cause power outages, disrupt telephone service, and severely affect radio communications, as well as surface and air transportation, which may seriously impair the emergency management capabilities of the impacted areas.

**Table 25**

**COMMUNITIES IN WASHINGTON COUNTY WITH SPECIAL FLOOD AND RELATED STORMWATER DRAINAGE CONSIDERATIONS**

Community	Reason for Special Consideration
City of Hartford	10 structures estimated to be in flood hazard area
City of West Bend	41 structures estimated to be in flood hazard area
Village of Germantown	27 structures estimated to be in flood hazard area
Village of Jackson	165 structures estimated to be in flood hazard area
Village of Kewaskum	112 structures estimated to be in flood hazard area
Village of Newburg	Four structures estimated to be in flood hazard area
Village of Richfield	200 structures estimated to be in flood hazard area, including three repetitive loss structures that are located in the Village
Town of Addison	36 structures estimated to be in flood hazard area. Substantial agricultural flood damages
Town of Barton	37 structures estimated to be in flood hazard area
Town of Erin	57 structures estimated to be in flood hazard area, including one repetitive loss structure that is located in the Town
Town of Farmington	46 structures estimated to be in flood hazard area
Town of Germantown	Eight structures estimated to be in flood hazard area
Town of Hartford	24 structures estimated to be in flood hazard area
Town of Jackson	47 structures estimated to be in flood hazard area
Town of Kewaskum	11 structures estimated to be in flood hazard area
Town of Polk	17 structures estimated to be in flood hazard area
Town of Trenton	45 structures estimated to be in flood hazard area
Town of Wayne	23 structures estimated to be in flood hazard area
Town of West Bend	77 structures estimated to be in flood hazard area

NOTE: See Maps 29 and 30.

Source: SEWRPC.

<sup>31</sup> National Weather Service Forecast Office.

<sup>32</sup> Prior to 2010, the National Weather Service criteria for severe thunderstorms was production of hail at least 0.75 inch in diameter, wind speeds equal to or greater than 58 miles per hour, or a tornado.

The National Weather Service monitors severe weather for 20 southern Wisconsin counties, including Washington County, from its Milwaukee/Sullivan office.<sup>33</sup> A severe thunderstorm watch indicates that conditions are favorable for severe weather, and that persons within the area for which the watch is issued should remain alert for approaching storms. A severe thunderstorm warning indicates that severe weather has been sighted in an area or indicated by weather radar and persons should seek shelter immediately. These severe thunderstorm watch and warning bulletins and advisories are disseminated over a number of telecommunication channels, including the NOAA Weather Radio, the NOAA Weather Wire, and the State Law Enforcement TIME System. NOAA Weather Radio is available to any individual with a weather alert radio. This system and the other sources are routinely monitored by local media that rebroadcast the weather bulletins over public and private television and radio stations. In addition, the National Weather Service operates three 24-hour weather radio transmitters that serve all or portions of Washington County. KEC60, operating at a frequency 162.400 megahertz (MHz), transmits from a location near Delafield in Waukesha County and serves all of Washington County. WWG87, operating at a frequency of 162.500 MHz, transmits from a location near Taycheedah in Fond du Lac County and serves the northern portion of Washington County. WWG91, operating at a frequency of 162.525 MHz, transmits from a location in the Town of Sheboygan in Sheboygan County and serves the northeastern corner of Washington County.

### **High Winds**

High-velocity, straight-line winds that are produced by thunderstorms and widespread nonthunderstorm high winds are the third most destructive natural hazard in Wisconsin and are responsible for most thunderstorm wind-related damages to property.<sup>34</sup> Thunderstorm winds can also be fatal. During the period from 1982 to 2008 in the State of Wisconsin, 28 fatalities were attributed to wind from severe thunderstorms. Although distinctly different from tornadoes, straight-line winds produced by thunderstorms can be very powerful, are fairly common, and can cause damages similar to that of a tornado event. Depending upon their intensity, high winds can uproot trees and crops, down power lines, and damage or destroy buildings and infrastructure. Flying debris can cause serious injury and death to humans, livestock, and wildlife in their path. Boats and airplanes are also extremely vulnerable to damage from high winds.

### **Hail**

Hailstorms are also associated with thunderstorms and are the fourth most destructive type of weather hazard in the State of Wisconsin. A hailstorm is a product of strong thunderstorms and unique weather condition where atmospheric water particles form into rounded or irregular masses of ice that fall to earth. Hail normally falls near the center of the moving storm along with the heaviest rain. In some instances, strong winds at high altitudes can blow the hailstones away from the storm center, causing unexpected hazards at places that otherwise might not appear threatened. Hailstones normally range from the size of a pea to that of a golf ball in the State of Wisconsin. Hailstones form when subfreezing temperatures cause water in thunderstorm clouds to accumulate in layers around an icy core. When strong underlying updraft winds no longer can support their weight, the hailstones fall earthward. Hail tends to fall in swaths that may be 20 to 115 miles long and five to 30 miles wide and can fall continuously or sporadically in a series of hail strikes. Hail strikes are typically one-half mile wide and five miles long. They may partially overlap, but often leave completely undamaged gaps between them.

Hailstorms are considered formidable among the weather and climatic hazards to property and farm crops, because they dent vehicles and structures, break windows, damage roofs, and batter crops to the point that significant agricultural losses result. Falling hailstones can also cause serious injury and loss of human life and livestock. However, these occurrences are rarely associated with hailstorms. In addition to impact damage, thick hail combined

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<sup>33</sup> *National Weather Service, Milwaukee/Sullivan Weather Forecast Office.*

<sup>34</sup> *Wisconsin Emergency Management Department of Military Affairs, State of Wisconsin Hazard Mitigation Plan, July 2011.*

with heavy rain can clog storm sewers and contribute to stormwater flooding. Hail sufficiently thick to cover a road will pose a traffic hazard. The peak season for hailstorms is April through August, although hail has been reported with thunderstorms in every month of the year.

### **Lightning**

Every thunderstorm produces lightning, and lightning has been shown to kill more people within the United States each year than tornadoes.<sup>35</sup> Lightning is defined as a sudden and violent discharge of electricity from within a thunderstorm due to a difference in electrical charges, and represents a flow of electrical current from cloud to cloud or cloud to ground. Water and ice particles also affect the distribution of electrical charge. Lightning bolts can travel 20 miles before striking the ground. The air near a lightning bolt can be heated to 50,000 degrees Fahrenheit (°F), which is hotter than the surface of the sun. The rapid heating and cooling of the air near the lightning channel causes a shock wave that results in thunder.

Lightning is a significant hazard associated with any thunderstorm and can cause extensive damage to buildings and structures, kill or injure people and livestock, start untold numbers of forest fires and wildfires, and damage electrical and electronic equipment. Lightning is a major cause of damage to farm buildings and equipment. It is responsible for more than 80 percent of all livestock losses and is the number one cause of farm fires. Counties in southern Wisconsin have been observed to experience a higher number of lightning events compared to other parts of the State due to higher thunderstorm frequency and more thorough documentation by the local media. Statistics for the United States have also shown that 92 percent of lightning-related fatalities occur during May through September and 73 percent of these events occur during the afternoon and early evening.<sup>36</sup> Approximately 30 percent of persons struck by lightning die and 74 percent of lightning strike survivors have permanent disabilities. In addition, 63 percent of lightning-associated deaths occur within one hour of injury and persons with cranial burns or leg burns from lightning are at higher risk for death than others struck by lightning.

### **Historical Thunderstorm, High-Wind, Hail, and Lightning Problems**

Historically, the State of Wisconsin averages over 30 days each year with thunderstorms across the northern region to about 40 days per year across the southern region. However, Washington County averages only about 10 days per year in which thunderstorms inflict wind, hail, or lightning damage. These thunderstorms and related high winds, hail, and lightning hazards can occur throughout the County during any month of the year, with little or no notice. Their highest frequency has been shown to occur during the period of May through September and between the hours of noon and 10:00 p.m. Washington County is subject to damage caused by thunderstorms and their related hazards, which can be severe and affect large areas of the County at a time, as well as potentially cause substantial loss of life and damage to property.

### **Description of Recent Thunderstorm, High-Wind, Hail, and Lightning Events**

The gravity of any particular thunderstorm and related wind, hail, and lightning hazard event is measured in terms of resulting deaths, injuries, and economic losses. Despite their relatively small size when compared with winter storms, thunderstorms and their related hazard events occur frequently and are dangerous.

#### ***Thunderstorm and High-Wind Events***

Data published by the National Climatic Data Center indicate that a total of 169 thunderstorms and 219 high-wind events have been recorded in Washington County during the 57-year period from August 1958 through December 2014. These events are shown on Map 34, and documented in terms of their magnitude and impact in Table 26. As shown in the table, the frequency of these storms can range from as few as one or two events per year up to 20 events

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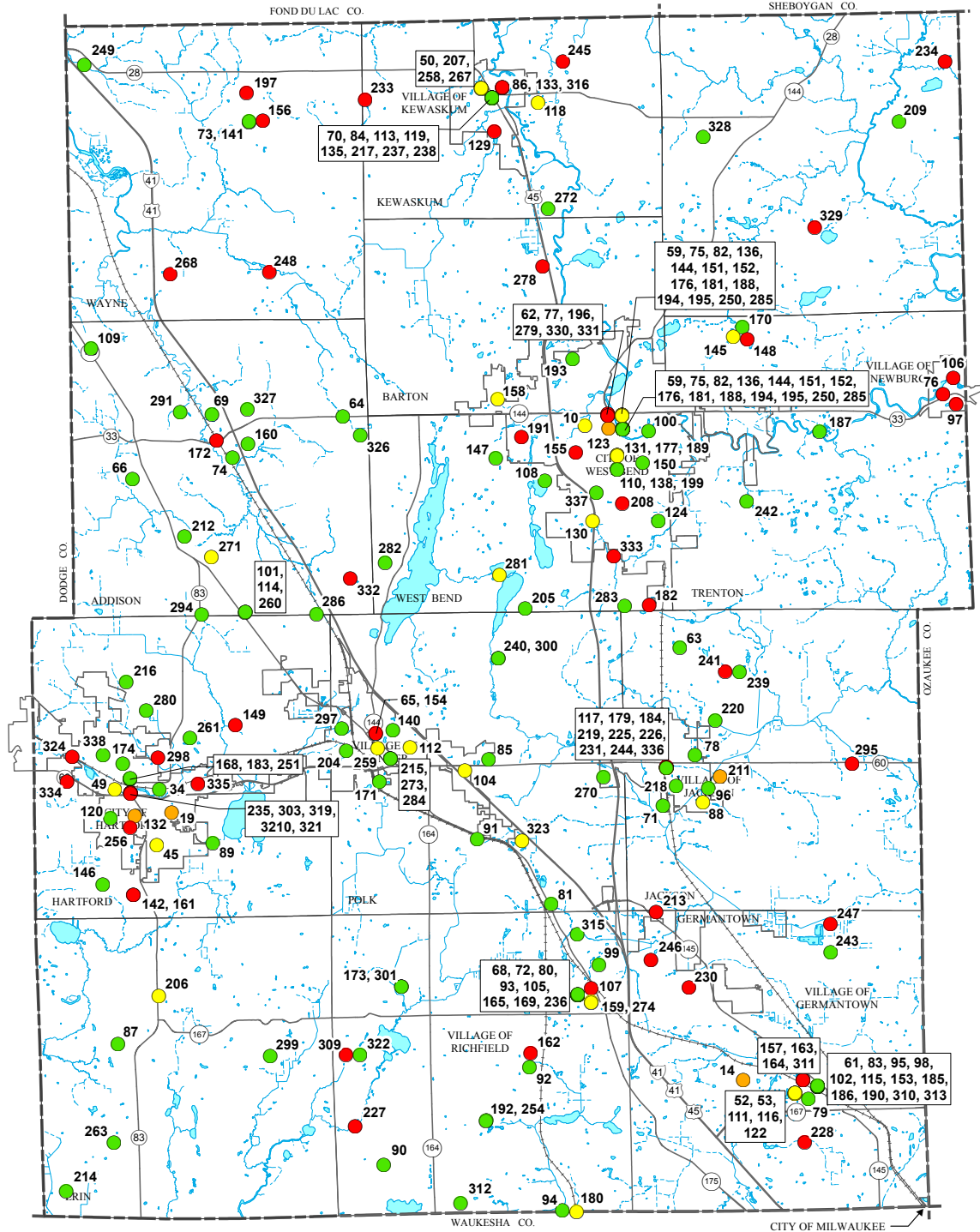
<sup>35</sup> *National Oceanic and Atmospheric Administration.*

<sup>36</sup> *U.S. Centers for Disease Control, "Lightning-Associated Deaths—United States, 1980-1995," Morbidity and Mortality Weekly Report, Volume 47, pages 391-394, 1998.*



### Map 34

## THUNDERSTORM, HIGH - WIND, HAIL, AND LIGHTNING EVENTS REPORTED WITHIN WASHINGTON COUNTY, AUGUST 1958 THROUGH DECEMBER 2014



- THUNDERSTORM AND HIGH WINDS
- HIGH WIND
- HAIL
- LIGHTNING
- 25 REFERENCE NUMBER (SEE TABLE III-10)

NOTE: THE NATIONAL CLIMATIC DATA CENTER INDICATES THAT THE EVENTS LISTED BELOW AFFECTED ALL OF WASHINGTON COUNTY:

- 4, 5, 6, 7, 8, 9, 12, 13, 15, 18, 20, 22, 24, 26, 27, 28, 30, 31, 32, 35, 36, 37, 40, 41, 42, 43, 44, 47, 48, 51, 54, 55, 56, 57, 60, 67, 127, 128, 134, 232, 325
- 17, 29, 33, 38, 46, 58, 125, 126, 143, 166, 167, 175, 178, 200, 201, 202, 203, 221, 222, 223, 224, 229, 253, 255, 257, 264, 265, 266, 269, 275, 276, 277, 287, 288, 289, 290, 292, 293, 302, 304, 305, 306, 307, 308, 314, 317, 318
- 1, 2, 3, 11, 16, 21, 23, 25, 39, 296

Source: National Climatic Data Center and SEWRPC.

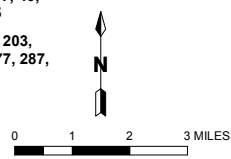


Table 26

THUNDERSTORM, HIGH-WIND, HAIL, AND LIGHTNING EVENTS REPORTED IN WASHINGTON COUNTY FROM AUGUST 1958 THROUGH DECEMBER 2014

Number on Map 3	Date	City/Village/Town	Event Type				Reported Damages <sup>a</sup>				
			Thunderstorm	High Winds	Hail	Lightning	Heavy Rain	Magnitude	Deaths	Injuries	Property Damage <sup>b</sup>
1	08/07/1958	Washington County	--	--	X	--	--	0	--	--	--
2	10/10/1962	Washington County	--	--	X	--	--	0	--	--	--
3	08/22/1964	Washington County	--	--	X	--	--	0	--	--	--
4	06/22/1965	Washington County	X	X	--	--	--	0	--	--	--
5	09/09/1965	Washington County	X	X	--	--	--	0	--	--	--
6	05/23/1966	Southeastern Counties	X	X	X	X	--	0	--	--	--
7	08/08/1966	Washington County	X	X	X	X	X	0	251,167.81	25,120.43	
8	06/10/1968	Washington County	X	X	X	--	--	0	401,868.50	40,186.85	
9	06/14/1968	Washington County	X	X	--	--	--	0	1,547,637.00	154,763.70	
10	09/14/1969	West Bend	--	--	--	--	--	0	18,707.70	--	--
11	08/26/1970	Washington County	--	--	X	X	--	0	177,391.50	55,931.53	
12	05/18/1971	Washington County	X	X	--	--	--	0	535,821.12	--	--
13	08/22/1971	Washington County	X	X	--	--	--	0	--	--	--
14	07/14/1972	German town	--	--	--	X	--	0	--	--	--
15	06/23/1973	Washington County	X	--	X	--	--	0	733,136.25	733,136.25	
16	07/26/1973	Washington County	--	--	X	--	--	0	--	--	--
17	08/09/1976	Washington County	--	X	--	--	--	0	36,656.81	36,656.81	
18	08/30/1973	Washington County	X	X	--	--	--	0	44,019.02	--	--
19	06/20/1974	Hartford	--	X	--	--	--	0	--	--	--
20	07/03/1974	Washington County	X	X	--	--	--	0	--	--	--
21	08/12/1974	Washington County	--	--	X	--	--	0	13,205.23	13,205.23	
22	08/16/1974	Washington County	X	X	--	X	--	0	13,205.23	--	--
23	08/26/1974	Washington County	--	--	X	--	--	0	--	--	--
24	06/13/1975	Washington County	X	X	--	--	--	0	--	--	--
25	07/30/1976	Washington County	--	--	X	--	--	0	--	--	--
26	07/06/1977	Washington County	X	X	--	--	--	0	--	--	--
27	06/17/1978	Washington County	X	X	--	--	--	0	1,996,995.00	--	--
28	08/18/1978	Washington County	X	X	--	--	--	0	--	--	--
29	05/30/1980	Washington County	--	X	X	--	--	0	31,603.00	--	--
30	06/06/1980	Washington County	X	X	X	--	--	0	123,539.00	--	--
31	07/05/1980	Washington County	X	X	--	--	--	0	79,007.50	79,007.50	
32	07/16/1980	Washington County	X	X	--	--	--	0	--	--	--
33	08/07/1980	Washington County	--	X	X	--	--	0	39,503.75	--	--
34	04/03/1981	Hartford	X	X	X	--	--	2	--	--	--
35	06/15/1981	Washington County	X	X	--	--	--	0	109,384.80	1,023,156.77	
36	07/12/1981	Washington County	X	X	--	--	--	0	238,737.53	238,737.53	
37	08/28/1981	Washington County	X	X	--	--	--	0	--	--	--
38	04/03/1982	Statewide	--	X	X	--	--	0	40,887.48	--	--
39	05/19/1982	Washington County	--	--	X	--	--	0	--	--	--
40	07/06/1982	Washington County	X	X	--	--	--	0	16,865.75	--	--
41	08/03/1982	Washington County	X	X	--	--	--	0	81,772.52	--	--
42	08/03/1982	Washington County	X	X	--	--	--	0	--	--	--
43	08/03/1982	Washington County	X	X	--	--	--	0	--	--	--
44	08/15/1982	Washington County	X	X	--	--	--	0	98,128.00	--	--
45	05/28/1983	Washington County	--	X	--	X	--	0	6,536.48	--	--
46	07/19/1983	Washington County	--	X	--	--	--	0	--	--	--
47	07/19/1983	Washington County	X	X	--	--	--	0	--	--	--
48	07/19/1983	Washington County	X	X	--	--	--	0	--	--	--
49	07/28/1983	Hartford	--	--	--	X	--	0	653,647.50	--	--
50	08/04/1983	Kewaskum	--	--	--	X	--	1	65,364.75	--	--

Table 26 (continued)

Number on Map 3	Date	City/Village/Town	Event Type					Magnitude	Reported Damages <sup>a</sup>		
			Thunderstorm	High Winds	Hail	Lightning	Heavy Rain		Deaths	Injuries	Property Damage <sup>b</sup>
51	09/10/1983	Washington County	X	X	--	--	50 knots	0	0	65,364.75	--
52	09/17/1983	Germantown	--	--	--	X	N/A	0	0	6,536.48	--
53	09/19/1983	Germantown	--	--	--	X	N/A	0	0	106,960.50	--
54	06/06/1984	Washington County	X	X	--	--	52 knots	0	0	91,140.00	--
55	07/10/1984	Washington County	X	X	--	--	52 knots	0	0	626,587.50	--
56	07/10/1984	Washington County	X	X	--	--	78 knots	0	0	--	--
57	07/23/1984	Washington County	X	X	--	--	52 knots	0	0	--	--
58	05/31/1985	Southeastern Counties	--	X	--	--	0 knots	0	0	--	--
59	07/06/1986	West Bend	X	X	--	--	52 knots	0	0	--	--
60	07/12/1986	Washington County	X	X	--	--	56 knots	0	0	--	--
61	07/21/1986	Germantown	X	X	--	--	0 knots	0	0	54,000.00	--
62	05/21/1987	West Bend	--	--	X	--	1.00 inch	0	0	--	--
63	07/29/1987	West Bend and Jackson	X	X	--	--	61 knots	0	0	--	--
64	08/16/1987	Allenton and West Bend	X	X	--	--	52 knots	0	0	--	--
65	04/05/1988	Slinger	--	--	X	--	0.75 inches	0	0	--	--
66	05/08/1988	Addison	X	X	--	--	0 knots	0	0	5,503.03	--
67	05/08/1988	Washington County	X	X	--	--	0 knots	0	0	--	--
68	05/08/1988	Richfield	X	X	--	--	0 knots	0	0	5,503.03	--
69	06/22/1988	Allenton	X	X	--	--	54 knots	0	0	--	--
70	06/22/1988	Kewaskum	X	X	--	--	0 knots	0	0	5,503.03	--
71	11/16/1988	Jackson	X	X	--	--	0 knots	0	0	550.30	--
72	05/24/1989	Richfield	X	X	--	--	56 knots	0	0	52,475.50	195.69
73	05/24/1989	Wayne	X	X	--	--	0 knots	0	0	524,755.00	195.69
74	05/24/1989	Allenton	X	X	--	--	0 knots	0	0	52,475.50	195.69
75	05/24/1989	West Bend	X	X	--	--	0 knots	0	0	524,755.00	195.69
76	07/27/1989	Newburg	--	--	X	--	2.50 inches	0	0	524,755.00	524,755.00
77	07/27/1989	West Bend	--	--	X	--	0.75 inches	0	0	--	1,392,986.00
78	07/27/1989	Jackson	X	X	--	--	0 knots	0	0	524,755.00	160.37
79	07/27/1989	Germantown	X	X	--	--	56 knots	0	0	524,755.00	160.37
80	08/04/1989	Richfield	X	X	--	--	50 knots	0	0	--	2,464.78
81	08/04/1989	Jackson	X	X	--	--	0 knots	0	0	--	2,464.78
82	07/22/1990	West Bend	X	X	--	--	0 knots	0	0	--	--
83	08/11/1990	Germantown	X	X	--	--	53 knots	0	0	--	--
84	08/26/1990	Kewaskum	X	X	--	--	56 knots	0	0	--	--
85	03/27/1991	Jackson	X	X	--	--	0 knots	0	0	--	--
86	03/27/1991	Kewaskum	X	X	--	--	0 knots	0	0	--	10,478.37
87	04/29/1991	Hartford	--	--	X	--	0.75 inches	0	0	--	10,478.37
88	07/01/1991	Jackson	--	--	X	X	0	0	0	--	--
89	07/07/1991	Hartford	X	X	--	--	N/A	0	0	--	--
90	07/07/1991	Plat	X	X	--	--	52 knots	0	0	47,797.75	47,797.75
91	07/07/1991	Ackerville	X	X	--	--	0 knots	0	0	47,797.75	47,797.75
92	07/07/1991	Hubertus	X	X	--	--	0 knots	0	0	477,977.50	477,977.50
93	07/07/1991	Richfield	X	X	--	--	0 knots	0	0	477,977.50	477,977.50
94	07/07/1991	Colgate	X	X	--	--	0 knots	0	0	477,977.50	477,977.50
95	07/07/1991	Germantown	X	X	--	--	0 knots	0	0	477,977.50	477,977.50
96	07/07/1991	Jackson	X	X	--	--	0 knots	0	0	477,977.50	477,977.50
97	06/17/1992	Newburg	--	--	X	--	0.75 inches	0	0	--	--
98	06/17/1992	Germantown	X	X	--	--	50 knots	0	0	--	--
99	06/17/1992	Richfield	X	X	--	--	50 knots	0	0	--	--
100	06/17/1992	West Bend	X	X	--	--	0 knots	0	0	--	--

Table 26 (continued)

Number on Map 3	Date	City/Village/Town	Event Type						Reported Damages <sup>a</sup>			
			Thunderstorm	High Winds	Hail	Lightning	Heavy Rain	Magnitude	Deaths	Injuries	Property Damage <sup>b</sup>	Crop Damage <sup>b</sup>
101	08/23/1993	St. Lawrence							0	0	0	8,191.50
102	06/05/1994	Germentown	X	X					0	0	7,987.00	7,987.00
103	07/05/1994	West Bend							0	0		
104	07/06/1994	Slinger							0	1		
105	07/19/1994	Richfield							0	0	43,928.50	43,928.50
106	07/23/1994	Newburg							0	0		
107	08/19/1994	Richfield							0	0		
108	08/27/1994	West Bend	X	X	X				0	0	11,181.80	
109	08/27/1994	Nenno	X	X					0	0		
110	07/15/1995	West Bend	X	X					0	0		32.62
111	08/07/1995	Germentown							0	0	6,213.60	
112	08/09/1995	Slinger							0	0		
113	08/28/1995	Kewaskum							0	0		8,800.01
114	08/28/1995	St. Lawrence							0	0		
115	08/28/1995	Germentown	X	X					0	0		8,800.01
116	08/28/1995	Germentown							0	0		
117	06/29/1996	Jackson							0	1		
118	07/02/1996	Kewaskum							0	0	27,158.40	
119	07/18/1996	Kewaskum							0	0	150,880.00	
120	07/18/1996	Hartford	X	X					0	0	22,632.00	
121	08/05/1996	West Bend	X	X					0	0	27,158.40	
122	08/26/1996	Germentown							0	0	7,544.00	199,635.36
123	10/30/1996	West Bend							0	0	75,440.00	
124	04/05/1997	West Bend							0	0		
125	04/06/1997	Washington County	X	X					0	0	13,275.00	
126	05/05/1997	Washington County							0	0	73,750.00	
127	06/24/1997	Washington County	X	X					0	0	8,555.00	
128	06/24/1997	Washington County	X	X					0	0	4,425.00	3,473.63
129	07/13/1997	Kewaskum	X	X					0	1	5,900.00	3,473.63
130	07/16/1997	West Bend							0	0		
131	07/21/1997	West Bend							0	0	14,750.00	
132	03/08/1998	Southeastern Counties							0	0	221,250.00	
133	03/30/1998	Kewaskum							0	0	28,387.16	
134	05/31/1998	Washington County	X	X	X				0	0	12,447,068.00	145,240.00
135	06/12/1998	Kewaskum	X	X					0	0	10,166.80	
136	06/18/1998	West Bend	X	X					0	0		
137	06/18/1998	Slinger	X	X					0	0		
138	06/27/1998	West Bend	X	X					0	0	7,262.00	
139	07/20/1998	West Bend							0	0	380,528.80	
140	07/20/1998	Slinger	X	X					0	0	14,524.00	
141	08/22/1998	Wayne	X	X					0	0	1,452.40	
142	09/01/1998	Hartford							0	0		
143	11/10/1998	Washington County							0	0	755,248.00	116,192.00
144	05/16/1999	West Bend	X	X					0	1	5,684.00	51,393.31
145	05/17/1999	West Bend	X	X					0	1	49,735.00	
146	06/06/1999	Hartford	X	X					0	0	1,421.00	
147	06/06/1999	West Bend	X	X					0	0	14,210.00	
148	06/06/1999	West Bend	X	X					0	0	4,263.00	
149	06/10/1999	Hartford							0	0		
150	06/10/1999	West Bend	X	X					0	0	4,263.00	

Table 26 (continued)

Number on Map 3	Date	City/Village/Town	Event Type						Reported Damages <sup>a</sup>			
			Thunderstorm	High Winds	Hail	Lightning	Heavy Rain	Magnitude	Deaths	Injuries	Property Damage <sup>b</sup>	Crop Damage <sup>b</sup>
151	06/10/1999	West Bend	X	X	-	-	-	0 knots	0	1,421.00	-	-
152	07/05/1999	West Bend	X	X	-	-	-	0 knots	0	2,842.00	49,815.29	-
153	07/08/1999	German town	X	X	-	-	-	0 knots	0	2,842.00	49,815.29	-
154	11/10/1999	Slinger	-	-	X	-	-	0.75 inches	0	-	-	-
155	11/10/1999	West Bend	-	-	X	-	-	1.00 inches	0	-	-	-
156	03/08/2000	Wayne	-	-	X	-	-	0.75 inches	0	-	-	-
157	03/08/2000	German town	-	-	X	-	-	0.75 inches	0	-	-	-
158	05/08/2000	West Bend	-	-	-	-	-	N/A	0	9,623.60	-	-
159	05/08/2000	Richfield	-	-	-	-	-	N/A	0	4,124.40	-	-
160	05/11/2000	Allenton	X	X	-	-	-	65 knots	0	137,480.00	78,587.69	-
161	05/18/2000	Hartford	-	-	X	-	-	1.00 inches	0	-	163.60	-
162	05/18/2000	Hubertus	-	-	X	-	-	0.75 inches	0	-	163.60	-
163	06/01/2000	German town	-	-	X	-	-	1.00 inches	0	-	-	-
164	07/02/2000	German town	-	-	X	-	-	1.00 inches	0	-	-	-
165	07/02/2000	Richfield	X	X	-	-	-	0 knots	0	1,374.80	82,371.14	-
166	04/07/2001	Washington County	-	X	-	-	-	57 knots	0	-	-	-
167	04/11/2001	Washington County	-	X	-	-	-	58 knots	0	-	-	-
168	05/10/2001	Hartford	X	X	-	-	-	56 knots	0	-	138,609.11	-
169	06/11/2001	Richfield	X	X	-	-	-	52 knots	0	13,367.00	21,786.87	-
170	06/16/2001	West Bend	X	X	-	-	-	52 knots	0	-	21,786.87	-
171	06/18/2001	Slinger	X	X	-	-	-	52 knots	0	-	21,786.87	-
172	07/03/2001	Allenton	-	-	X	-	-	0.75 inches	0	-	-	-
173	07/22/2001	Hartford	X	X	-	-	-	52 knots	0	40,101.00	8,516.12	-
174	08/09/2001	Hartford	X	X	-	-	-	52 knots	0	-	255.75	-
175	08/19/2001	Washington County	-	-	-	-	-	49 knots	0	-	-	-
176	08/22/2001	West Bend	X	X	-	-	-	52 knots	0	-	255.75	-
177	08/22/2001	West Bend	-	-	-	X	-	N/A	0	22,723.90	-	-
178	12/05/2001	Washington County	-	X	-	-	-	43 knots	0	7,017.68	-	-
179	03/08/2002	Jackson	-	-	-	X	-	N/A	0	6,579.50	-	-
180	03/09/2002	Colgate	-	-	-	X	-	N/A	0	32,897.50	-	-
181	04/18/2002	West Bend	X	X	-	-	-	52 knots	0	3,947.70	19,560.85	-
182	06/15/2002	West Bend	-	-	X	-	-	0.75 inches	0	-	-	-
183	07/08/2002	Hartford	X	X	-	-	-	56 knots	0	13,159.00	7,457.21	-
184	07/08/2002	Jackson	X	X	-	-	-	56 knots	0	13,159.00	7,457.21	-
185	07/08/2002	German town	X	X	-	-	-	52 knots	0	-	-	-
186	08/21/2002	German town	X	X	-	-	-	56 knots	0	-	-	-
187	08/21/2002	West Bend	X	X	-	-	-	52 knots	0	-	-	-
188	09/02/2002	West Bend	X	X	-	-	-	52 knots	0	-	-	-
189	09/19/2002	West Bend	X	X	-	-	-	56 knots	0	-	-	-
190	10/04/2002	German town	-	-	-	X	-	N/A	0	2,631.80	5,578.10	-
191	05/10/2003	West Bend	X	X	X	-	-	54 knots	0	13,159.00	-	-
192	08/01/2003	Hartford	X	X	-	-	-	0.88 inches	0	-	-	-
193	08/01/2003	West Bend	X	X	-	-	-	52 knots	0	12,866.00	-	-
194	08/03/2003	West Bend	X	X	-	-	-	52 knots	0	-	-	-
195	08/03/2003	West Bend	X	X	-	-	-	N/A	0	-	-	-
196	08/03/2003	West Bend	-	-	X	-	-	52 knots	0	-	-	-
197	08/03/2003	Wayne	-	-	X	-	-	0.75 inches	0	-	-	-
198	08/03/2003	Hartford	-	-	X	-	-	1.00 inches	0	-	-	-
199	11/01/2003	West Bend	-	-	-	-	X	N/A	0	-	-	-
200	11/12/2003	Washington County	-	X	-	-	-	42 knots	0	3,859.80	-	-

Table 26 (continued)

Number on Map 3	Date	City/Village/Town	Event Type					Reported Damages <sup>a</sup>			
			Thunderstorm	High Winds	Hail	Lightning	Heavy Rain	Magnitude	Deaths	Injuries	Property Damage <sup>b</sup>
201	03/07/2004	Washington County	--	X	--	--	--	0	0	3,759.60	--
202	03/14/2004	Washington County	--	X	--	--	--	0	0	5,012.80	--
203	04/18/2004	Washington County	--	X	--	--	--	0	0	12,532.00	--
204	05/21/2004	Slinger	--	--	--	--	X	0	0	--	500,523.69
205	05/21/2004	Hartford	X	X	--	--	--	0	0	438,620.00	500,523.69
206	06/12/2004	Thompson	--	--	--	--	X	0	0	3,759.60	--
207	06/12/2004	Kewaskum	--	--	--	--	--	0	0	187,980.00	--
208	06/23/2004	West Bend	--	--	X	--	--	0	0	--	--
209	06/23/2004	Fillmore	X	X	--	--	--	0	0	--	278,804.42
210	08/03/2004	West Bend	--	X	--	X	--	0	0	6,266.00	578.98
211	12/12/2004	Washington County	--	X	--	--	--	0	0	2,506.40	--
212	03/30/2005	St. Lawrence	X	X	--	--	--	0	0	181,830.00	--
213	06/04/2005	Jackson	--	X	X	--	--	0	0	--	--
214	06/11/2005	Hartford	X	X	--	--	--	0	0	--	--
215	07/25/2005	Slinger	X	X	--	--	--	0	0	2,424.40	--
216	07/25/2005	Hartford	X	X	--	--	--	0	0	30,305.00	2,424.40
217	09/13/2005	Kewaskum	X	X	--	--	--	0	0	--	--
218	09/13/2005	Jackson	X	X	--	--	--	0	0	--	--
219	09/13/2005	Jackson	X	X	--	--	--	0	0	--	--
220	09/13/2005	Jackson	X	X	--	--	--	0	0	--	--
221	11/13/2005	Washington County	X	X	--	--	--	0	0	12,122.00	--
222	01/24/2006	Washington County	--	X	--	--	--	0	0	13,334.20	--
223	03/13/2006	Washington County	--	X	--	--	--	0	0	5,871.50	--
224	03/31/2006	Washington County	--	X	--	--	--	0	0	5,871.50	--
225	04/13/2006	St. Lawrence	--	X	X	--	--	0	0	2,348.60	--
226	04/13/2006	Jackson	--	--	X	--	--	0	0	2,336,857.00	--
227	04/13/2006	Colgate	--	--	X	--	--	0	0	2,336,857.00	--
228	04/13/2006	Germentown	--	--	X	--	--	0	0	2,336,857.00	--
229	05/11/2006	Washington County	--	X	--	--	--	0	0	1,174.30	--
230	05/17/2006	Germentown	--	X	X	--	--	0	0	--	1,858.92
231	06/21/2006	Jackson	X	X	--	--	--	0	0	58,715.00	1,858.92
232	06/21/2006	Washington County	X	X	--	--	--	0	0	--	--
233	06/27/2006	Kewaskum	--	--	X	--	--	0	0	--	--
234	07/17/2006	Boltonville	--	--	X	--	--	0	0	--	--
235	07/17/2006	Hartford	--	--	X	--	--	0	0	--	--
236	07/20/2006	Richfield	--	--	X	--	--	0	0	--	--
237	07/27/2006	Kewaskum	X	X	--	--	--	0	0	5,871.50	1,759.10
238	07/30/2006	Kewaskum	X	X	--	--	--	0	0	5,871.50	1,759.10
239	08/01/2006	Jackson	X	X	--	--	--	0	0	17,614.50	1,759.10
240	08/01/2006	Slinger	X	X	--	--	--	0	0	--	--
241	08/01/2006	Jackson	--	X	X	--	--	0	0	--	--
242	08/02/2006	West Bend	X	X	--	--	--	0	0	5,871.50	--
243	08/02/2006	Jackson	X	X	--	--	--	0	0	--	--
244	09/06/2006	Jackson	--	X	X	--	--	0	0	--	--
245	09/06/2006	Kewaskum	--	X	X	--	--	0	0	--	--
246	09/08/2006	Hubertus	--	X	X	--	--	0	0	--	--
247	09/08/2006	Germentown	--	X	X	--	--	0	0	--	--
248	10/01/2006	Kohlsville	--	X	X	--	--	0	0	--	--
249	10/02/2006	Wayne	--	X	X	--	--	0	0	--	--
250	10/02/2006	West Bend	X	X	--	--	--	0	0	29,357.50	--

Table 26 (continued)

Number on Map 3	Date	City/Village/Town	Event Type					Reported Damages <sup>a</sup>			
			Thunderstorm	High Winds	Hail	Lightning	Heavy Rain	Deaths	Injuries	Property Damage <sup>b</sup>	Crop Damage <sup>b</sup>
251	10/02/2006	Hartford	X	X	--	--	--	0	--	--	--
252	10/04/2006	West Bend	--	--	--	X	--	0	58,715.00	--	--
253	02/22/2007	Washington County	--	X	--	--	--	0	2,283.60	--	--
254	04/02/2007	Hartford	--	X	--	--	X	0	--	--	--
255	04/04/2007	Washington County	--	X	--	--	--	0	5,709.00	--	--
256	05/16/2007	Hartford	--	X	X	--	--	0	0.75 inches	--	--
257	05/24/2007	Washington County	--	X	--	--	--	0	2,283.60	--	--
258	07/03/2007	Kewaskum	--	--	--	X	--	0	57,090.00	--	--
259	07/03/2007	Slinger	--	--	--	X	--	0	11,418.00	--	--
260	07/09/2007	Kohlsville	X	X	--	--	--	0	--	--	--
261	08/22/2007	Hartford	X	X	--	--	--	0	28,545.00	16,460.57	16,460.57
262	08/22/2007	Hartford	X	X	--	--	--	0	28,545.00	16,460.57	16,460.57
263	08/22/2007	Hartford	X	X	--	--	--	0	28,545.00	16,460.57	16,460.57
264	08/27/2007	Washington County	--	X	--	--	--	0	11,418.00	--	--
265	11/05/2007	Washington County	--	X	--	--	--	0	5,709.00	--	--
266	12/23/2007	Washington County	--	X	--	--	--	0	5,709.00	--	--
267	04/25/2008	Kewaskum	--	X	--	X	--	0	10,995.00	--	--
268	04/25/2008	Kohlsville	--	--	X	--	--	0	--	--	--
269	04/26/2008	Washington County	--	X	--	--	--	0	5,497.50	--	--
270	06/28/2008	Jackson	X	X	--	--	--	0	--	798,272.18	--
271	07/12/2008	St. Lawrence	--	X	--	X	--	0	--	--	--
272	07/16/2008	Kewaskum	X	X	--	--	--	0	109,950.00	--	--
273	07/16/2008	Slinger	X	X	--	--	--	0	--	--	--
274	08/25/2009	Richfield	X	X	--	X	--	0	--	--	--
275	09/27/2009	Washington County	--	X	--	--	--	0	33,105.00	--	--
276	10/06/2009	Washington County	--	X	--	--	--	0	5,517.50	--	--
277	05/05/2010	Washington County	--	X	--	--	--	0	5,517.50	--	--
278	06/06/2010	West Bend	--	X	X	--	--	0	--	--	--
279	06/06/2010	West Bend	--	X	X	--	--	0	--	--	--
280	07/14/2010	Hartford	X	X	--	--	--	0	--	8,123.21	--
281	07/14/2010	West Bend	--	X	--	X	--	0	--	--	--
282	07/14/2010	Slinger	--	--	--	X	--	0	--	--	--
283	08/09/2010	West Bend	X	X	--	--	--	0	--	1,496.82	--
284	08/20/2010	Slinger	X	X	--	--	--	0	--	1,496.82	--
285	08/20/2010	West Bend	X	X	--	--	--	0	--	1,496.82	--
286	09/02/2010	Hartford	X	X	--	--	--	0	--	--	--
287	09/07/2010	Washington County	--	X	--	--	--	0	--	--	--
288	09/24/2010	Washington County	--	X	--	--	--	0	--	--	--
289	10/26/2010	Washington County	--	X	--	--	--	0	--	--	--
290	02/18/2011	Washington County	--	X	--	--	--	0	2,104.80	--	280.15
291	04/04/2011	Nenno	X	X	--	--	--	0	--	--	--
292	04/15/2011	Washington County	--	X	--	--	--	0	3,157.20	--	--
293	05/15/2011	Washington County	--	X	--	--	--	0	5,262.00	--	--
294	05/22/2011	Hartford	X	X	--	--	--	0	10,524.00	58,806.01	--
295	05/22/2011	Jackson	--	--	X	--	--	0	--	--	--
296	06/06/2011	Washington County	X	X	X	--	--	0	105,240.00	--	--
297	06/08/2011	Slinger	X	X	X	--	--	0	--	44,856.45	--
298	06/08/2011	Hartford	--	X	X	--	--	0	--	--	--
299	06/21/2011	Holy Hill	X	X	X	--	--	0	78,930.00	44,856.45	--
300	08/12/2011	Slinger	X	X	--	--	--	0	--	2,230.04	--

Table 26 (continued)

Number on Map 3	Date	City/Village/Town	Event Type						Reported Damages <sup>a</sup>			
			Thunderstorm	High Winds	Hail	Lightning	Heavy Rain	Magnitude	Deaths	Injuries	Property Damage <sup>b</sup>	Crop Damage <sup>b</sup>
301	09/03/2011	Hartford	X		--	--	--	60 knots	0	0	3,157.20	--
302	09/29/2011	Washington County	--	X	--	--	--	43 knots	0	0	2,104.80	--
303	09/29/2011	Hartford	--	X	X	--	--	0.75 inches	0	0	--	--
304	10/19/2011	Washington County	--	X	--	--	--	39 knots	0	0	2,104.80	--
305	01/01/2012	Washington County	--	X	--	--	--	39 knots	0	0	1,031.10	--
306	03/10/2012	Washington County	--	X	--	--	--	0 knots	0	0	2,062.20	--
307	04/08/2012	Washington County	--	X	--	--	--	48 knots	0	0	2,062.20	--
308	04/16/2012	Washington County	--	X	--	--	--	39 knots	0	0	1,031.10	--
309	05/01/2012	Holy Hill	--	X	X	--	--	0.75 inches	0	0	--	--
310	05/01/2012	Germanatown	X	--	--	--	--	61 knots	0	0	3,093.30	2,378.75
311	05/01/2012	Germanatown	--	X	X	--	--	1.75 inches	0	0	--	--
312	05/28/2012	Colgate	X	X	--	--	--	61 knots	0	0	10,311.00	2,378.75
313	05/28/2012	Germanatown	X	X	--	--	--	56 knots	0	0	10,311.00	2,378.75
314	06/18/2012	Washington County	--	X	--	--	--	39 knots	0	0	10,311.00	--
315	07/26/2012	Richfield	X	X	--	--	--	52 knots	0	0	--	--
316	08/07/2012	Kewaskum	--	X	X	--	--	1.75 inches	0	0	2,062,200.00	--
317	01/19/2013	Washington County	--	X	--	--	--	42 knots	0	0	5,081.00	--
318	04/11/2013	Washington County	--	X	--	--	--	38 knots	0	0	5,081.00	--
319	06/27/2013	Hartford	--	X	X	--	--	1.00 inches	0	0	--	--
320	06/27/2013	Hartford	--	X	X	--	--	1.00 inches	0	0	--	4,897.07
321	06/27/2013	Hartford	--	X	X	--	--	1.00 inches	0	0	--	4,897.07
322	06/27/2013	Holy Hill	X	X	X	--	--	0.75 inches	0	0	1,016.20	1,103,727.34
323	08/22/2013	Slinger	--	--	--	X	--	N/A	0	0	2,134,020.00	--
324	08/30/2013	Hartford	--	X	X	--	--	0.88 inches	0	0	--	--
325	09/19/2013	Washington County	X	X	--	--	--	70 knots	0	0	50,810.00	93,012.79
326	10/03/2013	Allenton	X	X	--	--	--	52 knots	0	0	--	--
327	11/17/2013	Allenton	X	X	--	--	--	87 knots	0	0	25,405.00	--
328	11/17/2013	St. Michaels	X	X	--	--	--	87 knots	0	0	30,486.00	--
329	04/12/2014	Fillmore	--	--	X	--	--	0.88 inches	0	0	--	--
330	04/12/2014	West Bend	--	--	X	--	--	1.00 inches	0	0	--	--
331	04/12/2014	West Bend	--	--	X	--	--	0.75 inches	0	0	--	--
332	04/12/2014	St. Lawrence	--	--	X	--	--	1.50 inches	0	0	--	--
333	05/07/2014	West Bend	--	--	X	--	--	0.88 inches	0	0	--	--
334	05/07/2014	Hartford	--	--	X	--	--	1.00 inches	0	0	--	--
335	05/07/2014	Hartford	--	--	X	--	--	1.25 inches	0	0	--	--
336	05/08/2014	Jackson	--	--	X	--	--	0.75 inches	0	0	--	--
337	06/17/2014	West Bend	X	X	X	--	--	50 knots	0	0	10,000.00	98,685.00
338	06/30/2014	Hartford	X	X	--	--	--	51 knots	0	0	5,000.00	98,685.00
--	Total	--	169	219	90	39	6		1	10	44,686,156.39	11,535,472.46

<sup>a</sup>Deaths, injuries, and property damages reported were based upon a geographic area impacted by the hazard event, which affected Washington County and, in some cases, a larger area of impact than the County itself, generally within the southeast regional area of Wisconsin.

<sup>b</sup>Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.

Source: The National Climatic Data Center (NCDC) a part of the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), the National Environmental Satellite, Data and Information Service (NESDIS) and the U.S. Department of Agriculture Risk Management Agency.



per year. This demonstrates the high unpredictability of these events. In total, thunderstorm and high-wind events have resulted in one death, six injuries, and about \$36.5 million in property and crop damages within Washington County. As described below, much of these damages occurred as a result of a single, widespread, thunderstorm and high-wind event that occurred on May 31, 1998. Several examples of recent events follow.

A swift-moving cluster of severe thunderstorms packing downburst winds up to 83 mph carved out a widespread and extensive damage path across portions of south-central and southeastern Wisconsin on July 7, 1991. The major damage path ran through central Iowa, northern Dane, Northern Jefferson, northern Waukesha, and southern Ozaukee Counties with path widths several miles wide in many areas. Damages in Washington County included damages to 61 farm buildings, a collapsed chimney at a school, a barn blown off its foundation, a silo blown over, roof damage, road washouts, and debris clearance. Estimated property damages in Washington County exceeded \$2.9 million and estimated crop damages exceeded \$2.5 million (2014 dollars). A presidential disaster declaration was issued because of this storm. Local governments in Washington County received \$134,731 in public assistance for this event.

During the early morning hours of Sunday, May 31, 1998, southcentral and southeast Wisconsin experienced an unprecedented, widespread downburst wind event known as a derecho. Incredibly powerful, hurricane-force straight-line winds, with peak gusts of 100 to 128 mph, tore through 12 counties in this part of the state, while another eight counties had peak gusts of 60 to 80 mph. Residents noted that the strongest winds only lasted a minute or two, but gusty winds continued for 15 to 30 minutes. Meteorologically, a solid squall line developed in southern Minnesota and gathered strength as it raced eastward with a translational speed of 50 to 60 mph across southcentral and southeast Wisconsin. The squall line was oriented southwest to northeast and had many microbursts and macrobursts embedded in it. All 20 counties in southcentral and southeast Wisconsin reported scattered to widespread wind damage. All parts of Washington County had damage, but two concentrated swaths of micro/macroburst damage extended from the West Bend area east to Newburg and across the southern tier communities. Utility companies and emergency managers stated that this was the most damaging, widespread, straight-line thunderstorm wind event to affect southern Wisconsin in the past 100 years. Based on damages, peak wind gusts in Washington County were estimated to be in the 115 to 125 miles per hour (mph) range. Gust of 105 mph were measured in the southwest corner of the Town of Erin. A 48-year-old woman in the Town of Erin was crushed to death by a fallen tree while sleeping in her home. Two other persons in the County were injured as a result of this storm. At the West Bend Municipal Airport, six hangers and six airplanes were destroyed and several others were damaged. The storm produced considerable damage to residences, businesses, and farms within the County. Two residences were destroyed, 39 residences experienced major damage, and 1,636 residences experienced minor damage. Similarly, 12 Washington County businesses were destroyed, 14 experienced major damage, and 50 experienced minor damage. Three farm buildings were destroyed, 17 experienced major damage, and 13 experienced minor damage. In addition, the storm damaged numerous trees and power lines, resulting in power outages for as long as six days. In Washington County, this storm caused over \$12.4 million in property damages and \$145,000 in damages to crops (2014 dollars).

Two rounds of severe weather struck south-central and southeast Wisconsin overnight on May 11, 2000. Some of the thunderstorms in the second round developed supercell characteristics resulting in large damaging hail, downburst straight-line winds, and torrential rainfalls. Nearly all of the severe storms in this round of activity leveled large trees and power lines. The worst damage was reported in the Allenton to West Bend area of Washington County, with two pole sheds and two residential garages sustaining considerable damage. Large hail up to golf ball size also occurred with hurricane-force winds in Washington County. This storm caused an estimated \$137,480 in property damages and \$78,588 in damages to crops (2014 dollars).

A morning round of severe thunderstorms affected parts of south-central and most of southeast Wisconsin on May 21, 2004, bringing with it reports of damaging wind. Some of the stronger wind reports occurred in Washington and Ozaukee Counties where pockets of widespread tree and structural damage resulted. Hundreds of trees were toppled onto the roofs of many homes and vehicles from Hartford to Newburg in Washington County. Based on damage reports, winds were estimated at 78 knots (90 mph). Water damage to basements, roads, water control systems,

public buildings, and public utilities were reported in Washington County. This storm caused an estimated \$438,600 in property damages and over \$1,000,000 in damages to crops (2014 dollars).

A warm front pushed into southern Wisconsin ahead of a slow-moving low pressure system in Iowa on June 21, 2011 resulting in the production of strong to severe supercell thunderstorms during the afternoon into the evening. The severe thunderstorms also produced large hail and damaging wind gusts that damaged homes, barns and felled thousands of trees and numerous power lines. Part of a line of severe thunderstorms with wind gusts estimated up to 64 mph (56 knots) that blew down numerous trees and power lines moved through southern Washington County during the middle of the afternoon. The powerful wind gusts blew a tree down on a house and knocked down a barn near Holy Hill. Property damaged in Washington County from this storm were estimated at \$78,930 and crop damages were estimated at about \$44,860 (2014 dollars).

### ***Hail Events***

From August 1958 to December 2014, 90 major hailstorms were reported in Washington County that resulted in significant property damage throughout the southeastern areas of Wisconsin (see Map 34). In all, the NCDC and the USDA RSA have recorded about \$12.1 million in property damage and \$2.0 million in crop damage (2014 dollars) from these hailstorm events as shown in Table 26.

On April 13, 2006, scattered supercells developed in eastern Iowa during the late afternoon and pushed east-northeastward through southern Wisconsin and northern Illinois during the evening. Three main hailstorms affected southern Wisconsin. The first hailstorm produced one- to four-inch diameter hail and left a swath of damage that ran from southern Iowa County to northern Milwaukee County. The second hailstorm produced hail up to 1.5 inches in diameter and left a swath of damage from northern Lafayette County to central Milwaukee County. The third hailstorm developed in southern Dodge County and pushed through southern Washington County into central Ozaukee County. This storm produced 1 to 2 inch diameter hail. Damage was widespread and extensive with the three hailstorms. Thousands of motor vehicles, residential homes, businesses, and farms sustained hail damage. Vehicle damage consisted of broken windows and dented sheet metal. Roofs, windows, and siding of buildings were damaged. Many birds were killed on several inland lakes. Property damages throughout the state were estimated to be about \$186.2 million, making the April 13, 2006 episode the most costly hailstorm to affect Wisconsin. No crop losses were reported, but it should be noted that the growing season had not started. In Washington County, property damages were estimated at over \$9.3 million (2014 dollars) (Table 26).

A cold front moving into a hot, unstable air mass over southeastern Wisconsin produced scattered strong to severe thunderstorms during the late afternoon hours of August 7, 2012. High temperatures rose to around 90 degrees, with dew point rising to the lower to middle 60s in eastern sections due to a lake breeze bringing in moisture off Lake Michigan. The lake breeze also enhanced low level convergence, aiding the overall forcing along the front for thunderstorm development. This convergence produced the conditions necessary to support the sustained updrafts needed to produce large hail. The thunderstorms produced large hail up to 1.50 inches in diameter that damaged trees, vehicles, homes and outdoor equipment in Kewaskum in Washington County. This hail storm lasted five to eight minutes. Roughly 200 vehicles suffered damage from the hail, as well as many homes, condos, apartments and outdoor equipment. Property damages resulting from this storm were estimated as being over \$2.06 million (2014 dollars).

### ***Lightning Events***

From August 1958 to December 2014, 39 lightning events were reported in Washington County that resulted in significant property damage throughout the southeastern areas of Wisconsin (see Map 34). In all, the National Climatic Data Center has recorded \$5.1 million (in 2014 dollars) in property damage and four injuries from these lightning events, as shown in Table 26. A few recent incidents are described below.

On July 21, 1997, lightning struck a business building in West Bend, igniting a fire in the building's attic. This fire damaged the building's walls and destroyed much of the business' equipment. Property damages were estimated at about \$221,000 (2014 dollars).

On July 20, 1998, lightning from a severe thunderstorm struck an apartment complex in West Bend, igniting a fire. While there were no fatalities or injuries, this fire caused about \$380,000 in property damages (2014 dollars).

On July 12, 2008, lightning struck a barn near St. Lawrence. This started a fire that caused about \$109,000 in damages (2014 dollars). A fire fighter was injured when he was struck by flying debris from this fire.

The most damaging lightning event in Washington County occurred on August 22, 2013. Lightning struck a dump truck hauling granite that was traveling along the southbound lanes of USH 41.<sup>37</sup> The lightning blasted a three-foot long, 18-inch deep hole in the pavement. It also caused the dump truck to lose some of its load. While there were no fatalities or injuries, three vehicles including the dump truck were damaged as a result of this lightning strike. Property damages were estimated at over \$2.1 million (2014 dollars).

### **Vulnerability and Community Impacts Assessment**

The National Weather Service can forecast and track a line of thunderstorms that may be likely to produce severe high winds, hail, lightning, and tornadoes, but the locations that these hazards impact and their strengths remain unpredictable. As can be seen from the distribution of thunderstorm and related hazard events during the past 57 years as shown on Map 34, the locations of storm impact points is widely scattered throughout the County.

In order to assess the vulnerability of the Washington County area to thunderstorms and related storm hazards, a review of the community assets described in Chapter II indicate the potential for significant thunderstorm and related hazard impacts to: 1) a variety of residential, commercial, and other developed land uses; 2) agricultural lands; 3) roadway transportation system; 4) utilities; 5) critical community facilities; and 6) historic sites. Significant impacts may also be possible to other infrastructure or utility systems, or hazardous material storage sites. On average, the events reported over the 25-year period 1990 through 2014 have resulted in about \$129,800 of reported property damages and \$27,800 of reported crop damages per event or a total of about \$157,600 per event (2014 dollars). However, very few events have been responsible for a large percentage of the total damages. Thus, the average damage cost is considered to be only a very approximate measure of potential damages. On average, there are 10 thunderstorm and related storm events per year in Washington County. Over this same period, thunderstorms and related storm hazards have resulted in about \$1,344,900 in property damages and about \$288,500 in crop damages per year for average annual total damages of about \$1,633,400 (2014 dollars).

In 2015, the total equalized assessed property value in Washington County was estimated at almost \$13.4 billion. About \$9.3 billion of this total is comprised of buildings and other improvement and almost \$207 million is comprised of manufacturing or non-manufacturing personal property. Based on the current average estimate of \$1,633,400 in reported damages per year, it can be expected that approximately 0.01 percent of the value of all property, including buildings and infrastructure, in Washington County will be damaged from these events each year. Due to the unpredictability of thunderstorm, high-wind, hail, and lightning events, all buildings, infrastructure, and critical facilities within the County are considered at risk.

### **Potential Future Changes in Thunderstorm, High-Wind, Hail, and Lightning Conditions**

Based upon historical data from the past 25 years, Washington County can expect to experience an average of 10.4 thunderstorm, high-wind, hail, and/or lightning events per year somewhere in the County. It should be noted that the historical record shows considerable variation among years in the number of events that occurred. While it would be expected that in some years the County will experience either fewer events or more events than the average number, the average annual number of events is not expected to change.

The likely effect of climate change on thunderstorm and high-wind events is not clear. While projections based upon downscaled climate model results indicate that the magnitude and frequency of heavy precipitation events are

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<sup>37</sup> *This highway is now IH-41.*

likely to increase by the middle of the 21st century, they do not address potential trends in wind, hail, or lightning conditions. Modeling studies utilizing the output of multiple climate models suggest that number of days per year in which atmospheric environments that are known to support the formation of severe thunderstorms under current climatic conditions will increase between now and the end of the 21st century.<sup>38</sup> It should also be noted that wind strengths over the Great Lakes have increased and are expected to continue increasing in the future.<sup>39</sup> Surface wind speeds above the lakes are increasing by about 5 percent per decade, exceeding trends in wind speed over land.

Changes in land use can have an impact on the potential for thunderstorm and related hazards to occur. Such changes relate to the potential future increase in development within the County. Changing land use patterns within Washington County, as documented in the adopted regional land use plan, the County comprehensive plan, and County land and water resource management plan, and summarized in Chapter II, indicate a potential increased risk of thunderstorm, high-wind, hail, and lightning damage and related losses in the expanding urbanized areas within the County. Because of the actions that have been taken by the County and local units of government and individuals, the current vulnerability to thunderstorms and related hazards has been decreased in recent years. These ongoing mitigation measures are described further in Chapter IV.

### **Multi-Jurisdictional Thunderstorm, High-Wind, Hail, and Lightning Risk Management**

Based upon a review of the historic patterns of thunderstorm, high-wind, hail, and lightning events in Washington County, there are no specific municipalities that have unusual risks. Rather, the events are considered to be relatively uniform and of countywide concern.

## **VULNERABILITY ASSESSMENT FOR TORNADOES**

Wisconsin lies along the northern edge of an area of the United States commonly known as “tornado alley.” This area extends northeasterly along an axis extending from Oklahoma and Iowa in the west, to Michigan and Ohio in the east. This corridor is the one of the most tornado-prone areas of the United States reporting 29 violent tornadoes during the year 2001. A tornado is defined as a violently rotating column of air extending from the ground up to the thunderstorm base. It generally lasts for only a short period. The tornado appears as a funnel-shaped column with its lower, narrower end touching the ground and upper, broader end extending into the thunderstorm cloud system. In some cases, the visible condensation cloud may not appear to reach the ground, but meanwhile tornado-force winds may be causing severe destruction (rotating winds can be nearly invisible, except for dust and debris). Similar events that do not reach the land surface are known as funnel clouds. Funnel clouds may be a precursor to a tornado event. In Wisconsin, tornadoes usually occur in concert with thunderstorms formed by eastward-moving cold fronts striking warm, moist air streaming up from the south. It is not possible to predict tornado activity based upon the occurrence of thunderstorms, and, occasionally, multiple outbreaks of tornadoes occur along the frontal boundaries, affecting large areas of the State at one time. Tornadoes generally occur near the trailing edge of a thunderstorm. It is not uncommon to see clear, sunlit skies behind a tornado.

Historically, tornadoes have been categorized based upon the most intense damage along their paths using the Fujita Scale. This scale is shown in Table 27. Tornado intensities under this scale range from F0 events, representing the tornadoes doing the smallest amount of damage, to F5 events, representing the tornadoes doing the greatest amount of damage. Wind velocities necessary to produce the particular damage are often associated with ratings along the Fujita Scale, but that practice is often misleading. The wind estimates associated with the Fujita Scale

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<sup>38</sup> Noah S. Diffenbaugh, Martin Scherer, and Robert J. Trapp, “Robust Increases in Severe Thunderstorm Environments in Response to Greenhouse Forcing,” *Proceedings of the National Academy of Sciences, Volume 110, pages 16,361-16,366, 2013.*

<sup>39</sup> Ankur R. Desai, Jay A. Austin, Val Bennington, and Galen A. McKinley, “Stronger Winds Over a Large Lake in Response to Weakening Air-to-Lake Temperature Gradient,” *Nature Geoscience, Volume 2, pages 855-858, 2009.*

**Table 27**

**FUJITA SCALE CHARACTERISTICS**

F-Scale	Wind Speed (miles per hour) <sup>a</sup>	Character of Damage	Relative Frequency (percent)
F0 (weak)	40-72	Light damage	29
F1 (weak)	73-112	Moderate damage	40
F2 (strong)	113-157	Considerable damage	24
F3 (strong)	158-206	Severe damage	6
F4 (violent)	207-260	Devastating damage	2
F5 (violent)	261-318	Incredible damage (rare)	<1

<sup>a</sup>Equivalent wind speeds associated with the Fujita Scale represent the fastest one-quarter mile wind.

Source: National Oceanic and Atmospheric Administration.

**Table 28**

**ENHANCED FUJITA SCALE CHARACTERISTICS**

EF-Scale	Wind Speed (miles per hour) <sup>a</sup>	Character of Damage	Relative Frequency (percent)
EF0 (weak)	65-85	Light damage	53
EF1 (weak)	86-110	Moderate damage	32
EF2 (strong)	111-135	Considerable damage	11
EF3 (strong)	136-165	Severe damage	3
EF4 (violent)	166-200	Devastating damage	1
EF5 (violent)	> 200	Incredible damage (rare)	<1

<sup>a</sup>Equivalent wind speeds associated with the Enhanced Fujita Scale represent a three-second gust of wind.

Source: National Oceanic and Atmospheric Administration.

are intended to be based upon the expected damage to a well-built residential structure. Poorly built structures can suffer significant structural damage under lesser winds than the Fujita Scale might suggest. Other sorts of structures may or may not experience the same failures as a house under high wind speeds. Thus the Fujita Scale is largely a residential scale, with much more care required in assessment after wind damage to other sorts of structures. Since February 2007, the Fujita Scale has been replaced by the Enhanced Fujita Scale which retains the same basic design of its predecessor with six strength categories. This scale is shown in Table 28. The newer scale reflects more refined assessments of tornado damage surveys, more standardization, and consideration of damage over a wider range of structures. Because the National Weather Service has decided not to reclassify tornadoes that occurred prior to the implementation of the Enhanced Fujita Scale, the Fujita Scale classifications have been retained for those storms which occurred prior to February 2007.

The destructive power of the tornado results primarily from its high-wind velocities, wind-driven debris, and uplifting force. These tornado characteristics probably account for 90 percent of tornado-caused damage. Since tornadoes are generally associated with severe storm systems, hail, torrential rain, and intense lightning usually accompany tornado events. In addition, tornadoes may be accompanied by downbursts, events which are characterized by strong downdrafts, initiated by a thunderstorm, that manifest as straight-line winds on or near the ground. These winds can be powerful, with speeds up to 70 to 100 mph. These winds interact with tornadoes, and can affect the path of the tornado event in such a manner as to make tornadoes somewhat unpredictable. Depending on their intensity,

tornadoes can uproot trees and crops, down power lines, and damage or destroy buildings and infrastructure. Flying debris can cause serious injury and death to humans, livestock, and wildlife in their path. An approaching cloud of debris can mark the location of a tornado, even if the classic funnel cloud is not visible. Before a tornado hits, the wind may die down and the air may become very still.

The National Weather Service monitors severe weather nationwide from its office in Norman, Oklahoma. This office is the only entity that can issue a tornado watch. The National Weather Service office in Milwaukee/ Sullivan and the Washington County Office of Emergency Management may also issue tornado warnings. A tornado watch means that tornadoes are possible, and that persons within the area for which the watches are issued should remain alert for approaching storms. A tornado warning means that a tornado has been sighted in an area or indicated as likely to have occurred by weather radar. When tornado warnings are issued for an area, persons near and within that designated area are advised to move to a pre-designated place of safety. Tornado shelters may be identified by appropriate signage in public buildings. Tornado watch and warning bulletins and advisories are disseminated over a number of telecommunication channels, including the NOAA Weather Radio, the NOAA Weather Wire, and the State Law Enforcement TIME System. NOAA Weather Radio is available to any individual with a weather alert radio. This system and the other sources are routinely monitored by local media that rebroadcast the weather bulletins over public and private television and radio stations. In addition, the National Weather Service operates three 24-hour weather radio transmitters that serve all or portions of Washington County. KEC60, operating at a frequency 162.400 megahertz (MHz), transmits from a location near Delafield in Waukesha County and serves all of Washington County. WWG87, operating at a frequency of 162.500 MHz, transmits from a location near Taycheedah in Fond du Lac County and serves the northern portion of Washington County. WWG91, operating at a frequency of 162.525 MHz, transmits from a location in the Town of Sheboygan in Sheboygan County and serves the northeastern corner of Washington County.

In addition to tornado watches and warnings, severe thunderstorm watches and warnings indicate severe weather conditions that may generate scenarios in which tornadoes may occur. Such watches and warnings may be followed by tornado watches and warnings as weather conditions develop.

### **Historical Tornado Problems**

Tornado events that affected Washington County are shown on Map 35. Eight events were reported as having occurred prior to 1990. The two most severe are described in the following paragraphs.

On June 5, 1977, a tornado touched down about one mile east of Thompson in the Town of Erin. This tornado had previously touched down in Dodge County and lifted southeast of Mayville. The tornado destroyed a house trailer and barn on Highway 167 about two miles southeast of Thompson. It followed a path along the ground to about two miles east of Monches off CTH Q on the Washington/Waukesha County line. While the tornado caused no deaths or injuries, it resulted in considerable damage to buildings in the Town of Erin. Total property damages caused by this storm were estimated at \$1,171,950 (2014 dollars).

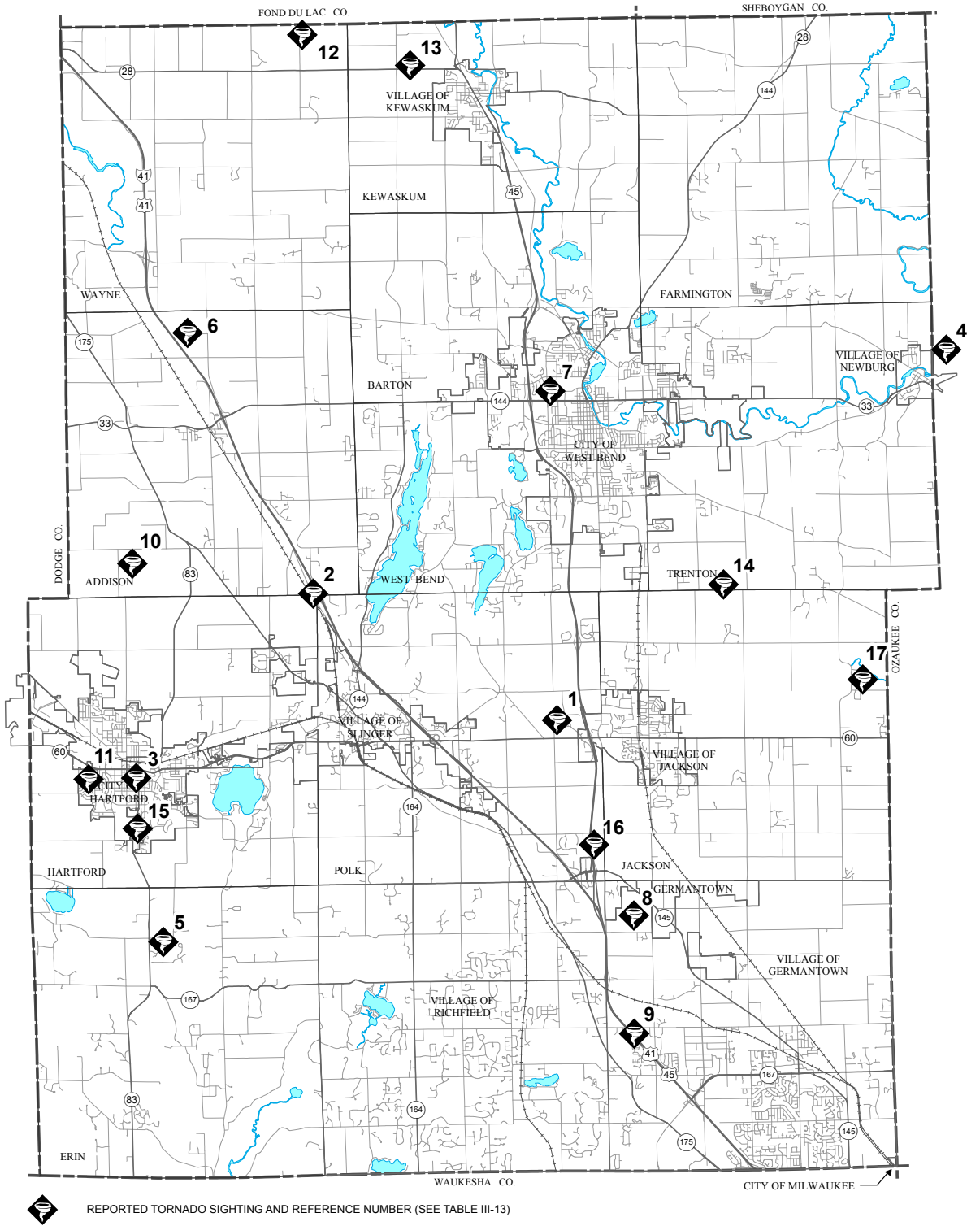
An extremely rare clockwise-rotating tornado moved through the City of West Bend a few minutes after midnight on April 4, 1981. The tornado touched down near the intersection of Jefferson Street and N. 18th Avenue, moved northeast through the City at about 30 mph, and lifted from a location northeast of Newark Drive E. This tornado followed a 1.8-mile path. This path is shown on Map 36. The width of this path grew from about 100 feet at point of touchdown to about 1,000 feet near the path's end. Based upon damage surveys, the tornado was rated an F4 on the Fujita scale and had estimated wind speeds of 225 mph. Three people were killed as a result of the storm. In addition, at least 53 people were injured. St. Joseph's Hospital was filled to capacity caring for victims of this storm.<sup>40</sup> In the City of West Bend property damages included the destruction of 37 homes and damage to 49 homes

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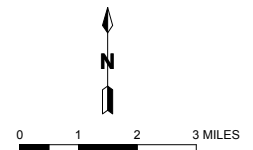
<sup>40</sup> "History of St. Joseph's Hospital," Froedtert Hospital website, <http://www.froedtert.com/st-josephs/history>, accessed January 6, 2016.

Map 35

TORNADO EVENTS IN WASHINGTON COUNTY: JULY 1964 THROUGH DECEMBER 2014

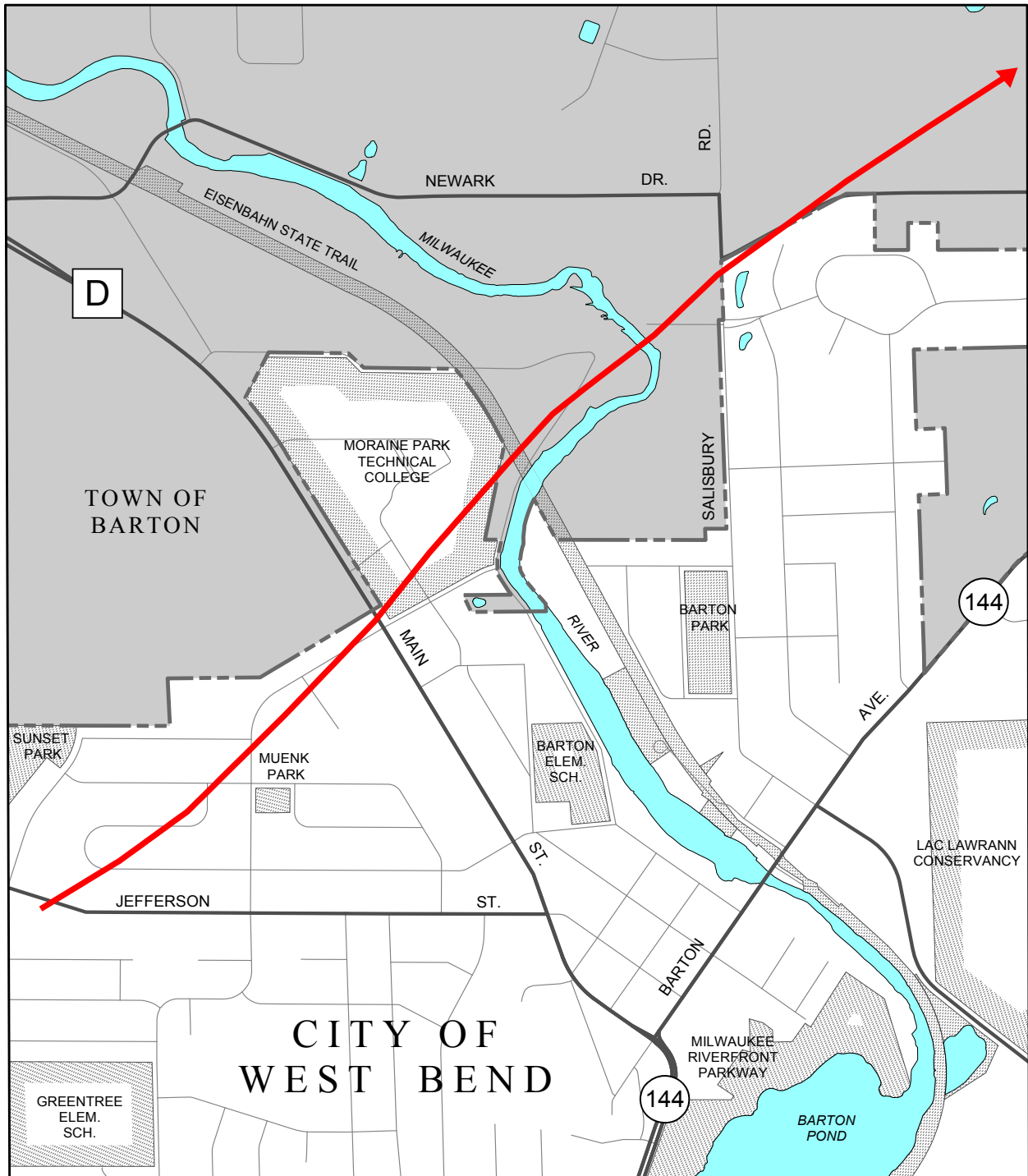


Source: National Climatic Data Center and SEWRPC.



Map 36

PATH OF THE APRIL 4, 1981 WEST BEND TORNAO



 TORNADO PATH



Source: *Journal of Climate and Applied Meteorology*, Volume 22, 1983 and SEWRPC.



and other buildings. In addition, 10 homes were reported damaged in Young America in the Town of Barton. The storm lifted an eight-unit apartment building off its foundation and moved it 15 feet, trapping 11 residents within.<sup>41</sup> At least 60 cars and many boats and campers were destroyed. As a result of this tornado, about 1,000 residences lost power. Following the storm, the Wisconsin Electric Power Company removed a 30-foot section of a barn from a 138,000-volt electrical transmission line located 70 feet above the ground.<sup>42</sup> Total damages resulting from this tornado were estimated at \$65.11 million (2014 dollars).

### **Description of Recent Tornado Events**

In the State of Wisconsin, tornado paths historically have averaged 3.5 miles in length and 50 yards in width, although tornadoes of a mile or more in width and 300 miles in length have been known to occur elsewhere in the United States. On average, tornadoes in southeastern Wisconsin move across the land surface at speeds of between 25 and 45 miles per hour, although overland speeds of up to 70 mph have been reported. Tornadoes rarely last more than a few minutes over a single spot or more than 15 to 20 minutes in a 10-mile area, but significant devastation may occur in those few minutes.

The gravity of any particular tornado event is measured in terms of the resulting deaths, injuries, and economic losses. The magnitudes of the tornadoes more recently recorded in southeastern Wisconsin have been low, primarily F0 or weak F1 events on the Fujita scale or EF0 or EF1 events on the Enhanced Fujita Scale (see Table 29).

A total of 17 tornadoes have been recorded in Washington County during the 46-year period between July 1964 to December 2014, or about one tornado every three years. Of the tornadoes reported for Washington County during that period, five were F0 or EF0 events, eight were F1 or EF1 events, two were F2 events, one was an F3 event, and one was an F4 event as categorized on the Fujita scale or the Enhanced Fujita scale. These are shown on Map 35, and their magnitudes and impacts are documented in Table 29, based upon data published by the National Climatic Data Center. In total, these 17 tornadoes have resulted in about \$73.1 million in property damages, \$200,140 in crop damages, three fatalities, and 57 injuries. Most of the property damages and injuries and all of the deaths resulted from one tornado—the one that struck the City of West Bend in April 1981. On average, about 25 tornadoes are reported each year within the State of Wisconsin.

On July 1, 1991, a tornado touched down near the southeast corner of STH 167 and USH 41. The tornado skipped along a four-mile path through the western side of the Village of Germantown, damaging four buildings in a lumberyard and two homes. A man working in the lumberyard was injured by flying debris. The storm caused about \$435,000 (2014 dollars) in property damages.

On June 1, 2000 long-lived tornado spun up about four miles south of Horicon in Dodge County, just southwest of the intersection of CTH S and CTH E. Eyewitness accounts suggested that this tornado was rain-wrapped and included multiple vortices. While in Dodge County, this tornado was rated as an F2 on the Fujita Scale and had wind speeds between 140 and 150 mph. It caused considerable damage in Dodge County before moving into Washington County. In Washington County this tornado traveled for about 1.5 miles near and along CTH S in the Town of Addison. In Washington County, the tornado had wind speeds estimated at 80 mph, giving it a rating of F1. No one was injured or killed by this storm. This tornado caused an estimated \$137,500 (2014 dollars) in crop damages.

A powerful squall line plowed through most of south-central and southeast Wisconsin during the late evening hours of June 11, 2001, resulting in widespread damage to trees, power lines, and power poles. This system generated at least three tornadoes, one of which spun up near Rubicon in Dodge County and moved southeast into Washington County. Once this tornado entered Washington County, it intensified to an F1 rating on the Fujita Scale and moved

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<sup>41</sup> “6 Are Killed and 100 Hurt in Tornado in Wisconsin,” *New York Times*, April 5, 1981.

<sup>42</sup> “West Bend Surveys Its Damage,” *The Milwaukee Journal*, April 5, 1981.

Table 29

## TORNADO EVENTS REPORTED IN WASHINGTON COUNTY: JULY 1964 THROUGH DECEMBER 2014

Number on Map 35	Date	City/Town/Village	Magnitude (Fujita)	Length (miles)	Width (yards)	Deaths	Injuries	Property Damage <sup>a</sup>	Crop Damage <sup>a</sup>
1	July 6, 1964	Town of Jackson	F1	<1	17	0	0	0.00	0.00
2	July 21, 1968	Village of Slinger	F2	2	100	0	0	170,070.00	0.00
3	May 31, 1969	Town of Erin	F1	2	50	0	0	161,265.00	0.00
4	July 27, 1970	Washington County	F0	N/A	N/A	0	0	0.00	0.00
5	June 5, 1977	Thompson – Town of Erin	F3	11	300	0	0	1,171,950.00	0.00
6	April 7, 1980	Allenton – Town of Addison	F2	6	33	0	2	718,250.00	0.00
7	April 4, 1981	City of West Bend	F4	2	330	3	53	65,110,000.00	0.00
8	April 27, 1984	Town of Jackson	F0	<1	33	0	0	56,962.50	0.00
9	July 1, 1991	Village of Germantown	F1	4	25	0	1	434,525.00	0.00
10	June 1, 2000	Allenton – Town of Addison	F0	2	50	0	0	0.00	137,480.00
11	June 11, 2001	City of Hartford	F1	N/A	N/A	0	0	534,680.00	0.00
12	July 6, 2003	Town of Wayne	F1	<1	40	0	0	25,732.00	0.00
13	June 23, 2004	Town of Kewaskum	F1	3	150	0	0	12,532.00	62,660.00
14	June 23, 2004	Town of Jackson	F0	<1	25	0	0	0.00	0.00
15	June 18, 2006	City of Hartford	F1	5	400	0	1	4,697,200.00	0.00
16	June 2, 2007	Town of Jackson	EF0	<1	15	0	0	0.00	0.00
17	June 3, 2007	Kirchhayn – Town of Jackson	EF1	<1	50	0	0	28,545.00	0.00
Total	--	--	--	--	--	3	57	73,121,711.50	200,140.00

NOTE: N/A indicates data not available.

<sup>a</sup>Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.

Source: National Climatic Data Center and SEWRPC.

southeast through the southwest part of the City of Hartford. Wind speeds associated with this tornado were estimated to be between 90 and 100 mph and it dissipated southeast of the City. This tornado inflicted wind or tree damage to more than 250 residences and businesses and caused about \$535,000 in property damages in Washington County. No deaths or injuries were reported as having been caused by this tornado.

Wisconsin recorded its fifth largest tornado outbreak during the late afternoon and early evening hours of June 23, 2004. Seventeen tornadoes and numerous reports of damaging straight-line winds and large hail accompanied the complex storm structures, which consisted of bow echoes and high-precipitation (HP) supercells. Two of these tornadoes affected Washington County. The first one spun up southwest of the Village of Campbellsport in Fond du Lac County. From its touchdown point, this tornado moved east-southeast and entered Washington County near the intersection of Lake Bernice Drive and St. Kilian Drive. In Fond du Lac County, this tornado was rated as F1 on the Fujita Scale. After crossing the Fond du Lac-Washington County line it weakened to F0 status. It dissipated about 1.5 miles northwest of Kewaskum, near a point north of STH 28 and west of STH 45. The average width of this tornado's path on the ground was about 100-150 yards. About \$12,500 property damages and \$62,700 in crop damages (both 2014 dollars) were attributed to this tornado. The second tornado in this outbreak was a brief F0 tornado that spun up about four miles north-northeast of Jackson in an open rural area north of STH 143 and east of CTH G. The tornado traveled southeast 0.1 miles and dissipated. No casualties or damages were reported.

The Fathers' Day tornado of 2006 struck the City of Hartford at about 2:45 p.m. on June 18, 2006. This tornado touched down southeast of Rubicon in Dodge County, traveled southeast and entered Washington County near the location where STH 60 enters from Dodge County. Once in Washington County, the tornado headed east-southeast through the southern part of the City of Hartford. The tornado continued east-southeast until it dissipated at a site near the northern intersection of CTH E and CTH K. This segment of the tornado track was rated as F1 on the Fujita Scale with wind speeds between 73 and 112 mph. The tornado caused about \$4.7 million in property damages (2014 dollars). These damages include the complete destruction of Lincoln Elementary School's roof and the collapse of a wall and the roof at a local motel. About 147 homes sustained damages, with 12 homes experiencing structural damages and 135 homes experiencing minor damage, mostly to roofs and siding. In addition, there were numerous fallen trees and downed power lines and ten businesses also sustained damages. About 300 We Energies customers lost electric power due to this storm. While this tornado caused no fatalities, one person was directly injured by the tornado. A 78-year-old man suffered a broken hip as a result of a fall he took while rushing to the basement in response to storm warnings. In addition, two persons were indirectly injured.

### **Vulnerability and Community Impacts Assessment**

In order to assess the vulnerability of the Washington County area to tornado and related storm hazards, a review of the community assets described in Chapter II was made which indicates the potential for significant tornado impacts to: 1) a variety of residential, commercial, and other developed land uses; 2) agricultural lands; 3) roadway transportation system; 4) utilities; 5) critical community facilities; and 6) historic sites. Significant impacts may also be possible to other infrastructure or utility systems, solid waste disposal sites, or hazardous material storage sites.

Tornado prediction is not an exact science. The National Weather Service can forecast that a line of thunderstorms may be likely to produce tornadoes, but where they form or touch down and how powerful they might be remains unpredictable. In addition, tornadoes may form quickly without ample warning, since Doppler Radar does not see below the cloud base. As can be seen from the distribution of tornado events during the past 57-years within Washington County, shown on Map 35, the locations of tornado impact points is widely scattered throughout the County. On average, the reported tornados have resulted in about \$4,301,300 of reported property damages and \$11,800 of reported crop damages per event or a total of about \$4,313,100 per event. It should be noted that two events were responsible for most of these damages, so the average damage damages per event may not be representative of the damages that could be expected from a tornado event affecting the County. On average, there is one tornado event every 3.4 years (or about 0.30 tornado events per year) in Washington County. Over this period of record, tornado hazards have resulted in about \$1,282,800 in property damages and about \$3,500 in crop damages per year for average annual total damages of about \$1,286,300.

During a tornado, homes, businesses, public buildings, and infrastructure may be damaged or destroyed by high winds, rain, and hail. Airborne debris, carried by the tornado and associated high winds, can break windows and doors, allowing winds and rain access to interior spaces. Fixed infrastructure, such as roads and bridges, also can be damaged by exposure to high winds, although more damage appears to result from flash flooding and debris jams as opposed to direct damage due to contact with funnel clouds. In an extreme tornado event, such as an F4 event, the force of the wind, alone, can cause tremendous devastation, uprooting trees, toppling power lines, and inducing the failure of weak structural elements in homes and buildings.

In 2015, the total equalized assessed property value in Washington County was estimated at almost \$13.4 billion. About \$9.3 billion of this total is comprised of buildings and other improvements and almost \$207 million is comprised of manufacturing or non-manufacturing personal property. Based on the current average estimate of \$1,286,300 in reported damages per year, it can be expected that approximately 0.01 percent of the value of all property, including buildings and infrastructure, in Washington County will be damaged from these events each year. Due to the unpredictability of tornado events, all buildings, infrastructure, and critical facilities within the County are considered at risk.

### **Potential Future Changes in Tornado Conditions**

Changes in land use can have an impact on the potential for tornado and related hazards to occur. Such changes relate to the potential future increase in development within the County. As noted above, changing land use patterns within Washington County, as documented in the adopted regional land use plan, the County comprehensive plan, and County land and water resource management plan, and summarized in Chapter II, indicate a continuing level of moderate risk of tornado damage and related losses in the County. Because of the actions that have been taken by the County and local units of government and individuals, the current vulnerability to tornadoes and related hazards has decreased in recent years. These ongoing mitigation measures are described further in Chapter IV.

The likely effects of climate change on tornado frequency and severity are not clear. The projections based upon downscaled climate model results do not address potential trends in tornado conditions. A recent study that examined trends in tornados rated F1 or EF1 and higher over the period 1954 through 2013 found that the frequency of outbreaks of multiple tornadoes may be changing.<sup>43</sup> While the study found no change in the frequency at which tornadoes occur, it found a decrease in the number of days per year on which at least one tornado occurs. At the same time, it found an increase in the number of days per year on which multiple tornadoes occur. Increasing trends were found at several different threshold for defining outbreaks of multiple tornadoes. Thus, the study found that the proportion of tornadoes that occur on “big tornado days” has increased. In addition, the study found that the spatial and temporal density of the tornadoes occurring has increased. The study concluded that the risk of “big tornado days” featuring clusters of densely packed tornadoes occurring is increasing. This trend could potentially increase tornado-related damages.

### **Multi-Jurisdictional Tornado Risk Management**

Based upon a review of the historic patterns of tornado events in Washington County, all municipalities in the County are at risk and tornadoes are a countywide concern. Mobile homes are particularly vulnerable to tornadoes. As indicated in Table 8 in Chapter II, there are mobile home parks located in five communities within the County—the Villages of Germantown, Jackson, and Slinger and the Towns of Hartford and Trenton. Thus, these five communities bear additional risks from tornadoes.

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<sup>43</sup> James B. Elsner, Svetoslava C. Elsner, and Thomas H. Jagger, “The Increasing Efficiency of Tornado Days in the United States,” *Climate Dynamics*, Volume 45, pages 651-659, 2015.

## VULNERABILITY ASSESSMENT FOR EXTREME TEMPERATURES

Heat and cold are two of the most underrated, least understood, and deadly of all the natural hazard events that impact Washington County. In contrast to the visible, destructive, and violent characteristics associated with floods and tornadoes, extreme high or low temperatures are “silent killers.” Deaths from heat and cold occur quietly, without headline-making destruction. The Centers for Disease Control and Prevention (CDC) reports that nationwide between 2006 and 2010, excessive heat was the underlying cause of death for an average of 407 persons and a contributing cause of death for an average of 326 persons each year.<sup>44</sup> Over the same time period, the CDC reports that excessive cold was the underlying cause of death for an average of 638 persons and a contributing cause of death for an average of 693 persons each year.<sup>45</sup>

Excessive heat has become the most deadly natural hazard in Wisconsin. According to the National Weather Service, 116 people died in Wisconsin directly as a result of heat waves from 1982 through 2008. This rate of mortality due to heat events during this period is almost four times greater than the next most deadly natural hazard, cold waves (31 deaths).

Temperature data for two selected observation stations in the Village of Germantown and the City of Hartford in Washington County are shown in Table 30. The table depicts extreme high and low temperatures and the departure from average temperatures recorded in the period from 1990 through 2014. The average annual high and low temperatures for these two stations are 93.8 degrees Fahrenheit (°F) and -12.2°F for the Village of Germantown and 93.5°F and -15.2°F for the City of Hartford during this period. Prolonged exposure to either of these temperatures could present a significant danger. It is worth noting that the data suggest that Lake Michigan may be exerting some effect on the average and the extreme cold temperature in eastern Washington County, but is not appreciably reducing the average extreme high temperature.

Heat and humidity together can create the most severe problems to human health. High humidity makes heat more dangerous because it slows the evaporation of perspiration, which is the body’s natural cooling process. The Heat Index (HI) is a measure of discomfort and the level of risk posed to people in high risk groups by heat and humidity. It is expressed in degrees Fahrenheit (°F) and incorporates an adjustment to the air temperature for relative humidity (RH). For example, if the air temperature is 94°F and the RH is 55 percent; the HI would equal 106°F (see Table 31). Since HI values were devised for shady, light wind conditions, exposure to full sunshine can increase HI values by up to 15°F. The level of risk to people in high-risk groups associated with different levels of the HI is shown in Table 32.<sup>46</sup> The NWS will issue advisories or warnings when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat wave determines whether advisories or warnings are issued. High temperature periods are often also accompanied by the related air quality problems related to ground-level ozone that can be harmful, especially to members of sensitive groups, such as active children and adults with respiratory problems. During heat and excessive heat periods between June 15, 2012 and July 6, 2012, there were nine days when weather conditions were forecast in southeastern Wisconsin that could result in unhealthy levels of ozone, the main component of smog.

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<sup>44</sup> Jeffrey Berko, Deborah D. Ingram, Shubhayu Saha, and Jennifer D. Parker, “Deaths Attributed to Heat, Cold, and Other Weather Events in the United States, 2006-2010,” National Health Statistics Reports, No. 76, July 30, 2014.

<sup>45</sup> Ibid.

<sup>46</sup> High-risk groups include the very young, the old, and persons with chronic health conditions.

Table 30

**AVERAGE AND DEPARTURE FROM AVERAGE TEMPERATURE CHARACTERISTICS WITHIN WASHINGTON COUNTY: 1990-2014**

Date	Germantown				Hartford			
	High Temperature (°F)	Low Temperature (°F)	Average Annual Temperature (°F)	Departure from Average Temperature (°F)	High Temperature (°F)	Low Temperature (°F)	Average Annual Temperature (°F)	Departure from Average Temperature (°F)
1990	93	-11	45.8	0.2	92	-13	46.5	1.2
1991	93	-13	45.9	0.3	93	-20	45.9	0.6
1992	89	-9	43.9	-1.7	89	-9	44.2	-1.1
1993	90	-20	42.8	-2.8	88	-20	44.0	-1.3
1994	95	-27	44.7	-0.9	95	-33	44.2	-1.1
1995	102	-8	44.8	-0.8	100	-15	44.2	-1.1
1996	92	-28	40.7	-4.9	93	-29	42.4	-2.9
1997	91	-14	44.4	-1.2	91	-17	44.2	-1.1
1998	92	-8	49.1	3.5	91	-9	50.8	5.5
1999	96	-21	47.1 <sup>a</sup>	1.5	105	-28	48.6 <sup>a</sup>	3.3
2000	91	-19	46.0 <sup>a</sup>	0.4	89	-27	45.9 <sup>a</sup>	0.6
2001	94	-5	47.3 <sup>a</sup>	1.7	97	-14	47.0 <sup>a</sup>	1.7
2002	96	-10	46.6	1.0	97	-15	46.3	1.0
2003	92	-10	45.1	-0.5	93	-10	44.9	-0.4
2004	90	-15	45.7	0.1	89	-16	45.3	0.0
2005	95	-7	46.6	1.0	96	15	46.3	1.0
2006	97	16	47.8	2.2	94	19	46.9	1.6
2007	96	-16	47.1	1.5	94	-18	45.9	0.6
2008	93	-12	44.4	-1.2	93	-14	43.5	-1.8
2009	94	-16	44.7	-0.9	93	-25	43.8	-1.5
2010	91	-5	47.5	1.9	91	-14	46.5	1.2
2011	96	-11	46.1	0.5	95	-26	44.0 <sup>a</sup>	-1.3
2012	104	-5	49.7	4.1	101	-9	47.8 <sup>a</sup>	2.5
2013	94	-11	44.1	-1.5	90	-14	42.7 <sup>a</sup>	-2.6
2014	89	-20	42.3	-3.3	89	-20	41.4 <sup>a</sup>	-3.9
Average	93.8	-12.2	45.6	--	93.5	-15.2	45.3	--

<sup>a</sup>Average and/or total values computed with one to nine daily values missing.

Source: National Oceanic and Atmospheric Administration and SEWRPC.

The following definitions/criteria are used for the 20 counties in south-central and southeastern Wisconsin served by the Milwaukee/Sullivan Weather Forecast Office:

- **Outlook Statement**—Issued two to seven days prior to time that minimal Heat Advisory or Excessive Heat Warning conditions are expected. Serves as a long-term “heads-up” message;
- **Excessive Heat Watch**—Issued 24 to 48 hours in advance of when Excessive Heat Warning conditions are expected;
- **Heat Advisory**—Issued six to 24 hours in advance of any 24-hour period in which daytime heat indices are expected to be 100° to 104°, or 95° to 99° for four or more consecutive days, and nighttime heat indices are greater than or equal to 75°. Advisories are issued for less serious conditions that cause significant inconvenience and, if caution is not exercised, could lead to situations that may threaten life; and
- **Excessive Heat Warning**—Issued six to 24 hours in advance of any 24-hour period in which daytime heat indices are expected to exceed 105° for three or more hours, and nighttime heat indices are greater than or equal to 75°. In addition if Heat Advisory conditions are expected to persist for four or more days, an Excessive Heat Warning will be issued. Warnings are issued for weather conditions posing a threat to life.

**Table 31****HEAT INDEX CHART**

Temperature (°F)	Relative Humidity (percent)												
	100	95	90	85	80	75	70	65	60	55	50	45	40
	Heat Index (°F)												
80	87.2	86.4	85.6	84.9	84.2	83.6	83.0	82.4	81.8	81.3	80.8	80.3	79.9
82	94.5	93.0	91.5	90.1	88.8	87.6	86.4	85.4	84.4	83.6	82.8	82.5	81.5
84	102.7	100.3	98.0	95.9	94.0	92.2	90.5	88.9	87.5	86.3	85.1	84.1	83.3
86	111.5	108.3	105.3	102.5	99.8	97.3	95.1	93.0	91.1	89.4	87.9	86.6	85.4
88	121.2	117.1	113.2	109.6	106.3	103.1	100.2	97.6	95.1	93.0	91.0	89.4	87.4
90	131.6	126.6	121.9	117.5	113.3	109.5	105.9	102.7	99.7	97.0	94.6	92.5	90.7
92	142.8	136.9	131.3	126.0	121.0	116.4	112.2	108.3	104.7	101.4	98.5	96.0	93.8
94	154.8	147.9	141.3	135.2	129.4	124.0	119.0	114.4	110.2	106.3	102.9	99.8	97.2
96	167.5	159.6	152.1	145.0	138.3	132.1	126.4	121.0	116.1	111.7	107.6	104.0	100.9
98	181.0	172.0	163.5	155.5	147.9	140.9	134.3	128.2	122.6	117.4	112.8	108.6	104.9
100	195.3	185.2	175.7	166.7	158.2	150.2	142.8	135.9	129.5	123.6	118.3	113.5	109.3
102	210.4	199.2	188.5	178.5	169.0	160.1	151.8	144.1	136.9	130.3	124.3	118.8	113.9
104	226.2	213.8	202.1	191.0	180.5	170.7	161.4	152.8	144.8	137.4	130.6	124.4	118.9
106	242.7	229.2	216.4	204.2	192.6	181.8	171.6	162.0	153.1	144.9	137.3	130.4	124.2
108	260.1	245.4	231.3	218.0	205.4	193.5	182.3	171.1	161.9	152.8	144.4	136.7	129.8
110	278.2	262.2	247.0	232.5	218.8	205.8	193.5	182.0	171.2	161.2	152.0	143.4	135.7

Source: National Weather Service.

**Table 32****LEVEL OF RISK FOR PERSONS IN HIGH RISK GROUPS ASSOCIATED WITH THE HEAT INDEX**

Heat Index (degrees Fahrenheit)	Category	Possible Heat Disorders for Persons in High-Risk Groups
80-90	Caution	Fatigue possible with prolonged exposure and/or physical activity
90-105	Extreme Caution	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity
105-129	Danger	Sunstroke, muscle cramps and/or heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity
130 or Above	Extreme Danger	Heat stroke or sunstroke likely

Source: National Weather Service.

During extended periods of very high temperature coupled with high humidity levels, individuals can suffer a variety of ailments, including heat cramps (muscular pains and spasms due to heavy exertion). Although heat cramps are the least severe impact, they are an early signal that the body is having trouble with the heat. Heat exhaustion typically occurs when people exercise heavily or work in a hot, humid place where body fluids are lost through heavy sweating. Blood flow to the skin increases, causing blood flow to decrease to the vital organs. This results in a form of mild shock. If not treated, the victim may suffer heat stroke. Heat stroke is life threatening and

requires immediate medical attention. The victim's temperature control system, which produces sweating to cool the body, stops working. The body temperature can rise so high that brain damage and death may result if the body is not cooled quickly. Sunstroke is another term for heat stroke. In addition to posing a public health hazard, periods of excessive heat usually result in high electrical consumption for air conditioning, which can cause power outages and brown outs.

Extreme cold is also a deadly hazard. Exposure to extreme cold temperatures can cause a number of health conditions and can lead to loss of fingers and toes; or cause permanent kidney, pancreas, and liver injury, and even death. These health impacts often result from a combination of cold temperatures, winds, and precipitation. As a result, winter storms can pose substantial risks because they can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. In addition, when deaths and injuries due to cold-related vehicle accidents and fatalities, fires due to dangerous use of heaters, and other winter weather fatalities are considered, the impact of severe cold periods become even greater.

Frostbite and hypothermia are two major health risks associated with severe cold. Frostbite is injury caused by freezing of the skin and underlying tissues. Frostbite causes a loss of feeling and a white or pale appearance in extremities. Mild frostbite, frostnip, does not cause permanent skin damage and can be treated with first-aid measures. More severe frostbite can damage skin and underlying tissues and requires medical attention. Potential complications of severe frostbite include infection and nerve damage. Frostbite is most common on fingers, toes, nose, ears, face, and chin. While exposed skin in cold, windy weather is most vulnerable to frostbite, this injury can occur on skin covered by gloves or other clothing.

Hypothermia is a condition brought on when the core body temperature drops to less than 95°F. It occurs when the body loses heat more quickly than it is able to produce it. Relative to temperature extremes, this occurs due to exposure to cold or frigid environments. As with frostbite, wind or wetness can contribute to producing hypothermia. Symptoms of mild hypothermia can include shivering, dizziness, hunger, nausea, fatigue, increased heart and respiration rates, lack of coordination, and difficulty speaking. As hypothermia worsens, shivering may end. Symptoms of moderate to severe hypothermia include lack of coordination, slurred speech, confusion, drowsiness, progressive loss of consciousness, weak pulse, and shallow breathing. Hypothermia may cause lasting kidney, liver, and pancreas problems or death. Members of certain populations are particularly vulnerable to hypothermia. These include older adults, infants and very young children, the homeless, persons using alcohol or other drugs, and persons taking certain medications.

Wind chill is an index used to evaluate the risk posed by the combination of cold temperatures and wind. It is based on a combination of temperature and wind speed. Table 33 shows the wind chill table used by the National Weather Service. Wind chill is not the actual temperature, but rather a measure of how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. This combination can strongly affect the risks associated with temperature exposure. For example, a wind chill of -20°F will cause frostbite on exposed skin in just 30 minutes.

The National Weather Service issues wind chill advisories when wind chill temperatures are potentially hazardous and wind chill warnings when wind chill temperatures are life threatening. A wind chill advisory is issued when wind chill values will reach -20°F to -35°F, with wind speeds around 4 mph or more for three or more hours. A wind chill warning is issued when wind chill values will reach -35°F or colder, with wind speeds around 4 mph or more for three or more hours. In addition, a wind chill watch is issued when these conditions may be met 12 to 48 hours in the future.

What constitutes extreme cold varies in different parts of the country. In the south, near freezing temperatures are considered extreme cold. Freezing temperatures can cause severe damage to citrus fruit crops and other vegetation. Pipes may freeze and burst in homes that are poorly insulated or without heat. In the north, extreme cold means temperatures well below zero. Winter residents in Washington County may see heavy snow, strong winds/blizzards,



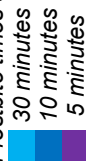
Table 33

WIND CHILL TEMPERATURES<sup>a</sup>

Wind (mph)	Temperature (°F)																	
	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

<sup>a</sup>Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V<sup>0.16</sup>) + 0.4275T(V<sup>0.16</sup>), where T = air temperature (°F) and V = wind speed (mph). The wind chill temperature is only defined for temperatures at or below 50°F and wind speeds above 3 mph. Bright sunshine may increase wind chill temperature by 10°F to 18°F.

Frostbite times associated with wind chills:



Source: National Weather Service.

extreme wind chill, lake-effect snow, and ice storms. The public can stay informed by listening to NOAA Weather Radio, commercial radio, or television for the latest winter storm warnings and watches.

### **Historical Extreme Temperature Problems**

Historically, most of the all-time maximum daily temperatures in Wisconsin were recorded during the Dust Bowl years between 1934 and 1936. The highest temperature ever recorded in Wisconsin was 114°F, which occurred on July 13, 1936, at the Wisconsin Dells. A severe heat wave in the summer of 1995 affected most of Wisconsin and resulted in 154 fatalities, 82 direct and 72 indirect. In addition, approximately 400 people received medical treatment due to heat-related causes. The 1995 summer heat wave was a rare and, in some respects, unprecedented event in terms of both unusually high maximum and minimum temperatures and the accompanying high relative humidity.

On December 9, 1995, bitter-cold arctic air swept into Wisconsin on northwest winds of 20 to 40 mph. Temperatures dropped as much as 15°F in 15 minutes as the strong front moved through. Wind chill values ranged from -25°F to -50°F. In Milwaukee County, two people died directly from hypothermia, while hypothermia was a secondary cause indirectly responsible for one death in Dane County and one death in Washington County. An episode of extreme cold, which started in late January 1996, continued through the first four days of February across south-central and southeastern Wisconsin. Wind chills were in the -35°F to -60°F range many times during this event that resulted in four cold-weather hypothermia deaths. In addition, there were 18 reported cases of sustained frostbite in Milwaukee County. The coldest temperature ever recorded in Wisconsin occurred during this episode. A low temperature of -55°F was recorded on both February 2, 1996 and February 4, 1996 at Couderay in Sawyer County.

### **Description of Recent Extreme Temperature Events**

Extreme temperatures that affect Washington County are not localized events, as they usually encompass the entire south-central to southeastern portion of the State and may continue for several days or weeks. Table 34 lists the extreme and record high and low temperature events that affected Washington County during the period January 1982 through December 2014. During this period, one fatality in Washington County was directly attributed to temperature extremes. In addition, about \$84,000 in property damages and \$364,000 in crop damages (2014 dollars) have been attributed to temperature extremes. These damage totals do not include damages attributed to related factors, such as drought.

#### ***Extreme Heat***

Southcentral and southeast Wisconsin experienced a historic heatwave during the period July 12 through July 15, 1995. Temperatures during this heat wave reached between 100°F and 109°F, setting new records at many locations. The heat was accompanied by muggy conditions with dewpoints in the upper 70s to lower 80s. The combination of high temperatures and high relative humidity resulted in heat index values peaking in the 120 to 128 range; probably the highest values recorded in Wisconsin. Statewide, heat associated with this heat wave was the major cause of 71 deaths. In addition, the heat was a contributing factor in at least 72 deaths. Approximately 100,000 animals perished in the State due to the oppressive heat, including beef and dairy cattle, pigs, horses, sheep, and poultry, overwhelming companies that pick up and dispose of dead livestock. Record demand for electricity necessitated voluntary usage reductions by residences and businesses in order to prevent widespread brownouts. No deaths or injuries attributable to this heat wave were reported in Washington County.

During the last two weeks of July 1999, an oppressive heat wave enveloped southern Wisconsin, including Washington County. This event peaked during the four days of July 28 through 31, 1999. Throughout these four days, high humidity and temperatures in the 90s and 100s produced heat index values from 110 to as high as 125. This heat wave was the major cause of eight deaths and a contributing factor in an additional six deaths. Most of these deaths occurred in or near the city of Milwaukee. This may have been related to the fact that Milwaukee registered minimum air temperatures of 70°F degrees or higher for the last 11 days of July. In addition, at least 150 people were treated at local hospitals for heat-related exhaustion or dehydration as a result of this event. This heat wave occurred when high pressure over the southeastern United States pushed hot, muggy air into southern Wisconsin. High relative humidity was associated with this air mass, with the dewpoint at General Mitchell International Airport

Table 34

**EXTREME TEMPERATURE EVENTS IN  
WASHINGTON COUNTY JANUARY 1982 THROUGH DECEMBER 2014**

Beginning Date	End Date	Type	Deaths	Injuries	Property Damage (dollars) <sup>a</sup>	Crop Damage (dollars) <sup>a</sup>
January 7, 1982.....	January 7, 1982	Extreme cold/wind chill	0	0	0.00	0.00
January 9, 1982.....	January 11, 1982	Extreme cold/wind chill	0	0	0.00	0.00
January 15, 1982.....	January 17, 1982	Extreme cold/wind chill	0	0	0.00	0.00
December 17, 1983.....	December 20, 1983	Extreme cold/wind chill	0	0	0.00	0.00
December 11, 1983.....	December 26, 1983	Extreme wind chill	0	0	0.00	0.00
January 17, 1984.....	January, 23, 1984	Cold	0	0	0.00	0.00
January 18, 1985.....	January 21, 1985	Severe cold	0	0	0.00	0.00
December 12, 1985.....	December 29, 1985	Severe cold	0	0	0.00	0.00
July 16, 1986.....	July 19, 1986	Heat	0	0	82,080.00	0.00
December 15, 1989.....	December 24, 1989	Cold/wind chill	0	0	0.00	0.00
January 13, 1994.....	January 20, 1994	Cold/wind chill	0	0	0.00	0.00
June 14, 1994.....	June 23, 1994	Heat	0	0	0.00	26,321.96
June 17, 1995.....	June 27, 1995	Excessive heat	0	0	0.00	0.00
July 13, 1995.....	July 15, 1995	Excessive heat	0	0	0.00	0.00
July 30, 1995.....	July 31, 1995	Excessive heat	0	0	0.00	0.00
December 9, 1995.....	December 9, 1995	Cold/wind chill	0	0	0.00	0.00
January 30, 1996.....	January 30, 1996	Cold/wind chill	0	0	0.00	5,227.99
January 31, 1996.....	January 31, 1996	Cold/wind chill	0	0	0.00	5,227.99
February 4, 1996.....	February 4, 1996	Cold/wind chill	0	0	0.00	0.00
January 17, 1997.....	January 17, 1997	Cold/wind chill	0	0	0.00	0.00
January 5, 1999.....	January 5, 1999	Cold/wind chill	0	0	0.00	0.00
July 4, 1999.....	July 5, 1999	Heat	0	0	0.00	0.00
July 23, 1999.....	July 24, 1999	Heat	0	0	0.00	0.00
July 29, 1999.....	July 31, 1999	Heat	0	0	0.00	0.00
July 21, 2001.....	July 22, 2001	Heat	0	0	0.00	291.40
July 31, 2001.....	July 31, 2001	Heat	0	0	0.00	291.40
August 5, 2001.....	August 9, 2001	Heat	0	0	0.00	0.00
April 15, 2002.....	April 18, 2002	Excessive heat	0	0	0.00	0.00
June 22, 2002.....	June 25, 2002	Excessive heat	0	0	0.00	0.00
June 30, 2002.....	July 3, 2002	Excessive heat	0	0	0.00	5,648.50
July 8, 2002.....	July 8, 2002	Heat	0	0	0.00	5,648.50
January 18, 2005.....	January 19, 2005	Cold/wind chill	0	0	0.00	0.00
February 17, 2006.....	February 18, 2006	Cold/wind chill	0	0	0.00	0.00
February 18, 2006.....	February 19, 2006	Cold/wind chill	0	0	0.00	0.00
July 30, 2006.....	July 31, 2006	Heat	0	0	0.00	0.00
August 1, 2006.....	August 2, 2006	Heat	0	0	0.00	18,915.62
February 3, 2007.....	February 6, 2007	Cold/wind chill	0	0	2,283.60	0.00
January 19, 2008.....	January 20, 2008	Cold/wind chill	0	0	0.00	0.00
February 10, 2008.....	February 10, 2008	Cold/wind chill	0	0	0.00	0.00
December 15, 2008.....	December 15, 2008	Cold/wind chill	0	0	0.00	0.00
December 21, 2008.....	December 22, 2008	Cold/wind chill	0	0	0.00	0.00
January 14, 2009.....	January 15, 2009	Cold/wind chill	0	0	0.00	8,218.87
January 15, 2009.....	January 16, 2009	Extreme cold/wind chill	0	0	0.00	8,218.87
March 3, 2010.....	March 3, 2010	Cold/wind chill	1	0	0.00	478.79
January 21, 2011.....	January 21, 2011	Cold/wind chill	0	0	0.00	0.00
July 17, 2011.....	July 18, 2011	Heat	0	0	0.00	46.04
July 20, 2011.....	July 21, 2011	Heat	0	0	0.00	46.04
June 28, 2012.....	June 28, 2012	Heat	0	0	0.00	0.00
July 3, 2012.....	July 6, 2012	Excessive Heat	0	0	0.00	40,001.13
July 16, 2012.....	July 17, 2012	Heat	0	0	0.00	40,001.13
July 23, 2012.....	July 23, 2012	Heat	0	0	0.00	40,001.13
July 25, 2012.....	July 25, 2012	Heat	0	0	0.00	40,001.13
January 21, 2013.....	January 22, 2013	Cold/wind chill	0	0	0.00	116,973.77
July 16, 2013.....	July 19, 2013	Heat	0	0	0.00	0.00
August 30, 2013.....	August 30, 2013	Heat	0	0	0.00	0.00
January 6, 2014.....	January 7, 2014	Extreme cold/wind chill	0	0	0.00	1,267.00
January 27, 2014.....	January 29, 2014	Cold/wind chill	0	0	0.00	1,267.00
Total	--	--	1	0	84,363.60	364,094.28

<sup>a</sup>Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.

Source: National Climatic Data Center and U.S Department of Agriculture Risk Management Agency.

reaching 82°F on July 30. Maximum air temperatures on July 30 ranged from 95°F in Juneau to 104°F in Kenosha. As a result of the high dewpoints, heat index values over much of southeastern Wisconsin during the afternoon hours of July 29 and July 30 ranged between 110 and 115. In some southeast Wisconsin locations heat index values exceeded 115. For example, during a three-hour period on July 30 heat indices between 116 and 119 were reported in the City of Fond du Lac. No deaths or injuries attributable to this heat wave were reported in Washington County. During this time, there was record peak daily electric power demand in the Milwaukee area, and for that summer there was a record set for the Midwest region for electrical demand.

In 2002 seven rounds of excessive heat in April, June, and July affected most of southeastern Wisconsin, including Washington County. Throughout southeastern Wisconsin, heat index temperatures reached 110°F, three people died, and numerous people suffered from heat-related sicknesses. The excessive heat damaged crops with about \$11,300 (2014 dollars) in crop insurance indemnities being paid to agricultural operators in Washington County for losses caused by heat during July 2002.

A period of very hot and humid weather began on the evening of July 30, 2006, and continued into August 2nd. Depending on the day, overnight temperatures fell to between 70°F and the lower 80s during this stretch. Afternoon temperatures peaked in the 95 to 100 degree range. With dew points in the low to mid-70s, heat index values dropped to only about 75 overnight on July 30 and peaked in the 105 to 100 degree range across south-central and southeast Wisconsin during the afternoons. The oppressive conditions continued during the overnight hours of August 1 with low temperatures around 80°F before a cold front swept through during the afternoon, ending the heat wave. Two deaths in Milwaukee County were attributed to this heat wave and an estimated 40 people in Milwaukee County were hospitalized due to heat-related symptoms. While no deaths or injuries attributable to this heat wave were reported in Washington County, about \$18,900 (2014 dollars) in crop insurance indemnities were paid to agricultural operators in Washington County for losses caused by heat during July and August 2006.

During the summer of 2012 southern Wisconsin, including Washington County, experienced five successive bouts of heat and excessive heat beginning in late June and continuing through July (Table 34). On June 28 heat and humidity built up under a persistent ridge of high pressure with air temperatures ranging between 90°F at Sheboygan and 100°F at Kenosha. These hot temperatures combined with high dew points in the lower to middle 70s to produce maximum heat index values of 111°F in Washington County. The heat broke later that evening as a cold front passed through southern Wisconsin. The State experienced a major heat wave during the first seven days of July 2012. In Washington County, this heat wave peaked during the period July 3 through July 6. Statewide, this event caused at least 10 heat-related fatalities and resulted in several hundred people needing medical treatment. Other reported impacts of this heat wave in southern Wisconsin include buckled and cracked road surfaces, isolated kills of fish and wildlife, intensification of drought conditions, some minor wildfires, and drying up of some small waterbodies and wetlands. In response to this event, several local governments placed restrictions on outdoor burning and/or use of fireworks. The temperatures during this heat wave were as hot as those that occurred during the July 1995 heat wave; however, because of lower relative humidity heat indices during the July 3 through 6 heat wave were lower than those that were experienced in July 1995. Despite this, the long duration of this excessive heat period makes this event one of the four most dangerous heat waves to strike southern Wisconsin in recorded history. The heat returned July 16 and 17, with high temperatures in the mid to upper 90s combining with dew points in the mid to upper 60s to produce heat index values between 100°F and 110°F. Another round of heat affected southern Wisconsin on July 23 when temperatures in the 90s combined with dew points in the 60s to lower 70s to produce heat index values between 100°F and 109°F. The maximum heat index value in Washington County reached 101°F during this event. A final round of dangerous heat affected southern Wisconsin on July 25. High temperatures topped out between 98 and 101 degrees, with dew points near 70 degrees produced heat index values between 100°F and 108°F across south-central and southeast Wisconsin. The average temperature for the month of July 2012 of 79.4 degrees was the second warmest on record after an average of 79.8 degrees that was recorded in 1901. While no deaths or injuries attributable to the July 2012 heat events were reported in Washington County, over \$160,000 (2014 dollars) in crop insurance indemnities were paid to agricultural operators in Washington County for losses caused by heat during July.

**Table 35**

**1995 NATIONWIDE HEAT-RELATED FATALITIES BY AGE AND GENDER**

Age Group	Female	Male	Total	Percent of Total
0 to 9 Years Old.....	6	6	12	1
10 to 19 Years Old.....	0	2	2	<1
20 to 29 Years Old.....	2	3	5	<1
30 to 39 Years Old.....	7	27	34	3
40 to 49 Years Old.....	15	64	79	8
50 to 59 Years Old.....	22	73	95	9
60 to 69 Years Old.....	50	129	179	18
70 to 79 Years Old.....	131	122	253	25
80 to 89 Years Old.....	145	96	241	24
90 Years Old and Older.....	51	10	61	6
Unknown.....	6	54	60	6
<b>Total</b>	<b>435</b>	<b>586</b>	<b>1,021</b>	<b>100</b>
<b>Percent</b>	<b>43</b>	<b>57</b>	<b>100</b>	<b>--</b>

Source: National Weather Service and SEWRPC.

Most heat-related deaths occur in cities. Large urban areas become “heat islands.” Brick buildings, asphalt streets, and tar roofs store heat and radiate it like a slow burning furnace. Heat builds up in a city during the day and cities are slower than rural areas to cool down at night. The amount of sunshine is an important contributing factor in urban heat waves. In addition, the stagnant atmospheric conditions associated with a heat wave trap ozone and other pollutants in urban areas. The worst heat disasters, in terms of loss of life, happen in large cities when a combination of high daytime temperatures, high humidity, warm nighttime temperatures, and an abundance of sunshine occurs for a period of several days. There are also socioeconomic problems that make some urban populations at greater risk. The elderly, disabled, and debilitated are especially susceptible to heat-related illness and death. During the 1995 nationwide heat wave, 67 percent of the fatalities occurred in the 60-year-old to 89 year-old age group (see Table 35).

Between January 1982 and December 2014, about \$82,000 in property damages and \$217,200 in crop damages, in 2014 dollars, have been reported in Washington County as a result of extreme heat.

***Extreme Cold***

Following the previous day's blizzard, northwest winds of 10 to 25 mph blew very cold arctic air into southern Wisconsin on January 30, 1996. Wind chills dropped to 35 to 45 below zero. Maximum temperatures rose to only 3°F in Milwaukee after overnight lows across southern Wisconsin dropped to between -5°F to -15°F. Arctic air continued to pour into southern Wisconsin on January 31 with northwest winds continuing to blow at 10 to 20 mph. Morning lows dipped to -29°F in Monroe, -23°F in Plymouth, -21°F in Madison, and -20°F in Waukesha. Wind chills dropped into the 40 below to 60 below zero range as daytime temperatures never recovered to zero. A record low temperature of -29°F was reported in the City of West Bend on February 3. This episode of extreme cold continued through the first four days of February ending on February 4. By the end of this cold snap, most of southern Wisconsin had experienced a long period of subzero temperatures, with Milwaukee having spent a 73-hour-period with temperatures below zero and Madison reporting a 177-hour-period with temperatures below the zero mark. In addition to the cold, wind chills were in the -35 to -60 degree range many times during this event. Reported impacts of this episode in southern Wisconsin include four deaths due to hypothermia and 18 persons treated for frostbite injuries. Most of these occurred in Milwaukee County. In addition, service stations were overwhelmed with calls for assistance, schools were closed on February 2, numerous water main pipes burst, fiber optic cables froze disrupting telephone service, hardware stores reported high demand for space heaters, snow blowers, and other cold-weather gear, and 8,000 homes in southeast Wisconsin lost electrical service on February 2 as power companies cut back on output. While no deaths or injuries attributable to these extreme cold events were reported in Washington County,

over \$10,400 (2014 dollars) in crop insurance indemnities were paid to agricultural operators in Washington County for losses caused by the cold during January 1996.

Extreme cold temperatures and wind chills occurred in Southern Wisconsin over the four-day period of February 3-6, 2007, as a massive arctic high pressure system pushed southeast through the Western Great Lakes Region. Minimum air temperatures tumbled to -5°F to -14°F on February 3, with the Lone Rock Airport (Sauk County) registering -14°F. The lowest minimum temperatures of the four-day period occurred on February 5, ranging from -11°F in Milwaukee to -26°F at the Lone Rock Airport. Afternoon maximum temperatures on February 4 stayed below zero, ranging from -1°F at Milwaukee to -3°F at Madison. On February 3 and 4, west to northwest winds were generally 15 to 30 mph, which generated wind chill values of -20°F to -30°F. Lower wind speeds of five to 20 mph were noted on February 5. The counties of Sheboygan, Sauk, Iowa, Waukesha, Racine, and Washington experienced Extreme Cold/Wind Chill event conditions (wind chills of -35°F to -38°F) for several hours during the early morning hours of February 5. Newspaper accounts indicated that plumbers answered numerous frozen-pipe calls.

Cold arctic air poured into south-central and southeast Wisconsin on January 14, 2009 as a massive arctic high pressure pushed into the Midwest. Air temperatures dropped into the single digits and then below zero as northwest to west winds of 12 to 23 mph pushed wind chills down into the -20 to -30 range. Maximum air temperatures on January 14 ranged from 5°F in Juneau to 12°F at several locations in Washington County. Minimum air temperatures on the morning of January 15 ranged from -10°F in Sheboygan to -24°F in Sauk City. This cold snap continued through January 16. Maximum air temperatures on January 15 ranged from -8°F at Monroe to 1°F in the locations of Germantown, West Allis, and Mt. Mary College in the City of Milwaukee. The lowest wind chill values during this arctic blast occurred during the pre-dawn hours of January 16. They ranged between -35 in West Bend and -42.5 in Middleton. Numerous schools closed down on January 15 and 16, and many civic clubs activities were cancelled. While no deaths or injuries resulting from the cold were reported in Washington County, two people were treated for frostbite in a Madison hospital on January 14. Over \$16,400 (2014 dollars) in crop insurance indemnities were paid to agricultural operators in Washington County for losses caused by the cold during January 2009.

Colder than normal early March weather in southeastern Wisconsin played a role in a hypothermia death of a man in West Bend on March 3, 2010. The man was found frozen on the ground outside his residence during the early morning hours with air temperatures in the teens and a light northwest wind of 3 to 6 mph. Normal lows at this time of the year are around 22°F. The previous day's maximum temperatures were around 32°F, which was about 5 degrees below normal.

On January 21, 2013, arctic air spread into southern Wisconsin behind deep low pressure that tracked to the north of the State. This system produced gusty northwest winds, which combined with surface temperatures in the single digits below zero to produce wind chills between -20 and -30. The frigid wind chills began the morning of January 21 across far northern southeast Wisconsin and most of south-central Wisconsin. They spread across the remainder of southern Wisconsin during the evening of January 21 and continued into the morning of January 22. An interesting side note to this cold outbreak was the fact that it was one of the relatively few times that a low temperature below zero has been recorded at Milwaukee without snow cover being present. This cold snap caused considerable damages to crops. About \$117,000 (2014 dollars) in crop insurance indemnities were paid to agricultural operators in Washington County for losses caused by the cold during January 2013.

January 2014 brought two bouts of extreme cold and wind chill to southeastern Wisconsin, including Washington County. On January 6, an extreme cold wave of arctic air with brisk winds brought 40-below wind chills to southern Wisconsin. Numerous school and business closings occurred. This cold wave lasted through January 7. Another arctic cold wave affected southern Wisconsin during January 27 through 29, 2014. West to northwest winds of 10-20 mph accompanied the passage of an arctic cold front. This brought wind chill values of -20 to -38 that began during the early morning of January 27. These low wind chills persisted until the morning of January 29. The coldest period was the morning of January 28 when wind chills ranged between -30 and -38. Widespread school and business closings occurred during this time. The Governor declared a state of emergency due to a propane shortage

across the state. Numerous water main breaks and frozen laterals continued to occur throughout the entire month of January. Two cold weather deaths occurred, one in Rock County and one in Milwaukee County. Over \$2,500 (2014 dollars) in crop insurance indemnities were paid to agricultural operators in Washington County for losses caused by the cold during January 2014.

Between January 1982 and December 2014, about \$2,300 in property damages and about \$147,000 in crop damages, in 2014 dollars, have been reported in Washington County as a result of extreme cold.

### **Vulnerability and Community Impacts Assessment**

Temperature extremes are primarily a public health concern. The poor and elderly are much more susceptible to temperature-related deaths and injury. Education, improved social awareness, and community outreach programs have likely helped to reduce the number of individuals killed or injured by extreme temperature events. Those at greatest risk are the very young, the very old, and the sick. Most deaths during a heat wave are the result of heat stroke. Large and highly urbanized cities can create an island of heat that can raise the area temperature 3°F to 5°F. Therefore, urban communities with substantial populations of elderly, disabled, and debilitated people could face a significant medical emergency during an extended period of excessive heat. Some residents in high crime areas, especially the elderly, are afraid to open windows or go out to cooling shelters. As neighborhoods change, some older residents become isolated because of cultural, ethnic, and language differences.

High demands for electricity can result in black outs and brown outs. Loss of water pressure can result from opening of fire hydrants in urban areas. Stagnant atmospheric conditions that occur with heat waves are also favorable for trapping ozone and other pollutants in urban areas. Pets and livestock can suffer from prolonged exposure to excessive heat.

Based upon the historical data, Washington County can expect about 0.9 extreme cold and 0.8 extreme heat or about 1.7 extreme temperature events per year.

A review of the community assets described in Chapter II indicate the potential for extreme temperature hazard events to impact: 1) residents at a countywide level, especially the poor, elderly, and sick; 2) agricultural croplands; 3) pets and livestock; 4) municipal water and electric utilities; and 4) natural surface and groundwater reserves. No specific cost data are estimated for temperature extreme events, because the nature of such events does not readily permit direct cost analysis.

### **Potential Future Changes in Extreme Temperature Conditions**

Based upon historical data, Washington County can expect to experience an average of 1.7 extreme temperature events per year. On average, these occur as 0.8 extreme heat events and 0.9 extreme cold events per year. It should be noted that the historical record shows considerable variation among years in the number of events that occurred. While it would be expected that in some years the County will experience either fewer events or more events than the average number, the average annual number of events is not expected to change.

The projections based on downscaled results from climate models indicate that there will likely be substantial changes in the frequencies of extreme cold and extreme heat events over the 21st century.

Extreme heat events are likely to occur more frequently and to be more severe by the middle of the century. As previously described, average summertime temperatures in Washington County are projected to increase by 5.0-5.5°F by year 2055. The number of days per year in which temperatures in southern Wisconsin exceed 90°F is expected to double from about 12 to about 25 by 2055. Given that much of the documented increases in average temperature since 1950 have occurred through increases in night-time low temperatures, it is likely that there will be fewer night-time breaks in the heat during extreme heat events in the future. This could result in some extreme heat events persisting longer. Heat waves have direct impacts on human health, especially among sensitive populations such as the young children and the elderly. In the absence of mitigative measures, the projected increase in the

frequency, duration, and severity of heat waves will be likely to cause increases in fatalities and illnesses related to extreme heat.

By contrast, the frequency of extreme cold events may decrease by the middle of the century. The projected warming trends are expected to be greatest during the winter. Average winter temperatures in Washington County are projected to increase by about 7.5°F. This may result in a reduction of some risks associated with extreme cold.

### **Multi-Jurisdictional Extreme Temperature Risk Management**

Based upon a review of the historic patterns of extreme temperature events in Washington County, there are no specific municipalities that have unusual risks. Rather, the events are of a uniform countywide concern.

## **VULNERABILITY ASSESSMENT FOR WINTER STORMS**

Winter storms can vary in size and strength and include heavy snow storms, blizzards, freezing rain, sleet, ice storms, and blowing and drifting snow conditions. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injury, such as frostbite and death. A variety of weather phenomena and conditions can occur during winter storms. For clarification, the following are National Weather Service approved descriptions of winter storm elements:

- **Heavy Snowfall**—The accumulation of six or more inches of snow in a 12-hour period or eight or more inches in a 24-hour period;
- **Blizzard**—An occurrence of sustained wind or frequent gusts 35 mph or higher accompanied by falling or blowing snow, and visibilities of one-quarter mile or less, for three or more hours;
- **Ice Storm**—An occurrence of rain falling from warmer upper layers of the atmosphere to the colder ground, freezing upon contact with the ground and exposed surfaces, resulting in ice accumulations of one-quarter inch or more within 12 hours or less;
- **Freezing Drizzle/Freezing Rain**—The effect of drizzle or rain freezing upon impact on objects that have a temperature of 32 degrees Fahrenheit or below;
- **Sleet**—Solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes. This ice does not cling to surfaces; and
- **Wind Chill**—An apparent temperature that describes the combined effect of wind and low air temperatures on exposed skin.

Much of the snowfall in Wisconsin occurs in small amounts of between one and three inches per occurrence. Heavy snowfalls that produce at least eight to 10 inches of widespread accumulation happen on the average only once per winter season across southern Wisconsin. In addition, a snowfall event of six to eight inches usually occurs once per winter. The northwestern portion of Wisconsin receives most of its snow during early and late season storms, while southwestern and southeastern counties receive heavy snows more often in mid-winter. Snowfall amounts in Washington County average between 30 and 40 inches per season.

### **Historical Winter Storm Problems**

True blizzards are not common in Wisconsin. However, when they do occur, they tend to affect the eastern counties near Lake Michigan. Due to less frictional drag over Lake Michigan, northwest wind storms can reach higher speeds. Blizzards are more likely to occur in northwestern Wisconsin than in southern portions of the State, even though heavy snowfalls are more frequent in the southeast. Blizzard-like conditions often exist during heavy snowstorms when gusty winds cause severe blowing and drifting of snow. Heavy snow storms have been a part of nearly every winter in Washington County history. There have been 154 major winter storm events reported since 1960. Each



of these storms contained some form of snow, sleet, freezing rain, or slippery road conditions (see Table 36). A heavy snowstorm may cause schools and businesses to close, delay or cancel airline flights, and create treacherous roadway travel conditions.

Ice and sleet storms can occur at any time throughout the winter season from October into April. The majority of these storms occur in west-central to east-central Wisconsin, based on data from 1982-2008. In a typical winter season there are three to five light freezing rain events. A major ice storm occurs about once every other year somewhere in the State, once every seven years over southeastern Wisconsin, and about once in every four years in west-central Wisconsin. If one-half inch of rain freezes on trees and utility wires, extensive damage can occur, especially if accompanied by high winds that compound the effects of the added weight of the ice. There are also between three and five instances of glazing (less than one-quarter of an inch of ice) throughout the State during a normal winter.

A major winter storm, highlighted by a devastating ice storm moved across Wisconsin on March 4 and 5, 1976. This storm affected 22 counties and resulted in a Presidential disaster declaration. It was one of the worst natural disasters to ever hit the State. The severest icing conditions occurred along a band stretching from Grant County eastward to Washington and Ozaukee Counties. Thunderstorms occurring as temperatures hovered about the freezing point led to rapid accumulations of ice on tree limbs and utility wire. In some locations, ice accumulations of up to five inches were reported. These conditions were exacerbated by high wind which gusted to 60 mph. This storm destroyed many trees, snapped hundreds of utility poles, destroyed electrical transformers, and downed thousands of power and phone lines (see Figure 1). At the height of the storm up to 100,000 people were without power. In some areas interruptions of power and communications lasted for two to 15 days. Washington County experienced severe impacts from this storm. About 1,500 utility poles in the County were snapped by massive ice buildups. Several high-tension electricity transmission towers were damaged. Countless trees were snapped or completely destroyed. At one point during this storm, 85 to 95 percent of County residents were without power. Most roads in the County were covered by fallen trees, poles, and wires. A state of emergency was declared over the entire County and roads within the County were closed to all but emergency traffic. At the request of the Washington County Sheriff, the National Guard was activated and about 200 Guardsmen were called up to provide assistance. While power was out, Guardsmen traveled between farms with industrial-sized generators and provided power for a few hours to allow farmers to feed and water their livestock. Newspaper reports indicated that some farmers had to dump milk in their fields because they had run out of milk storage capacity and dairy haulers were unable to access their farms. These reports also noted that the lack of power to run silos resulted in many dairy animals being fed a diet of baled hay during the storm which led to a decrease in milk production. This storm caused an estimated \$71.6 million (2014 dollars) in property damages, making it the single most damaging disaster in the County's history.

A storm system created a broad band of light freezing rain and freezing drizzle over much of southern Wisconsin from the night of February 3, 1986 into the morning hours of February 5, 1986. Ice accumulated on and coated and damaged millions of trees. Birches, soft maples, weeping willows, and elms were especially impacted. Slinger and West Bend in Washington County and Port Washington in Ozaukee County appeared to be the hardest hit communities. About 50 to 75 percent of the trees in those areas sustained ice damage. Falling limbs also caused widespread damage to vehicles and roofs of houses. Numerous power lines snapped in many areas. Over 30,000 customers were without power at one time or another during the event. Power was not restored to some areas in Washington County for five days. Several television cable systems failed, schools were closed, and some mail deliveries were cancelled. In Washington County, this storm caused about \$165,000 in property damage and an additional \$165,000 in crop damage (2014 dollars).

### **Description of Recent Winter Storm Events**

Generally, the winter storm season in Wisconsin runs from October through March. Severe winter weather has occurred, however, as early as September and as late as the latter half of April and into May in some locations in the State. The average annual duration of snow cover in Washington County is approximately 85 days.

Table 36

WINTER STORM AND ICE STORM EVENTS IN WASHINGTON COUNTY: JANUARY 1960 THROUGH DECEMBER 2014

Beginning Date	End Date	Type	Deaths	Injuries	Property Damages (dollars) <sup>a</sup>	Crop Damages (dollars) <sup>a</sup>
February 9, 1960	February 10, 1960	Heavy snow	0	0	0.00	0.00
December 24, 1965	December 25, 1965	Heavy snow	0	0	295,242.49	0.00
December 10, 1974	December 10, 1974	Ice storm	0	0	0.00	0.00
March 1, 1976	March 2, 1976	Ice Storm	0	0	0.00	0.00
March 4, 1976	March 5, 1976	Heavy snow/ice storm/winter storm	0	0	71,562,320.00	0.00
November 24, 1977	November 25, 1977	Heavy snow	0	0	0.00	0.00
January 25, 1978	January 27, 1978	Blizzard/heavy snow	0	0	0.00	0.00
February 9, 1981	February 10, 1981	Heavy snow	0	0	0.00	0.00
January 3, 1982	January 4, 1982	Heavy Snow	0	0	186,443.20	0.00
January 22, 1982	January 23, 1982	Freezing rain	0	0	0.00	0.00
April 5, 1982	April 5, 1982	Heavy snow	0	0	0.00	0.00
February 1, 1983	February 2, 1983	Freezing rain/heavy snow/ice storm	0	0	0.00	0.00
December 13, 1983	December 16, 1983	Heavy snow	0	0	0.00	0.00
December 26, 1984	December 26, 1984	Heavy snow	0	0	0.00	0.00
December 31, 1984	January 1, 1985	Heavy snow	0	0	0.00	0.00
March 3, 1985	March 4, 1985	Heavy snow	0	0	0.00	0.00
March 30, 1985	March 31, 1985	Freezing rain/heavy snow	0	0	0.00	0.00
November 8, 1985	November 10, 1985	Heavy snow	0	0	0.00	0.00
November 30, 1985	December 2, 1985	Heavy snow	0	0	0.00	0.00
February 3, 1986	February 5, 1986	Heavy snow/ice storm	0	0	165,024.00	165,024.00
January 29, 1987	January 30, 1987	Winter storm	0	0	0.00	0.00
December 14, 1987	December 15, 1987	Blizzard/heavy snow	0	0	0.00	0.00
December 27, 1987	December 27, 1987	Heavy snow	0	0	0.00	0.00
March 17, 1989	March 17, 1989	Freezing rain/heavy snow	0	0	0.00	0.00
January 24, 1990	January 25, 1990	Heavy snow	0	0	0.00	0.00
February 14, 1990	February 15, 1990	Heavy snow	0	0	0.00	0.00
May 10, 1990	May 10, 1990	Heavy snow	0	0	2,716,950.00	0.00
January 10, 1991	January 11, 1991	Heavy snow	0	0	0.00	0.00
December 2, 1991	December 3, 1991	Heavy snow	0	0	0.00	0.00
January 13, 1993	January 14, 1993	Heavy snow	0	0	0.00	0.00
February 20, 1993	February 11, 1993	Heavy snow	0	0	0.00	0.00
March 9, 1993	March 10, 1993	Heavy snow	0	0	0.00	0.00
March 31, 1993	April 1, 1993	Heavy snow	0	0	9,010.65	0.00
January 26, 1994	January 28, 1994	Heavy snow/ice storm	0	0	0.00	0.00
February 22, 1994	February 23, 1994	Heavy snow	0	0	0.00	0.00
February 25, 1994	February 25, 1994	Heavy snow	0	0	0.00	0.00
April 30, 1994	April 30, 1994	Heavy snow	0	0	0.00	0.00
December 5, 1994	December 7, 1994	Heavy snow	0	0	0.00	0.00
January 19, 1995	January 20, 1995	Heavy snow	0	0	0.00	0.00
February 26, 1995	February 27, 1995	Ice storm	0	0	0.00	0.00
November 10, 1995	November 11, 1995	Heavy snow	0	0	0.00	0.00
November 26, 1995	November 27, 1995	Heavy snow	0	0	0.00	0.00
December 13, 1995	December 14, 1995	Freezing rain	0	0	0.00	0.00
January 16, 1996	January 16, 1996	Freezing rain/winter weather	0	0	0.00	0.00
January 23, 1996	January 23, 1996	Heavy snow	0	0	0.00	0.00
January 26, 1996	January 27, 1996	Heavy snow	0	0	0.00	0.00
January 29, 1996	January 29, 1996	Blizzard	0	0	0.00	0.00
April 15, 1996	April 16, 1996	Heavy snow	0	0	0.00	0.00
January 9, 1997	January 10, 1997	Heavy snow	0	0	0.00	0.00
January 16, 1997	January 16, 1997	Blizzard	0	0	0.00	0.00
February 27, 1997	February 27, 1997	Heavy snow	0	0	0.00	0.00
March 12, 1997	March 13, 1997	Heavy snow	0	0	0.00	0.00
April 11, 1997	April 12, 1997	Winter storm	0	0	0.00	0.00
January 8, 1998	January 9, 1998	Winter storm	0	0	0.00	0.00
January 2, 1999	January 2, 1999	Blizzard	0	0	0.00	0.00
March 9, 1999	March 9, 1999	Winter storm	0	0	0.00	0.00
April 9, 2000	April 7, 2000	Winter storm	0	0	0.00	0.00
December 11, 2000	December 12, 2000	Heavy snow	0	0	0.00	0.00
December 18, 2000	December 19, 2000	Heavy snow	0	0	0.00	0.00
March 2, 2002	March 2, 2002	Heavy snow	0	0	0.00	0.00
February 3, 2003	February 3, 2003	Winter weather	0	0	0.00	0.00
April 4, 2003	April 4, 2003	Winter storm	0	0	0.00	0.00
January 4, 2004	January 5, 2004	Winter weather	0	0	0.00	0.00
January 16, 2004	January 17, 2004	Winter weather	0	0	0.00	0.00

Table 36 (continued)

Beginning Date	End Date	Type	Deaths	Injuries	Property Damages (dollars) <sup>a</sup>	Crop Damages (dollars) <sup>a</sup>
January 26, 2004	January 27, 2004	Heavy snow	0	0	0.00	0.00
February 8, 2004	February 9, 2004	Winter weather	0	0	0.00	0.00
January 6, 2005	January 6, 2005	Winter storm	0	0	0.00	0.00
January 22, 2005	January 23, 2005	Winter storm	0	0	0.00	0.00
February 20, 2005	February 20, 2005	Winter storm	0	0	0.00	0.00
February 16, 2006	February 16, 2006	Winter storm	0	0	0.00	0.00
November 10, 2006	November 10, 2006	Winter weather	0	0	0.00	0.00
December 1, 2006	December 1, 2006	Winter storm	0	0	0.00	0.00
January 12, 2007	January 12, 2007	Winter weather	0	0	0.00	0.00
January 14, 2007	January 15, 2007	Winter weather	0	0	0.00	0.00
January 21, 2007	January 21, 2007	Winter weather	0	0	0.00	0.00
February 23, 2007	February 24, 2007	Winter storm	0	0	0.00	0.00
February 24, 2007	February 25, 2007	Blizzard	0	0	11,418.00	0.00
February 25, 2007	February 25, 2007	Winter storm	0	0	0.00	0.00
March 1, 2007	March 1, 2007	Winter weather	0	0	0.00	0.00
March 2, 2007	March 2, 2007	Winter weather	0	0	0.00	0.00
November 21, 2007	November 21, 2007	Winter weather	0	0	0.00	0.00
December 1, 2007	December 2, 2007	Winter storm	0	0	0.00	0.00
December 4, 2007	December 5, 2007	Winter weather	0	0	0.00	0.00
December 11, 2007	December 11, 2007	Winter storm	0	0	0.00	0.00
December 15, 2007	December 16, 2007	Winter weather	0	0	0.00	0.00
December 22, 2007	December 23, 2007	Winter weather	0	0	0.00	0.00
December 28, 2007	December 28, 2007	Winter weather	0	0	0.00	0.00
January 22, 2008	January 22, 2008	Heavy snow	0	0	0.00	0.00
January 29, 2008	January 30, 2008	Winter storm	0	0	0.00	0.00
February 5, 2008	February 6, 2008	Winter storm	0	0	0.00	0.00
February 9, 2008	February 10, 2008	Winter weather	0	0	0.00	0.00
February 11, 2008	February 12, 2008	Winter weather	0	0	0.00	0.00
February 17, 2008	February 17, 2008	Ice storm	0	0	21,990.00	0.00
March 21, 2008	March 22, 2008	Winter storm	0	0	0.00	0.00
November 24, 2008	November 24, 2007	Winter weather	0	0	0.00	0.00
November 30, 2008	November 30, 2008	Winter storm	0	0	0.00	0.00
December 1, 2008	December 1, 2008	Winter storm	0	0	0.00	0.00
December 3, 2008	December 3, 2008	Winter weather	0	0	0.00	0.00
December 8, 2008	December 9, 2008	Winter storm	0	0	0.00	0.00
December 16, 2008	December 17, 2008	Winter weather	0	0	0.00	0.00
December 18, 2008	December 19, 2008	Winter storm	0	0	0.00	0.00
December 21, 2008	December 21, 2008	Winter storm	0	0	0.00	0.00
December 23, 2008	December 23, 2008	Winter weather	0	0	0.00	0.00
December 24, 2008	December 24, 2008	Winter weather	0	0	0.00	0.00
December 25, 2008	December 26, 2008	Winter weather	0	0	0.00	0.00
December 27, 2008	December 28, 2008	Winter weather	0	0	0.00	0.00
January 3, 2009	January 4, 2009	Winter weather	0	0	0.00	0.00
January 12, 2009	January 13, 2009	Winter weather	0	0	0.00	0.00
January 13, 2009	January 14, 2009	Winter weather	0	0	0.00	0.00
February 21, 2009	February 21, 2009	Winter storm	0	0	0.00	0.00
February 26, 2009	February 27, 2009	Winter weather	0	0	0.00	0.00
March 28, 2009	March 29, 2009	Winter storm	0	0	0.00	0.00
December 23, 2009	December 24, 2009	Winter storm	0	0	0.00	0.00
January 7, 2010	January 8, 2010	Winter storm	0	0	0.00	0.00
February 9, 2010	February 10, 2010	Winter storm	0	0	0.00	0.00
December 9, 2010	December 10, 2010	Winter weather	0	0	0.00	0.00
December 11, 2010	December 12, 2010	Blizzard	0	0	0.00	0.00
December 20, 2010	December 21, 2010	Winter weather	0	0	0.00	0.00
January 17, 2010	January 17, 2010	Winter weather	0	0	0.00	0.00
February 1, 2011	February 2, 2011	Blizzard	0	0	0.00	0.00
February 20, 2011	February 21, 2011	Winter storm	0	0	0.00	0.00
February 21, 2011	February 22, 2011	Winter weather	0	0	0.00	0.00
March 9, 2011	March 9, 2011	Winter weather	0	0	0.00	0.00
April 19, 2011	April 19,2011	Winter weather	0	0	0.00	0.00
December 29, 2011	December 29, 2011	Winter weather	0	0	0.00	0.00
January 12, 2012	January 13, 2012	Winter weather	0	0	0.00	0.00
January 17, 2012	January 17, 2012	Winter weather	0	0	0.00	0.00
January 20, 2012	January 20, 2012	Winter weather	0	0	0.00	0.00
January 22, 2012	January 23, 2012	Winter weather	0	0	0.00	0.00
January 23, 2012	January 24, 2012	Winter weather	0	0	0.00	0.00

**Table 36 (continued)**

Beginning Date	End Date	Type	Deaths	Injuries	Property Damages (dollars) <sup>a</sup>	Crop Damages (dollars) <sup>a</sup>
December 9, 2012	December 9, 2012	Winter weather	0	0	0.00	0.00
December 20, 2012	December 21, 2012	Winter storm	0	0	0.00	0.00
January 27, 2013	January 28, 2013	Winter weather	0	0	0.00	0.00
January 30, 2013	January 30, 2013	Winter weather	0	0	0.00	0.00
February 7, 2013	February 7, 2013	Winter storm	0	0	0.00	0.00
February 22, 2013	February 22, 2013	Winter weather	0	0	0.00	0.00
February 26, 2013	February 27, 2013	Winter storm	0	0	0.00	0.00
March 5, 2013	March 5, 2013	Winter weather	0	0	0.00	0.00
March 15, 2013	March 13, 2013	Winter weather	0	0	0.00	0.00
March 18, 2013	March 19, 2013	Winter weather	0	0	0.00	0.00
November 25, 2013	November 25, 2013	Winter weather	0	0	0.00	0.00
December 8, 2013	December 9, 2013	Winter weather	0	0	0.00	0.00
December 19, 2013	December 20, 2013	Winter weather	0	0	0.00	0.00
December 22, 2013	December 22, 2013	Winter weather	0	0	0.00	0.00
January 10, 2014	January 11, 2014	Winter weather	0	0	0.00	0.00
January 14, 2014	January 15, 2014	Winter storm	0	0	0.00	0.00
January 24, 2014	January 25, 2014	Winter weather	0	0	0.00	0.00
January 26, 2014	January 26, 2014	Winter weather	0	0	0.00	0.00
January 26, 2014	January 27, 2014	Winter weather	0	0	0.00	0.00
February 13, 2014	February 13, 2014	Winter weather	0	0	0.00	0.00
February 17, 2014	February 17, 2014	Winter storm	0	0	0.00	0.00
November 24, 2014	November 24, 2014	Winter weather	0	0	0.00	0.00
November 28, 2014	November 28, 2014	Winter weather	0	0	0.00	0.00
--	--	--	0	0	74,968,398.34	165,024.00

<sup>a</sup>Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.

Source: National Climatic Data Center.

Based upon data published by the National Climatic Data Center, a total of 154 winter storm and ice storm events have been recorded in Washington County during the 55-year period from January 1960 through December 2014. As shown in Table 36 these storms can range from one or two events per year, up to 19 events per year, which demonstrates the high unpredictability of these events. In total, these winter storm events have resulted in no deaths or injuries, and over \$75.1 million in property and crop damages within Washington County (2014 dollars). As previously described, much of these damages occurred as a result of a single, widespread ice storm event that occurred in March 1976. Several examples of recent events follow:

On May 10, 1990, a spring snowstorm dumped up to eight inches of very wet heavy snow over eastern Wisconsin. The snow combined with winds gusting to 35 mph damaged or destroyed thousands of trees and downed numerous power lines. Many residences, businesses, and vehicles were damaged by the falling trees. Schools and businesses were closed, mail delivery was cancelled, and numerous accidents occurred. Much of the Village of Slinger was without power for about 29 hours. This storm caused an estimated \$2.72 million in property damages in Washington County (2014 dollars).

While the winter of 1998-99 was quite mild, a heavy snowfall occurred January 1-3, 1999. More than 10 inches fell in most southern counties with parts of Milwaukee, Ozaukee, Walworth, Washington, and Waukesha Counties receiving more than 18 inches of snow. A statewide blizzard occurred January 2, 1999, depositing 10 or more inches of snow across the central and southern portions of the State. This excessive snowfall throughout such a large area of the State severely taxed capabilities to clear and remove snow.

The 2007-2008 winter season in Wisconsin was “one-for-the-ages.” Numerous winter storms, including a couple blizzards and four ice storms, pounded the southern half of the State. Winter snowfall totals of 70 to 122 inches across the southern counties established new all-time winter snowfall records at many locations. Portions of central

Figure 1

ICE STORM DAMAGE NEAR HARTFORD MARCH 4-5, 1976



Source: Wisconsin Division of Emergency Management.

Washington County received in excess of 90 inches of snow during this winter. These totals were roughly 200 to 240 percent of normal, and many communities ran out of salt, or were unable to purchase additional supplies due to increased demand. The second highest snowfall total in the State for this season was reported from an NWS cooperative station in Germantown which received 121.6 inches of snow over this winter. The worst storm of the winter occurred on February 5-6, 2008, southeast of a line from Dubuque, Iowa to Madison to Sheboygan where 12 to 21 inches of snow were deposited. Snowfalls in excess of 15 inches were reported from several locations in Washington County, including 16 inches reported in West Bend and Allenton, 19.5 inches reported in Germantown, and 20 inches reported in Jackson. Several roads in southeast Wisconsin were closed by the intense snowfalls and blowing snow. Washington County was included in an Emergency declaration area, receiving a total of \$417,868 in Federal funds for extraordinary expenses associated with clearing roads and emergency response efforts.

During the overnight hours of February 1 to February 2, 2011, a powerful low pressure center passing south of Wisconsin produced blizzard conditions across much of southern Wisconsin. Snow associated with the system began in the mid-afternoon hours in far southern Wisconsin and pushed northward into the state through the evening. Twenty-four-hour snowfall totals were between 8 and 16 inches, with 16 inches of snow reported by a cooperative observer near West Bend. This was in addition to several inches of snow that had fallen on January 31. Very strong winds were associated with this storm for an extended period of time. Sustained northeast winds of 30 to 40 mph were common through the event, with peak wind gusts between 45 and 55 mph. The combination of high winds and heavy snow created widespread sustained visibilities of less than one-quarter mile, with frequent whiteout conditions and near zero visibilities. Many locations saw blizzard conditions beginning early during the evening of February 1 and continuing through the early morning hours of February 2. Snow drifts of three to 10 feet were common, with reports of some drifts reaching 12 to 15 feet in open rural areas. Drifting snow closed county highways and roads with many stranded motorists having to be rescued from vehicles buried in the drifting snow. About 100 National Guardsmen were mobilized statewide in response to the Governor's emergency declaration for 29 counties to help rescue motorists and run emergency shelters at armories. At the height of the storm, WE Energies reported 5,200 customers were without power across Southeast Wisconsin. A Presidential disaster declaration was issued for 11 Wisconsin Counties, including Washington County, as a result of the Groundhog Day Blizzard of 2011. Washington County received about \$395,575 in public assistance under this declaration.

### **Vulnerability and Community Impacts Assessment**

Prior to 1990, the reports of winter storms in the NCDC database are spotty. Between 1990 and 2014, 130 winter storms affected Washington County. Based on this, it is estimated that Washington County experiences an average

of 5.2 winter storm events per year. It should be noted that historically there has been considerable variation around this average, with the County experiencing as few as zero winter storm events in some years and as many as 19 winter storm events in other years.

On average, the reported winter storms have resulted in about \$486,800 of reported property damages and \$1,100 of reported crop damages per event or a total of about \$487,900 per event. It should be noted that two events, one of them catastrophic, were responsible for most of these damages. Because of this the average damages per event may not be representative of the damages that could be expected from a winter storm event affecting the County. Over the period 1960 through 2014, winter storm hazards have resulted in about \$1,363,000 in property damages and about \$3,000 in crop damages per year for average annual total damages of about \$1,366,000. Again, because most of these damages resulted from two events, these damage totals may overestimate the damage that could be expected from the typical winter storm affecting Washington County.

Winter storms present a serious threat to the health and safety of affected citizens and can result in significant damage to property. Snow and ice are the major hazards associated with winter storms and are the eighth most destructive natural hazard in Wisconsin. Snow and ice can cause traffic accidents, cause telephone and power lines to collapse, damage trees, impede transportation, burst water pipes, and can tax capabilities for snow removal during heavy storms. A major winter storm can have a serious impact on a community. Loss of heat and mobility are key complications that contribute to winter storm fatalities.

Ice storms and freezing rain are less common than snow, but produce road conditions that can make travel hazardous. Even fog or mist on cold roads can produce a glaze of ice that makes travel slippery and dangerous. Accumulated ice can cause the structural collapse of buildings, bring down trees and power lines, and cause property damage, loss of power, and isolate people from assistance or services. Even with all of the dangers that are caused by winter storm and ice events, on average, there are zero deaths and injuries per year related to these storms in Washington County.

A review of the community assets described in Chapter II indicates there is a potential for winter storm hazard events to impact: 1) residents at a countywide level; 2) roadway transportation system; 3) utilities; and 4) the operation of critical community facilities.

In 2015, the total equalized assessed property value in Washington County was estimated at almost \$13.4 billion. About \$9.3 billion of this total is comprised of buildings and other improvement and almost \$207 million is comprised of manufacturing or non-manufacturing personal property. Based on the current average estimate of \$1,366,000 in reported damages per year, it can be expected that approximately 0.01 percent of the value of all property, including buildings and infrastructure, in Washington County will be damaged from these events each year. Due to the unpredictability of winter storm events, all buildings, infrastructure, and critical facilities within the County are considered at risk.

### **Potential Future Changes in Winter Storm Conditions**

Based upon historical data from the past 25 years, Washington County can expect to experience an average of 5.2 winter storm events per year. It should be noted that the historical record shows considerable variation among years in the number of events that occurred. While it would be expected that in some years the County will experience either fewer events or more events than the average number, over the five-year term of this plan, the average annual number of events is not expected to change.

Changes over the 20th century and in projections based on downscaled results from climate models indicate that there will likely be changes in winter storm conditions affecting Washington County over the 21st century. It is projected that by 2055, the average amount of precipitation that Washington County receives during the winter will increase by about 0.5 to 1.0 inch, an increase of about 25 percent. Due to increasing winter temperatures, the amount of precipitation that falls as rain during the winter rather than as snow is projected to increase significantly. It is also projected that freezing rain will be more likely to occur.

## **Multi-Jurisdictional Winter Storm Risk Management**

Based upon a review of the historic patterns of winter storm events in Washington County, there are no specific municipalities that have unusual risks. Rather, the events are of a uniform countywide concern.

## **VULNERABILITY ASSESSMENT FOR DROUGHT**

Drought is the result of a natural decline in the expected precipitation over an extended period of time, and occurs in virtually every climate on the planet, including areas of high and low precipitation. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds, high temperatures, and low relative humidity. Drought is a complex natural hazard which is reflected in the following four definitions commonly used to describe it:

1. Meteorological drought: The degree of dryness, expressed as a departure of actual precipitation from expected average or normal amount, based on monthly, seasonal, or annual time scales;
2. Hydrological drought: The effects of precipitation shortfalls on streamflows, reservoir, lake, and groundwater levels;
3. Agricultural drought: Soil moisture deficiencies relative to water demands of crop life; and
4. Socioeconomic drought (or water management drought): Which occurs when the demand for water exceeds the water supply, resulting in a water shortage.

A drought's severity depends on several factors, including its duration, its intensity, its geographic extent, and the demands for water for use by both humans and vegetation.

Drought can be difficult to define in exact terms. This is partly due to its multi-dimensional nature and partly due to the ways it differs from other natural hazards. There is no exact and universally accepted definition of what constitutes a drought. The onset and end of a drought are difficult to determine due to the slow accumulation of its impacts and the lingering of its effects after its apparent end. The impacts of drought are less obvious than those of some other hazards and may be spread over a larger geographic area. These characteristics have hindered the preparation of drought contingency or mitigation plans by many governments and can make it difficult to perform an accurate risk assessment analysis.

Droughts can have several impacts. They can reduce water levels and flows in surface waterbodies and groundwater. This can cause shortages of water for human and industrial consumption, hydroelectric power, recreation, and navigation. Water quality may also decline and the number and severity of wildfires may increase during a drought. Severe droughts may result in the loss of agricultural crops and forest products, undernourished wildlife and livestock, and lower land values.

Wisconsin is most vulnerable to agricultural drought. The State has approximately 14.6 million acres of farmland on 70,000 farms.<sup>47</sup> Even small droughts of limited duration can significantly reduce crop growth and yields, adversely affecting farm incomes and local economies. Droughts significantly increase the risk of forest fires and wildfires. Additionally, the loss of vegetation in the absence of sufficient water can result in flooding, even from average rainfall, following drought conditions.

### **Historical Drought Problems**

Small droughts of shortened duration have occurred in Wisconsin at an interval of about once every 10 years since the 1930s. Extended, widespread droughts have been infrequent in Wisconsin. The five most significant historical droughts, in terms of severity and duration, are 1987-1988, 1976-1977, 1955-1959, 1948-1950 and 1929-1934.

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<sup>47</sup> U.S. Department of Agriculture National Agricultural Statistics Service, 2012 Census of Agriculture: Wisconsin State and County Data, *Volume 1, Geographic Area Series, Part 49, May 2014.*

The 1929-1934 drought probably was the most significant in Wisconsin history, considering its duration, as well as its severity. This drought had at least a 75-year recurrence interval in most of the State and over 100-year recurrence interval in certain areas. The severe economic impact of the Depression compounded its effects. The drought continued with somewhat decreased effect until the early 1940s in some parts of the State.

The drought that occurred during 1948-1950 was most significant in the northern part of the State. In the most severely affected areas, the drought had a recurrence interval of greater than 70 years.

The drought of 1955-1959 had a recurrence interval of between 30 and 70 years in all but the northwestern corner of Wisconsin.

The drought of 1976-1977 was most severe in a wide band stretching from north to south across Wisconsin. Stream flow measuring stations recorded low flow recurrence intervals from 10 to 30 years. Agricultural losses during this drought were set at \$624 million. Sixty-five counties throughout the State were declared Federal drought areas and deemed eligible for assistance under the Disaster Relief Act. Additionally, numerous private and municipal wells went dry due to the lowered groundwater tables. Federal assistance was also obtained to assist communities in drilling new wells and obtaining new water supplies.

In 1987 and 1988 Wisconsin experienced one of the most severe droughts in recent history. It was characterized not only by below normal precipitation, but also by persistent dry air and above normal temperatures throughout the Midwest. Streamflow measuring stations indicated low flow recurrence intervals of between 75 and 100 years. The drought's effects were most severe in north central and northeastern Wisconsin. The drought occurred early in the growing season and resulted in a 30 to 60 percent crop loss, with agricultural losses set at \$1.3 billion. Fifty-two percent of the State's farms were estimated to have crop losses of 50 percent or more, with 14 percent estimated having losses of 70 percent or more. Agricultural operators in Washington County received about \$110,000 in crop insurance indemnities for losses caused by drought in 1987 and 1988 (2014 dollars, see Table 37). In addition to crop losses, fish, birds, and wildlife were adversely affected and the amount of electric power generated by hydroelectric plants was reduced by as much as 80 percent as a result of the low water levels associated with this drought. A combination of State and Federal drought assistance programs helped the State's farmers recover a portion of their losses. All Wisconsin counties were designated eligible for this drought assistance. The effect of this drought on municipal and private water supplies was not as severe, with only a few reports of individual wells drying up. A number of municipal water utilities experienced maximum use of their water delivery systems and imposed some type of water-use reduction rules or restrictions, usually involving the limitation of lawn sprinkling and yard watering.

### **Description of Recent Drought Events**

Estimates of agricultural losses experienced in Washington County due to drought over the period 1980 through 2014 are shown in Table 37. These estimates come from two sources: event descriptions in the NCDC storm events database and records of indemnities paid to agricultural operators by Federal crop insurance programs. For those years in which loss estimates were available from both the NCDC and crop insurance indemnities, the larger value was used to estimate losses due to drought for that year. This reflects several factors that affect the estimate of losses. First, crop losses often go unreported. Second, Federal crop insurance policies offer coverage to only certain types of crops in any particular year. Third, agricultural operators generally insure only a portion of their crops when purchasing Federal crop insurance. Thus, loss estimates derived from these two sources are likely to represent underestimates of actual losses. It should be noted that indemnities for drought-related losses were paid out in most years. This probably reflects variability in rainfall causing localized crop losses. Based on these sources, it is estimated that Washington County experienced crop damages in excess of \$19 million (2014 dollars) between 1980 and 2014.

The summer of 2002 was a drought period in south-central and southeastern Wisconsin. Mild drought began in early July, and intensified in early August. Most locations received less than one inch of rain for the first 11 days of



**Table 37**

**ESTIMATES OF CROP LOSSES DUE TO DROUGHT IN WASHINGTON COUNTY: 1980-2014**

Year	NCDC Loss Estimate (dollars) <sup>a</sup>	Crop Insurance Indemnity Paid (dollars) <sup>a</sup>	Loss Estimate Used in Risk Assessment (dollars) <sup>a,b</sup>
1980	--	3,941.76	3,941.76
1981	--	9,981.51	9,981.51
1982	--	1,479.28	1,479.28
1983	--	3,551.09	3,551.09
1984	--	15,471.02	15,471.02
1985	--	13,290.80	13,290.80
1986	--	--	--
1987	--	5,589.02	5,589.02
1988	--	103,987.16	103,987.16
1989	--	3,936.77	3,936.77
1990	--	14,934.17	14,934.17
1991	--	924.67	924.67
1992	11,554,002.00	30,148.78	11,554,002.00
1993	--	--	--
1994	--	13,314.33	13,314.33
1995	--	33,778.68	33,778.68
1996	--	8,772.16	8,772.16
1997	--	--	--
1998	--	23,550.67	23,550.67
1999	--	5,851.68	5,851.68
2000	--	--	--
2001	--	38,082.58	38,082.58
2002	197,385.00	150,083.66	197,385.00
2003	--	679,211.58	679,211.58
2004	--	219,551.87	219,551.87
2005	--	67,398.32	67,398.32
2006	--	33,781.09	33,781.09
2007	85,635.00	143,785.73	143,785.73
2008	--	1,031,831.27	1,031,831.27
2009	--	241,572.70	241,572.70
2010	--	--	--
2011	--	19,102.11	19,102.11
2012	--	4,036,917.62	4,036,917.62
2013	--	458,638.70	458,638.70
2014	--	41,180.40	41,180.40
Total	11,837,022.00	7,453,641.18	19,024,795.74

<sup>a</sup>Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.

<sup>b</sup>For those years in which loss estimates were available from both the NCDC and crop insurance indemnities, the larger value was used.

Source: National Climatic Data Center (NCDC), U.S. Department of Agriculture Risk Management Agency, and SEWRPC.

August, with General Mitchell International Airport in Milwaukee reporting only 0.24 inch during this period. This drought affected much of the country, with about 45 percent of the territory in the country's contiguous states experiencing a severe or extreme drought. Crop yields were reduced due to this drought. Many farmers reported that their corn crops had withered and that soybeans had stopped growing. Newspaper reports indicated that agricultural experts expected substantial reductions in crop yields, with reductions on the order of 50 to 67 percent expected for corn and soybeans. Drought-related crop losses of about \$197,000 (2014 dollars) were reported in Washington County.

Drought conditions returned to south-central and southeastern Wisconsin in August 2003. The jet stream and associated low pressure systems stayed north of Wisconsin, resulting in few cold front passages. As a result, precipitation was far below normal for the year. For example, at General Mitchell International Airport in Milwaukee, 22.3 inches of precipitation were recorded for the year—about 12.5 inches less than normal—making 2003 the driest year since 1963. The three-month summer period of June through August was the driest in three decades in West Bend, where only 5.11 inches of rain fell. This was 7.82 inches below normal. By October, soils in southeastern Wisconsin were reported to be dry to depths of 18 to 30 inches. The drought resulted in estimated losses of 25 to 50 percent of the corn crop and about 50 percent of the soybean crop. On July 28, 2003, Governor Doyle declared a statewide drought emergency. This emergency declaration included provisions permitting the WDNR to grant farmers' requests for permits to irrigate dry crops by diverting streams or lakes. Subsequently, the U.S. Department of Agriculture designated 59 counties in the State of Wisconsin as primary agricultural disaster areas due to damages and losses caused by drought conditions over the period May 1, 2003 through October 31, 2003, and the Federal Small Business Administration (SBA) declared 70 Wisconsin counties as disaster areas. Both of these declarations included Washington County. About \$679,000 in indemnities were paid to farmers in the County from Federal crop insurance programs in 2003 for damages related to drought (2014 dollars).

Drought conditions developed in southeastern Wisconsin during the summer and fall of 2005, following a persistent dry spell which began in March and lasted most of the year coupled with warm dry air. By mid-July, only 12.5 inches of precipitation had been recorded for the year at General Mitchell International Airport—about 9.5 inches less than normal. By July 19, the drought in Washington County had worsened to extreme drought conditions. Some relief was provided by heavy rains in September; however, severe drought conditions persisted in Washington County into September and moderate drought persisted into December. On July 15, 2005, Governor Doyle declared a statewide drought emergency. This emergency declaration included provisions permitting the WDNR to grant farmers' requests for permits to irrigate dry crops by diverting streams or lakes. The U.S. Department of Agriculture issued a Secretarial disaster declaration for portions of Wisconsin, including Washington County, for the period March 1, 2005 through September 30, 2005. In addition, the SBA made Federal disaster loans available to nonfarm agriculture-related business for drought-related losses from the period March 1, 2005 through September 30, 2005. The drought resulted in estimated losses of 35 to 40 percent of the corn crop and about 50 percent of the soybean crop. About \$67,400 (2014 dollars) in indemnities were paid to farmers in the County from Federal crop insurance programs in 2005 for damages related to drought.

A short-lived drought affected Washington County during summer 2007. Abnormally dry conditions began in late June as the jet stream steered storm systems away from southeastern Wisconsin. By late July, these dry conditions had intensified to moderate drought. Drought conditions persisted until late August when thunderstorms reduced the effects of the drought. About \$144,000 (2014 dollars) in indemnities were paid to farmers in the County from Federal crop insurance programs in 2007 for damages related to drought.

A lack of rain over south-central and southeastern Wisconsin during June 2012 allowed a drought to slowly develop. The intensity of this drought increased rapidly. By July 10 conditions in Washington County had progressed from abnormally dry to severe drought. By July 17, Washington County was experiencing extreme drought. The drought was moderated by several rounds of thunderstorms that moved through the area during the latter half of July; however, this rain came too late for much of the corn crop which had passed the critical pollination stage. In addition, not enough precipitation was deposited by these storms to end the drought. Severe drought conditions continued in

Washington County until late August and moderate drought conditions persisted until the end of October. Conditions remained abnormally dry in Washington County into March 2013. The drought reduced crop yields. Agricultural operators in Washington County received over \$4.0 million in crop insurance indemnities in 2012 due to drought (Table 37). The drought also forced sell offs of some dairy and beef cattle herds. Farmers also reported that heat impacts to cows reduced milk production, in some instances by as much as 20 percent. In response to this drought, Governor Walker declared a drought emergency and authorized the WDNR to expedite permit applications for water withdrawals from lakes and streams for the purpose of watering crops. The Washington County Emergency Management Office and the Washington County Fire Chiefs Association issued a fire danger advisory and asked residents to refrain from outdoor burning and fireworks use. Many Washington County municipalities issued outdoor burning bans and several water utilities in the County placed restrictions on lawn watering.

### **Vulnerability and Community Impacts Assessment**

Washington County is vulnerable to agricultural drought as there are about 129,936 acres of farmland comprising 46.6 percent of the land in the County. Even small droughts of limited duration can significantly reduce crop growth and yields, adversely affecting farm income. More substantial events can decimate croplands and result in total loss, hurting the local economy. Due to the importance of agriculture to the Washington County economy and the potential for large crop losses, drought is a major natural hazard threat. There are also 220 miles of major streams, 14 major and numerous smaller lakes, and 46,528 acres of wetlands (16.7 percent of the land in the County) that can also be negatively impacted due to drought conditions. In addition, groundwater levels can be affected by drought conditions. This is most important throughout the County because groundwater constitutes the main source of water supply for most uses. Severe droughts may only happen on average every 25 or 50 years, but the 1976 drought proves that, while severe droughts are rare, they can be devastating to agriculture, damaging to the local economy, and negatively impact the natural surface water system and groundwater supply system.

In 2012, most recent year for which data are available, the market value of agricultural products sold by farms in Washington County was about \$122.7 million. This was comprised of about \$48.9 million in crops and \$73.8 in livestock, poultry, and their products.<sup>48</sup> Based on the current average estimate of \$543,400 in crop losses per year, it can be expected that approximately 1.1 percent of the market value of all crops or about 0.4 percent of the market value of all agricultural products sold by farms in the County will be lost to drought each year. It is also expected that there will be considerable variation among years in the amount of losses experienced.

During a severe drought some wells, mainly private wells, may go dry. Agriculture is vulnerable to drought, as many farms in Washington County do not irrigate. A review of the community assets described in Chapter II indicate the potential for drought hazard events to impact: 1) residents at a countywide level; 2) agricultural croplands; 3) livestock; 4) municipal water utilities; and 5) natural surface and groundwater reserves.

### **Potential Future Changes in Drought Conditions**

Based upon recent historical data, Washington County has about a 40 percent probability of drought conditions occurring during a portion of any given year. The statewide historical record indicates that severe droughts can be expected to occur at roughly 10-year intervals. It is not expected that the probability of drought will change during the five-year term covered by this plan.

Changes over the 20th century and in projections based on downscaled results from climate models indicate that there will likely be changes in drought conditions affecting Washington County over the 21st century. By mid-century, average temperatures are projected to rise, leading to longer summers and shorter winters. The temperature increase will also lead to a longer growing season and increased rates of evapotranspiration during summer and early fall months. While the amount of rain during the summer is projected to increase somewhat, a greater proportion of precipitation is projected to fall in heavy rainfall events. This will result in a greater number of dry days during the

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<sup>48</sup> *U.S. Department of Agriculture National Agricultural Statistics Service op. cit.*

summer. More dry days, coupled with higher summer temperatures and increases in evapotranspiration rates, will increase the likelihood of summer droughts occurring.

### **Multi-Jurisdictional Drought Risk Management**

Based upon a review of the potential impacts of droughts in Washington County, the areas most susceptible to hazard conditions are the agricultural communities, the municipalities served by public water supply that use groundwater as a source of supply, and those communities that have the largest numbers of private wells. This includes all of the communities in the County. Given this, drought is a uniform countywide concern, with those communities with largely agricultural land uses being the most vulnerable to risk.

## **VULNERABILITY ASSESSMENT FOR TRANSPORTATION ACCIDENTS**

Geographically, Washington County is located in a relatively good position with regard to continued growth and development. It has integral connections to a major international transportation network. As part of the Milwaukee metropolitan area, the County is in close proximity to several significant urban centers including the Chicago area; the Madison area; the Fox Cities-Green Bay area; and the Janesville, Beloit, and Rockford area. Washington County is also surrounded on the west and north by fertile agricultural lands and desirable agricultural areas of the rest of the State of Wisconsin. Many of the most important industrial areas and heaviest population concentrations in the Midwest lie within a 250-mile radius of the Southeast Region of Wisconsin.<sup>49</sup> Hence, the transportation system of Washington County serves both personal and goods movements for a variety of private business, public transport, and recreational purposes. The transportation system within Washington County consists of an arterial street and highway system, public transit facilities, railway facilities, and airport facilities.

Transportation accident categories addressed in this section were divided among arterial street and highway systems and railway systems, which include crashes or collisions involving trains and any type of motorized vehicles, or involving railroad cars. Transportation accidents can result from a number of causes, including but not limited to, human error, mechanical failure, weather conditions, and sabotage. All of these issues are addressed within this section, except for the issue of sabotage, which is included within the terrorism section below. Recreational boating and shipping accidents were not considered within the scope of this plan. In addition, transportation accidents involving hazardous materials incidents are addressed separately within the following hazardous materials incidents section.

### **Roadways**

As described in Chapter II, the existing arterial street network in the City of West Bend and in the extreme southeastern portion of the County is relatively densely spaced, with arterials occurring at about one-mile intervals in both the north-south and east-west directions (see Map 9 in Chapter II). IH 41 traverses the entire County in a northwest-southeast direction. USH 45 traverses the County in a north-south direction. The existing arterial network in the rest of the County is less-densely spaced, with arterials occurring at about two- to four-mile intervals.

Within the State of Wisconsin, the fatality rate per 100 million miles of travel was 1.02 in the year 2012, with a total of 601 persons being killed in Wisconsin motor vehicle traffic crashes. Of those crashes with fatalities, 37 percent involved alcohol, 28 percent involved speed, and 10 percent involved both alcohol and speed as primary drive contributing factors. Crashes that occurred on County trunk highways and local roads accounted for 57 percent of all crashes within Wisconsin. The fatalities occurring in Wisconsin during the year 2012 included 44 pedestrians, 11 bicyclists, and 112 motorcyclists.<sup>50</sup>

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<sup>49</sup> *SEWRPC Planning Report No. 49, A Regional Transportation System Plan for Southeastern Wisconsin: 2035, June 2006.*

<sup>50</sup> *Wisconsin Department of Transportation, 2012 Wisconsin Traffic Crash Facts, March 2014.*

## **Railways**

As described in Chapter II, railway freight service is provided within Washington County by two railway companies operating active mainline railway lines (see Map 10 in Chapter II). The Wisconsin & Southern Railroad Company provides freight service along a segment that runs through the southern portion of the County. The Canadian National Railway provides freight service over a north-south main line, traversing the western half of the County. The Canadian National Railway also provides service over a spur segment in the central portion of the County which serves urban areas in the Villages of Germantown and Jackson and the City of West Bend.

Railway crashes/accidents were separated into several basic categories, including collisions, derailments, train yard accidents, railway-crossing incidents, and other incidents. Within the United States from 1995 through 2014 there were approximately 190 collisions, 1,800 derailments, 1,350 train yard accidents, and 2,600 railway-crossing incidents per year. These averages hide one important trend: the number of railway-crossing incidents has decreased steadily at an average rate of slightly more than 2 percent per year, from about 12,000 incidents per year in the mid-to-late-1970s to about 1,800 incidents per year over the period 2010 through 2014. Despite this decrease, the risk of railway accidents is generally greatest at railway crossings, where one or more railroad tracks cross a highway, road, street, sidewalk, pathway, or private drive. Approximately 89 percent of the railway crossings in the State of Wisconsin are at-grade crossings.<sup>51</sup> The remaining railway crossings are grade-separated overpasses or underpasses. Within the State of Wisconsin from 1995 through 2014, there were averages of 192 train accidents (not including railway-crossing incidents) per year and 75 railway-crossing incidents per year. In addition, from 1995 to 2014 there was an average of nine trespasser-related casualties per year in Wisconsin. These averages obscure trends toward fewer railway accidents in the State. Over the period 2010 through 2014, there were averages of 122 train accidents (not including railway-crossing incidents) and 43 railway-crossing incidents per year. Over the same period, there was an average of about eight trespasser-related casualties per year in Wisconsin.

## **Description of Recent Transportation Accident Events**

### ***Roadways***

From 1999 through 2013, data published by the Wisconsin Department of Transportation (WisDOT) shows that there was an average of 2,607 motor vehicle crashes per year in Washington County (Table 38). These crashes were responsible for an average of 14 fatalities per year, 1,024 injuries per year, and over \$26.2 million dollars in economic losses per year. Table 38 indicates that despite considerable year-to-year variability, the number of accidents per year increased during this 15-year period. During the five-year period 1999 through 2003, there was an average of 2,395 accidents per year. For the five-year period 2009 through 2013 there was an average of 2,692 accidents per year, an increase of almost 300 accidents per year. Over the same 15-year period, the number of persons injured in motor vehicle crashes in Washington County decreased from an average of 1,090 injuries per year for the five-year period 1999 through 2003 to an average of 890 injuries per year for the five year period 2009 through 2013. At least three factors account for the decrease in the annual number of injuries that has occurred despite the increase in the annual number of crashes. First, safety belt use by drivers and passengers of motor vehicles in the State of Wisconsin has increased over time. Annual field observation surveys of safety belt use conducted by WisDOT show that the number of front seat passenger vehicle occupants using their safety belts increased from about 66 percent in July 2002 to almost 86 percent in July 2015.<sup>52</sup> Second, there have been steady improvements in automobile design and safety technology. These improvements have reduced the likelihood of injuries when crashes occur.<sup>53</sup> Third,

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<sup>51</sup> *U.S. Department of Transportation, National Highway-Rail Crossing Inventory File, April 12, 2009.*

<sup>52</sup> *Wisconsin Department of Transportation, Bureau of Transportation Safety, "Field Observation of Safety Belt Use in Wisconsin," July 2015.*

<sup>53</sup> *See, for example, National Highway Traffic Safety Administration, An Analysis of Recent Improvements to Vehicle Safety, DOT HS 811 572, June 2012.*

Table 38

**MOTOR VEHICLE RELATED-ACCIDENTS, FATALITIES, AND  
ECONOMIC LOSSES REPORTED IN WASHINGTON COUNTY: 1999-2013**

Year	Registered Vehicles	Automobile Accidents	Fatalities	Injuries	Economic Losses (2014 dollars) <sup>a</sup>
1999	104,268	2,339	19	1,082	24,909,562
2000	106,567	2,524	18	1,159	21,564,563
2001	110,080	2,232	19	1,067	23,995,770
2002	112,699	2,337	11	1,059	18,801,301
2003	115,417	2,545	15	1,085	20,566,301
2004	118,288	2,607	13	1,137	23,271,924
2005	117,369	2,794	17	1,114	21,916,576
2006	120,429	2,563	9	1,030	22,611,264
2007	123,698	2,939	10	1,182	25,963,733
2008	124,177	2,766	7	991	25,578,218
2009	128,463	2,510	14	935	30,074,458
2010	127,835	2,364	17	820	28,588,904
2011	129,354	2,371	12	860	28,289,354
2012	130,380	2,795	19	833	43,403,742
2013	130,380	3,061	6	952	34,172,062
Total	--	39,107	206	15,356	393,677,747
Average	119,960	2,607	14	1,024	26,245,183

<sup>a</sup>The Wisconsin Department of Transportation reports economic losses for only those accidents occurring in incorporated municipalities with populations of 5,000 or more. Thus, the losses reported here represent a minimum estimate for economic losses related to traffic accidents occurring in Washington County.

Source: Wisconsin Department of Transportation and SEWRPC.

there have been ongoing improvements in highway design and engineering, especially with respect to intersections. While these improvements have not always reduced the number of accidents occurring at particular locations, they have reduced the severity of many of the accidents that occur.

One of the most severe traffic accidents in the State of Wisconsin occurred at about 6:00 a.m. on February 12, 1997 on USH 41 near the County Trunk Highway (CTH) K on ramp near the Village of Slinger.<sup>54</sup> A northbound semi-trailer truck pulling two empty trailers lost control on icy roads and crossed over the 50-foot depressed median into oncoming traffic in the southbound lanes. The semi-trailer struck a southbound flatbed truck loaded with lumber. The flatbed crossed into the northbound lane and struck a passenger van with nine occupants. The van underrode the right front side of the flatbed. Following this, a refrigerator truck carrying produce collided with the trailer of the flatbed. Eight of the occupants of the van were killed in this accident and the ninth occupant sustained severe injuries. In addition, the drivers of the semi-trailer and the flatbed trucks were treated for minor injuries and released. The accident spilled hundreds of pieces of lumber along the highway. The investigation of this accident by the National Transportation Safety Board concluded that the probable cause of the accident was the lack of judgement shown

<sup>54</sup> This highway is currently designated IH 41.

**Table 39**

**MOTOR VEHICLE ACCIDENT TYPES, FATALITIES, INJURIES, AND ECONOMIC LOSSES  
REPORTED AMONG MUNICIPALITIES WITHIN WASHINGTON COUNTY: 2013**

Municipality	Types of Accidents					Losses			
	Bike	Pedestrian	Motorcycle	Alcohol	Speed	Fatalities	Injuries	Property Damage Accidents	Total Estimated Economic Loss <sup>a</sup>
Village of Germantown .....	3	1	2	18	89	0	154	384	\$ 7,717,700
City of Hartford .....	3	6	5	17	40	1	74	186	5,505,200
Village of Jackson.....	0	1	1	1	14	0	33	62	1,290,400
Village of Slinger.....	1	0	5	3	34	0	34	109	2,219,200
City of West Bend.....	16	5	16	15	90	0	240	487	10,687,500
<b>Total</b>	<b>23</b>	<b>13</b>	<b>29</b>	<b>54</b>	<b>267</b>	<b>1</b>	<b>535</b>	<b>1,228</b>	<b>\$27,420,000</b>

<sup>a</sup>Economic loss was calculated using 2012 National Safety Council estimates plus 3.0 percent to account for inflation. Cost multipliers used were: Fatality, \$1,452,000; Incapacitating injury, \$74,900; Nonincapacitating injury, \$24,100; Possible injury, \$13,600; and Property damage, \$9,200.

Source: Wisconsin Department of Transportation, Department of Motor Vehicles; and SEWRPC.

by the semi-trailer driver in driving at speeds too fast for the configuration of his truck under hazardous weather conditions.<sup>55</sup> The investigation also noted that the lack of use of restraints such as seat belts by the passengers of the van contributed to the fatalities and severity of injuries sustained by the occupants of the van.

There are seasonal patterns in automobile accidents in Washington County. Wisconsin Department of Transportation data for the years 1999 through 2013 show that the total number of fatalities associated with vehicle crashes is greatest during the spring and summer months of May through September. The same data show that the average number of vehicle crashes involving injuries and associated injuries were lowest during the months of February through April. While the average numbers of vehicle crashes involving injuries and associated injuries were high during the months of May through October, they were highest during the month of December. During the 1999 through 2013 period, the numbers of vehicle crashes involving injuries and associated injuries ranged from lows of 26 crashes and 39 injuries in March 2010 to highs of 90 crashes and 131 injuries in January 2004.

It should be noted that a substantial fraction of the losses from traffic accidents that occur in Washington County occur in the County's largest municipalities. In 2013, accidents reported in the five largest municipalities in Washington County, the Cities of Hartford and West Bend and the Villages of Germantown, Jackson, and Slinger, accounted for one of the six fatalities, 535 of the 952 injuries, and about \$27.4 million of the \$34.2 million in economic losses that were reported in the County (see Table 39). Of the accidents that occurred in those five municipalities, 267 were speed-related, 54 were alcohol-related, 29 involved motorcyclists, 23 involved bicycles, and 13 involved pedestrians.

**Railways**

From 1975 through 2014 there were a total of 143 railway accidents reported within Washington County. These events are documented in terms of their type of accident and casualties in Table 40, based upon data published by the Federal Railroad Administration. As shown in Table 40, these accidents ranged from zero to 12 events per year. In total, these accident events have resulted in 14 deaths, 46 injuries, and over \$8.4 million in property damages within Washington County since 1975.

<sup>55</sup> National Transportation Safety Board, Highway Accident Report: Multiple Vehicle Crossover Accident, Slinger, Wisconsin, February 12, 1997, PB98-916203 NTSB/HAR-98/01, July 24, 1998.

Table 40

## RAILWAY ACCIDENTS REPORTED WITHIN WASHINGTON COUNTY: 1975-2014

Year	Type of Accident						Losses		
	Track, Road Bed and Structures	Signals and Communication	Mechanical or Electrical Failure	Human Error	Railway Crossing	Other	Fatalities	Injuries	Damages to Railway Property (2014 dollars)
1975	2	0	0	0	0	0	0	0	282,499.26
1976	0	0	1	0	10	0	1	5	217,507.85
1977	0	0	0	0	6	3	1	3	48,538.26
1978	1	0	3	0	8	0	1	2	411,235.73
1979	1	0	0	1	3	1	0	1	1,093,232.11
1980	1	0	4	1	5	1	0	1	381,494.18
1981	3	0	1	0	1	0	0	2	282,663.35
1982	1	0	0	0	1	1	0	0	9,383.49
1983	0	0	1	0	1	0	0	0	19,205.35
1984	0	0	0	1	2	0	0	1	15,926.72
1985	0	0	0	0	2	0	0	2	0.00
1986	0	0	0	0	5	0	4	2	0.00
1987	0	0	0	0	7	0	0	5	0.00
1988	0	0	1	0	1	0	0	0	72,039.60
1989	0	0	0	0	2	0	0	0	0.00
1990	0	0	0	0	3	0	0	0	0.00
1991	1	0	0	0	2	0	0	1	12,340.51
1992	0	0	0	1	1	0	0	0	13,443.52
1993	0	0	0	0	7	0	1	6	0.00
1994	0	0	0	1	0	0	0	0	12,859.07
1995	0	0	0	0	3	0	0	1	0.00
1996	0	0	0	0	3	0	0	1	0.00
1997	1	0	0	0	0	0	0	0	231,847.88
1998	0	0	0	1	3	0	1	0	9,585.84
1999	1	0	0	0	4	0	1	0	92,480.10
2000	1	0	0	0	1	0	0	1	39,056.69
2001	1	0	0	0	2	1	2	0	77,425.67
2002	1	0	0	0	2	0	0	0	1,647,726.56
2003	0	0	0	0	0	0	0	0	0.00
2004	0	0	0	0	1	0	0	1	0.00
2005	0	0	0	0	1	0	0	0	0.00
2006	0	0	0	0	3	1	0	1	23,043.29
2007	0	0	0	0	1	0	0	1	0.00
2008	0	0	0	0	0	0	0	0	0.00
2009	0	0	0	0	0	0	0	0	0.00
2010	0	0	0	0	1	0	0	0	0.00
2011	1	0	0	0	2	2	0	0	125,875.46
2012	0	0	0	0	3	1	2	0	100,693.10
2013	0	0	0	0	0	0	0	0	0.00
2014	0	0	0	1	2	0	0	2	3,184,792.00
Total	16	0	11	7	98	11	14	46	8,404,895.58

Source: Federal Railroad Administration and SEWRPC.



On July 15, 2002, a 107-car Canadian National Railway train derailed in the Town of Addison. About 37 cars overturned in a derailment on a concrete bridge. The train was carrying hazardous materials, although none were involved in the accident. Contents from some of the train's cargo fed a fire that erupted in the wreckage. No fatalities or injuries were reported in this accident.

On Friday, November 11, 2011, a freight train operated by Wisconsin & Southern Railroad derailed just west of the Village of Germantown. Seven cars derailed, and six of these were loaded with salt. The remaining car was empty. The train was not transporting hazardous materials at the time of the derailment. No fatalities or injuries were reported as resulting from this accident. The cause of the derailment was determined to be an internal break in the rail due to age and deterioration.

On July 20, 2014 a Wisconsin Central train collided with a Canadian National Train in the Village of Slinger, causing three engines and 10 cars to derail. The collision caused a spill of about 4,000 gallons of diesel fuel from one of the engines. This necessitated the evacuation of over 100 homes near the accident site. A shelter was opened at Slinger Middle School to accommodate the evacuees. Hazmat crews and fire fighters from six departments responded to the accident. The Federal Railroad Administration reported that this incident caused over \$3.1 million in damages. In addition, two train crew members were hospitalized for injuries resulting from this collision. This accident was attributed to human error.

### **Vulnerability, Community Impacts, and Multi-Jurisdictional Assessment**

There are several factors that should be considered when attempting to identify the potential number and vulnerability in terms of transportation-related accidents within specific areas of Washington County, which include type of vehicle, density of traffic, type of roadway, type of driver, road conditions, weather conditions, and safety equipment. In 2012, the age group with the greatest fatalities and injuries for males and females was 15 to 24 years of age in the State of Wisconsin. This age group accounted for about 26 percent of the traffic-related fatalities and injuries that occurred in 2012. In addition, traffic-related accidents are the leading cause of death to children in America. The highest numbers of fatalities throughout the State of Wisconsin in the year 2012 occurred on Saturdays between the hours of 2:00 p.m. to 10:00 p.m., followed by Tuesdays between the hours of 2:00 p.m. to 10:00 p.m. and Saturdays between the hours of 10:00 p.m. to 6:00 a.m. During the week from Monday through Friday the greatest risk of an accident is between the 2:00 p.m. and 10:00 p.m.

Traffic safety problems are typically identified by reviewing a five-year history of traffic crash records and determining the crash rate—the number of crashes per 100 million vehicle-miles of travel—on a road segment. Using the traffic crash history of the freeway and state trunk highway surface arterial systems over a recent five year period of 2008 through 2012, the traffic crash rate for each segment of the freeway system and state trunk highway surface arterial system in Washington County was estimated. The estimated traffic crash rate for each freeway segment within Washington County was compared to the average crash rate for freeway segments within the County, the Southeastern Wisconsin Region, and the State of Wisconsin. Similarly, the average crash rate for each segment of the state trunk highway surface arterial system within Washington County was compared to the average crash rate for state trunk highway surface arterial segments within the County, the Southeastern Wisconsin Region, and the State of Wisconsin.

The average crash rate on freeway segments in Washington County over the period 2008-2012 was 43.3 crashes per 100 million vehicle miles.<sup>56</sup> This average was lower than the average crash rate for freeway segments in the Southeastern Wisconsin Region, 72.5 crashes per 100 million vehicle miles, and the average crash rate for freeway segments in the State of Wisconsin, 58.6 crashes per 100 million vehicle miles. The average crash rate on segments of the state trunk highway surface arterial system in Washington County over the same period was 215.0 crashes

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<sup>56</sup> *It should be noted that in all of the crash rates presented, only crashes that have occurred in years since a roadway segment was last reconfigured are included in the crash rate.*

per 100 million vehicle miles. This average was lower than the average crash rate for segments of the state trunk highway surface arterial system in the Southeastern Wisconsin Region, 265.0 crashes per 100 million vehicle miles, and considerably greater than the average crash rate for segments of the state trunk highway surface arterial system in the State of Wisconsin, 149.8 crashes per 100 million vehicle miles.

Map 37 shows those freeway and state trunk highway surface arterial segments in Washington County with average crash rates which exceed the average crash rate for the County. On the freeway system, some of these segments are located at or near on and off ramp locations, with the most dangerous freeway segment near the IH 41 interchanges with STH 33, STH 144, STH 145, STH 167, CTH K, and CTH Q. On the state trunk highway surface arterial system, these dangerous segments are scattered throughout the County. Several of the most dangerous state trunk highway surface arterial segments include sections of USH 45 in and near the City of West Bend and the Villages of Germantown and Kewaskum, sections of STH 33 and STH 144 in and near the City of West Bend, sections of STH 60 and STH 175 in and near the Village of Slinger, and sections of STH 60 and STH 83 in and near the City of Hartford.

Weather conditions can also significantly contribute to the numbers of transportation accidents and associated injuries and deaths. Tables 41 and 42 present a comparisons of the numbers roadway accidents in the State of Wisconsin during 2013 under different weather and pavement conditions. Rain and snow were associated with some of the highest numbers of fatalities, injuries, and property damages. Fog also seems to be a significant contributing factor in those vehicle-related accidents that caused fatalities and injuries. In 2013, accidents during foggy conditions resulted in with 12 fatalities and 246 injuries (see Table 41). In dry road conditions, foggy weather is also associated with some of the greatest number of vehicle accidents compared to other weather conditions, as shown in Table 42. However, snow and slush road conditions, combined with snowy weather, were associated with high numbers of vehicle-related accidents within Wisconsin in 2013.

All of the communities of the County are vulnerable to roadway-related accidents. The areas along the major freight railways are obviously the more vulnerable to railway-related accidents. Vulnerable communities include the Cities of Hartford and West Bend; the Villages of Germantown, Jackson, Richfield, and Slinger; and the Towns of Addison, Hartford, Jackson, Polk, Wayne, and West Bend.

### **Potential Future Changes in Transportation Accident Conditions**

Transportation-related accidents are not expected to change significantly in the near future. Changes in land use can have an influence on the potential for increased incidents to occur. Such changes relate to the potential future increase in development and population growth within the County. Changing land use patterns within Washington County, as documented in Chapter II, would result in a potential increased risk of damage and related losses due to transportation accidents in the expanding urbanized areas within the County. However, this increase in population growth and associated increased risk of transportation accidents may also be offset by improvements in vehicles, roadways, railway intersections, education, or some other related feature.

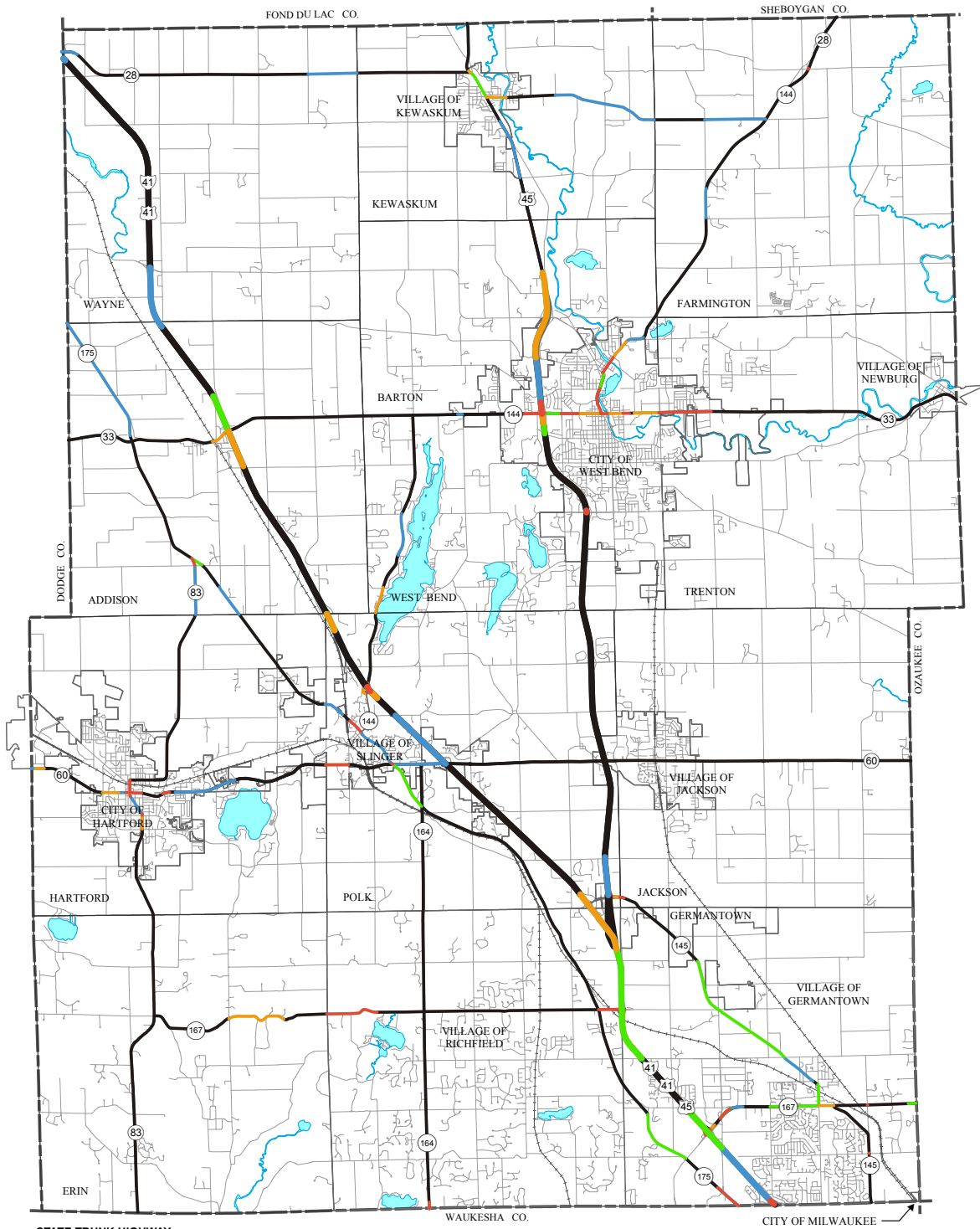
Changes in climate may result in changes in transportation accident frequencies. As previously described, the changes in temperature and precipitation that are projected to occur between now and the middle of the century are likely to cause a greater proportion of precipitation during winter to fall as rain rather than as snow. This could potentially lead to increased rates of automobile crashes during the winter. A national study indicates that wet weather is more hazardous than winter weather.<sup>57</sup> The reason for this rather counterintuitive prediction is related to driver behavior during inclement weather. Driving on wet pavement is riskier than driving on dry pavement because

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<sup>57</sup> Paul A. Pisano, Lynette C. Goodwin, and Michael A. Rossetti, "U.S. Highway Crashes in Adverse Road Weather Conditions," Paper presented at the 85th annual meeting of the American Meteorological Society, New Orleans, Louisiana, January 20-24, 2008.

Map 37

AVERAGE VEHICULAR CRASH RATE OF STATE TRUNK HIGHWAYS IN WASHINGTON COUNTY: 2008-2012



**STATE TRUNK HIGHWAY**  
 — FREEWAY  
 — SURFACE ARTERIAL

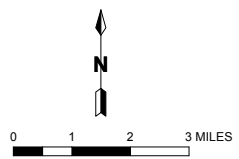
**PERCENT OF COUNTYWIDE AVERAGE CRASH RATE**  
 — AT OR BELOW COUNTYWIDE AVERAGE  
 — 1 PERCENT TO 50 PERCENT ABOVE  
 — 51 PERCENT TO 100 PERCENT ABOVE  
 — 100 PERCENT TO 200 PERCENT ABOVE  
 — MORE THAN 200 PERCENT ABOVE

NOTE: 1. THE AVERAGE CRASH RATE ON THE STATE TRUNK HIGHWAY NETWORK IN WASHINGTON COUNTY FROM 2008 THROUGH 2012 WAS 43.3 CRASHES PER 100 MILLION VEHICLE MILES FOR FREEWAYS AND 215 CRASHES PER 100 MILLION VEHICLE MILES FOR SURFACE ARTERIALS.

2. A SEPARATE CRASH RATE IS CALCULATED FOR EACH DIRECTION FOR DIVIDED HIGHWAYS. THE SIDE OF THE DIVIDED HIGHWAY HAVING THE WORST CRASH RATE IS DISPLAYED ON THE MAP.

3. ONLY CRASHES THAT OCCURRED IN YEARS SINCE THE ROADWAY WAS LAST RECONFIGURED ARE INCLUDED IN THE CRASH RATES SHOWN.

Source: Wisconsin Department of Transportation and SEWRPC.



**Table 41**

**SUMMARY OF ACCIDENT FATALITIES, INJURIES, AND PROPERTY DAMAGES  
AMONG WEATHER CONDITIONS REPORTED WITHIN THE STATE OF WISCONSIN: 2013**

Weather Conditions	Fatal Crashes	Injury Crashes	Property Damage Crashes	Total Crashes	Total	
					Fatalities	Injuries
Clear .....	271	14,501	31,588	46,360	287	20,248
Cloudy .....	137	8,764	20,836	29,737	150	12,140
Snow.....	33	2,399	10,130	12,562	38	3,282
Rain .....	22	2,225	5,238	7,485	23	3,065
Fog/Smog/Smoke.....	12	246	474	732	12	327
Sleet/Hail .....	8	318	1,284	1,610	8	434
Blowing Sand/Dirt/Snow .....	3	145	478	626	3	204
Severe Crosswinds.....	0	21	54	75	0	23
Other.....	0	10	13	23	0	14
Unknown.....	5	118	18,921	19,044	6	134
<b>Total</b>	<b>491</b>	<b>28,747</b>	<b>89,016</b>	<b>118,254</b>	<b>527</b>	<b>39,872</b>

Source: Wisconsin Department of Transportation Bureau of Transportation Safety and SEWRPC.

**Table 42**

**TOTAL NUMBER OF ACCIDENTS AMONG WEATHER AND ROAD CONDITIONS  
REPORTED WITHIN THE STATE OF WISCONSIN: 2013**

Weather Conditions	Road Conditions							Total
	Dry	Wet	Snow/Slush	Ice	Sand/Mud/Dirt/Oil	Other	Unknown	
Clear .....	40,907	1,423	2,417	1,356	115	70	72	46,360
Cloudy .....	19,306	4,660	3,864	1,757	68	29	53	29,737
Snow.....	61	693	10,525	1,264	0	2	17	12,562
Rain .....	60	6,880	166	366	6	3	4	7,485
Fog/Smog/Smoke.....	234	356	48	84	2	2	6	732
Sleet/Hail .....	4	153	502	947	1	1	2	1,610
Blowing Sand/Dirt/Snow .....	3	12	361	248	1	1	0	626
Severe Crosswinds.....	28	12	14	20	0	1	0	75
Other.....	9	4	3	5	0	0	2	23
Unknown.....	202	38	99	25	5	2	18,673	19,044
<b>Total</b>	<b>60,814</b>	<b>14,231</b>	<b>17,999</b>	<b>6,072</b>	<b>198</b>	<b>111</b>	<b>18,829</b>	<b>118,254</b>

Source: Wisconsin Department of Transportation Bureau of Transportation Safety and SEWRPC.

pavement friction is lower on wet pavement than dry pavement. Studies have shown that when precipitation is not falling, motorists tend to reduce their speed only slightly when driving on wet pavement.<sup>58</sup> They tend to reduce speed more during rainfall<sup>59</sup> and snowfall.<sup>60</sup> In addition, traffic volumes are lower during snow events than clear weather.<sup>61</sup> Despite these national findings, State of Wisconsin data for the year 2013 as set forth in Table 42, indicate that during snow/slush or icy road conditions the number of accidents was greater than during wet road conditions. In the absence of mitigation, these differences in driver behavior under adverse weather conditions could increase the risks of crashes occurring under the winter conditions projected to occur by the middle of the 21st century.

## **VULNERABILITY ASSESSMENT FOR CONTAMINATION OR LOSS OF WATER SUPPLY**

Water supply systems are among the most important infrastructure facilities affecting the economic development and environmental quality of Washington County. Such systems directly affect the health and welfare of the resident and transient populations of an area, and the viability of commercial and industrial activities in an area. Accordingly, the Local Planning Team members for development of this plan ranked contamination or loss of water supply as having the 24th highest perceived risk among 45 possible hazard event types and considered this to be a hazard that this plan should examine.

As noted in Chapter II, about 12.86 million gallons per day (mgd) of groundwater and 0.45 mgd of surface water are utilized as the source of supply by all water users in the County. An ample supply of clean, wholesome water is essential to urban development. Indeed, without a reliable water supply, urban areas become subject to epidemics of such waterborne diseases as cholera, dysentery, typhoid fever, and parasitic infections, such as *Cryptosporidium*. In addition to providing safe drinking water, a reliable water supply system is also essential in other ways to good sanitation in urban areas. An adequate and reliable water supply system is essential for bathing, laundering, and other forms of cleaning and washing, and provides the sanitary sewage conveyance system essential to a high level of quality in urban life. An adequate and reliable water supply system is essential to good fire protection, and is also essential to all types of commercial and industrial development. Table 43 lists the active public and community private water supply systems in Washington County.

### **Water Supply Issues Related to Groundwater**

Groundwater serves as the source of water supply for the municipal water utilities in Washington County. This includes the Allenton Sanitary District, the Germantown Water Utility, the Hartford Waterworks, the Jackson Waterworks, the Kewaskum Waterworks, the Slinger Water Utility, and the West Bend Waterworks. Groundwater is also the primary source of water supply for most of the other than municipal community water systems in

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<sup>58</sup> Ruediger Lamm, Elias M. Choueiri, and Theodor Mailaender, "Comparison of Operating Speeds on Dry and Wet Pavements of Two-Land Rural Highways," *Transportation Research Record*, No. 1280, pages 199-207, 1990; Lin Zhang and Panos Prevedouros, "Motorist Perceptions on the Impact of Rainy Conditions on Driver Behavior and Accident Risk," *Paper presented at the 84th annual meeting of the Transportation Research Board, Washington, D.C., January 9-13, 2005.*

<sup>59</sup> Zhang and Prevedouros 2005, op. cit.

<sup>60</sup> Daniel Eisenberg and Kenneth E. Warner, "Effects of Snowfalls on Motor Vehicle Collisions, Injuries, and Fatalities," *American Journal of Public Health*, Volume 95, pages 120-124, 2005.

<sup>61</sup> Aemal Khattak and Keith Knapp, "Interstate Highway Crash Injuries during Winter Snow and Non-Snow Events," *Transportation Research Record*, No. 1746, pages 30-36, 2001; Wael M. ElDessouki, John N. Ivan, Emmanouil N. Anagnostou, Adel W. Sadek, and Chen Zhang, "Using Relative Risk Analysis to Improve Connecticut Freeway Traffic Safety Under Adverse Weather Conditions," *Report to U.S. Department of Transportation, October 11, 2004.*

Table 43

## ACTIVE COMMUNITY WATER SUPPLY SYSTEMS IN WASHINGTON COUNTY: 2015

Water System Name	Population Served	Primary Water Source Type	Number of Active Wells
Allenton Sanitary District.....	860	Groundwater	2
Brookside Meadows Mobile Home Park .....	230	Groundwater	1
Cedar Lake Home 5.....	330	Groundwater	1
Cedar Lake Home 9.....	206	Groundwater	1
Cottages at Cedar Run .....	35	Groundwater	1
Germantown Water Utility .....	15,864	Groundwater	6
Hartford Waterworks .....	14,320	Groundwater	5
Jackson Waterworks.....	7,605	Groundwater	6
Jamestown East Homeowners Association .....	125	Groundwater	1
Kewaskum Waterworks .....	4,000	Groundwater	4
Maple Terrace Mobile Home Park .....	124	Groundwater	2
Reflections Village .....	47	Groundwater	1
Slinger Water Utility .....	4,275	Groundwater	3 <sup>a</sup>
Voight's Lakeside Estates.....	54	Groundwater	1
West Bend Waterworks .....	31,500	Groundwater	12
Wheel Estates Mobile Home Park .....	160	Groundwater	1
--	79,735	--	48

<sup>a</sup>The WDNR Public Water Supply System Database indicates that, as of August 26, 2015, the Village of Slinger has a fourth well that is new, but not yet in service.

Source: Wisconsin Department of Natural Resources Public Water Supply System Database, August 7, 2015.

the County and for most of the self-supplied residential, industrial, commercial, institutional, recreational, and agricultural water supply systems in the County.

### Groundwater Quality

Approximately 68 percent of Wisconsin's residents use groundwater, so the knowledge of the chemical character of groundwater and its variations is crucial for effective planning, management, and protection of groundwater resources. Systematic gathering of information on groundwater chemistry provides the base for determining future changes in groundwater quality; however, the available data are not adequate to fully describe groundwater quality and its trends. Systematic studies of groundwater chemistry have not been conducted in Washington County, but some data are available from sampling of wells in the County which are summarized on a county basis in the Wisconsin Department of Natural Resources GRN database. It is important to note that the data summarized in this database represent the number of wells that have been sampled, the number of wells in which the substance was detected, and the number of wells in which the concentrations detected exceeded groundwater quality criteria established by the State of Wisconsin. In addition, the summaries do not indicate whether an individual well was sampled more than once, and, if a well was sampled more than once, whether the pattern of detections and exceedence of standards for the compound of interest was the same in all samplings. Beyond being located in Washington County, the summaries do not indicate the locations of the wells sampled. Because of this, the summaries do not indicate whether exceedances of groundwater quality criteria represent conditions in a limited local area, conditions in a larger portion of the County, or conditions over the entire County. Similarly, the summaries do not indicate from which aquifers the wells sampled draw water. Finally, for most substances of concern, the number of wells sampled is small.

Additional groundwater quality data should be collected and assessed in the future in order to fully address groundwater quality issues within the County.

The chemical composition of groundwater largely depends on the composition and physical properties of the soil and rocks it is in contact with, the length of the groundwater flow path, the residence time of the water, and the antecedent water quality. The composition of groundwater in the County is primarily a result of its movement through and interaction with Pleistocene unconsolidated materials (glacial drift) and Paleozoic rocks containing large amounts of dolomite,  $\text{CaMg}(\text{CO}_3)_2$ , which is dissolved by water passing through it. In general, groundwater quality tends to be relatively uniform within a given aquifer basin, both spatially and temporally, but in different locations major contrasts in natural quality of groundwater can be observed. The current quality of groundwater in both the shallow and deep aquifers through the County is generally good and suitable for most uses, although localized water quality problems occur.

### ***Groundwater Quality Concerns***

Some water quality problems are caused by natural factors, which cannot be controlled. For example, the abundant dolomite material in bedrock underlying the County releases calcium and magnesium, which form about one-half of all ions in groundwater and are the principal components of hardness. Therefore, hardness is objectionably high in groundwater in most of the County and softening is required for many water uses. Additionally, radioactivity from radium is also a potential concern in Washington County for groundwater supplies utilizing the deep aquifer.

There are several potential water quality concerns that affect groundwater that are created from human activities. Specifically, these include bacteria, nitrate, pesticides, and volatile organic chemicals (VOCs). The first three can affect quality of water in the private wells, but generally they do not cause major problems in the County. Volatile organic chemicals are also a water quality concern that stems from landfills, leaking underground storage tanks, and spills from hazardous substances. Generally, groundwater quality in Washington County is good. There are not widespread problems with VOCs, bacteria, or agri-chemical contamination in groundwater supplies. As described below, there are localized instances of contamination.

Potential sources of groundwater contamination are many and varied. In addition to some natural processes, human-installed facilities or structures and many human activities have the potential to eventually contribute to groundwater quality problems. Many of the sources of contamination are summarized according to their place of origin in Table 44.

In areas where well histories show contamination of groundwater, Section NR 812.12(3) of the *Wisconsin Administrative Code* requires that the WDNR designate special well casing pipe depth areas. When wells are drilled in these areas, it also requires that they be provided with well casings that extend to sufficient depth to reduce the possibility that new wells will produce water containing significant concentrations of contaminants. As of 2015, 18 of these special well casing depth areas have been designated in Washington County. These areas are shown on Map 38. Table 45 lists the special well casing depth areas in the County and describes the contaminants found and the specific casing requirements for each area.

### ***Recent Instances of Groundwater Contamination in Washington County***

On July 17, 2012, an underground pipeline belonging to the West Shore Pipeline Company ruptured along a welded seam in the Town of Jackson. As a result of the rupture, the pipeline released about 55,000 gallons of gasoline into the environment. This contaminated the aquifer used as a source of water by private wells near the site of the spill, causing the aquifer to become unusable as a source of water for many years to come. Petroleum compounds were detected in water samples collected from 44 private wells located on 42 properties near the site of the spill. The concentrations of petroleum compounds detected in samples from 39 of these wells exceeded health standards. In response to the release, the WDNR, the Wisconsin Department of Health Services, and the Washington County Health Department issued a drinking water advisory, advising persons in the area covered to use bottled water or water from another clean source for cooking or drinking. In addition, the advisory area contained a smaller “flush only” area in which residents were advised to use their well water only for flushing toilets and to refrain from using it for drinking, bathing, washing dishes or clothing, and other uses of potable water. The “flush only” advisory was lifted on August 30, 2012. The West Shore Pipeline Company implemented a number of remedial actions to

**Table 44**

**HUMAN ACTIVITIES THAT MAY CREATE GROUNDWATER  
QUALITY PROBLEMS IN WASHINGTON COUNTY**

Originating on the Land	Originating Below Land Surface
Above-Ground Storage Tanks	Above Water Table
Accidental Spills	Animal waste storage facilities
Agricultural Activities:	Landfills
Animal Feedlots	Leakage:
Fertilizer and Pesticide Storage, Mixing, and Loading	Underground storage tanks
Fertilizer and Pesticide Application	Underground pipelines
Irrigation Return Flow	Sewers
Silage and Crop Residue Piles	Septic tanks
Highway Deicing	Surface wastewater impoundments
Liquid waste Spreading or Spraying (sewage, sludge, septage, whey)	Sumps, dry wells
Stockpiles (chemicals, salt), Dumps	Waste disposal in dry excavations
Infiltration of Contaminated Surface Water or Precipitation	Below Water Table
Salvage Yards	Groundwater development:
Application of fertilizers and pesticides to urban lawns and gardens	Abandoned wells and holes
Urban Runoff	Improper well construction
	Overpumping
	Illegal drainage or disposal wells
	Waste disposal in wet excavations

Source: Wisconsin Geological and Natural History Survey and SEWRPC.

minimize the effects of the spill to the environment and water supplies in the area. The company provided bottled water to affected residents, removed about 7,270 tons of contaminated soil, installed ground water recovery wells and soil vapor extraction wells to remove contaminants, sampled private water supply wells in the affected area, and installed point of entry treatment systems at many water supply wells. Property damages related to this hazardous material incident were estimated at about \$24 million. As a result of this incident, the WDNR required 37 property owners to permanently abandon their contaminated wells. In addition, West Shore Pipeline Company was required to offer a new water supply to 153 town properties. As of March 2015, about 139 property owners had accepted water service provided by the Village of Jackson.

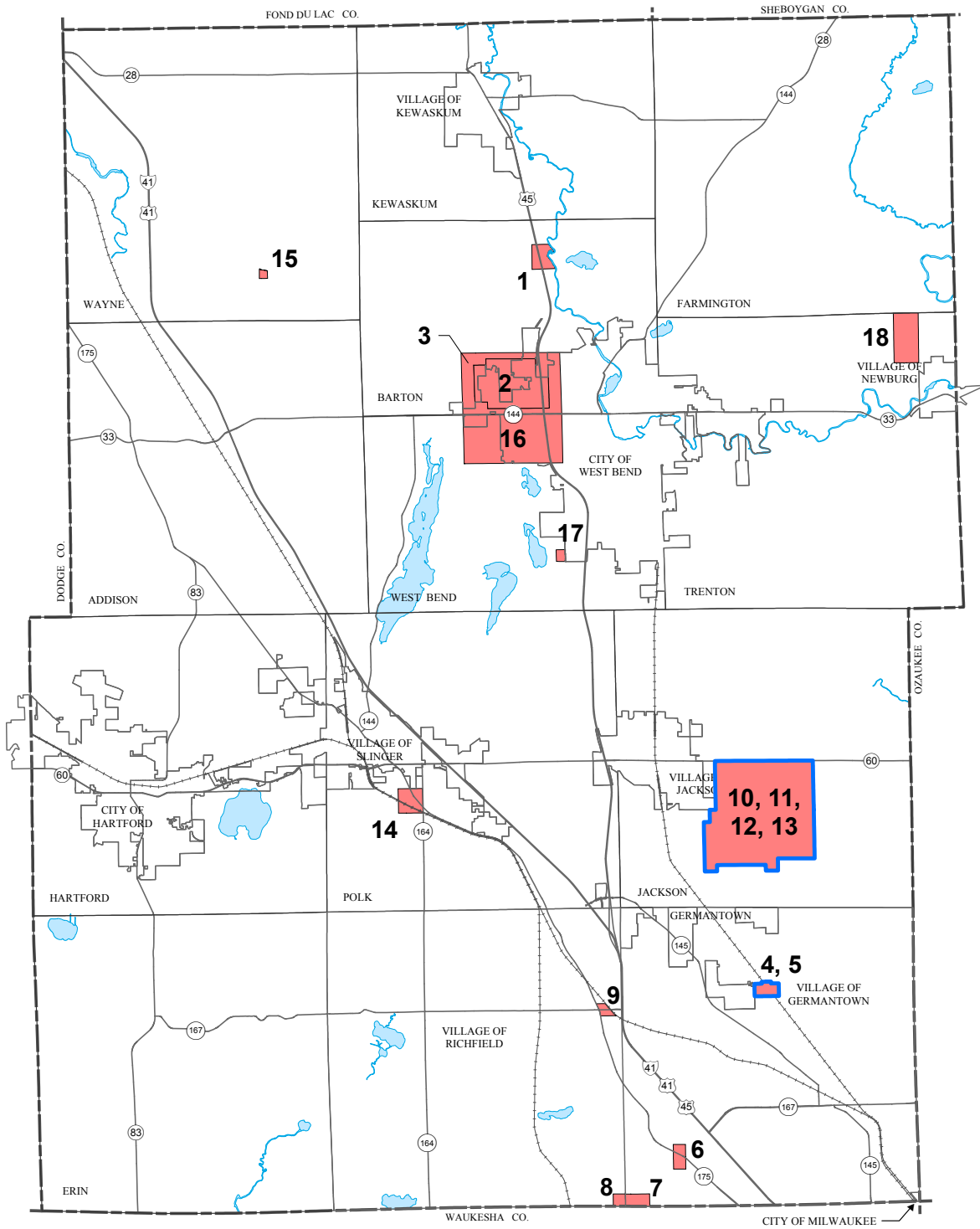
**Water Supply Issues Related to Surface Water**

Surface water does not serve as a source of public water supply in Washington County; however, it does serve as a source for some industrial, irrigation, and agricultural uses within the County. The water for these uses is captured from a variety of surface waterbodies.



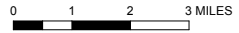
Map 38

SPECIAL WELL CASING PIPE DEPTH AREAS IN WASHINGTON COUNTY: 2015



- SPECIAL WELL CASING DEPTH AREA (SEE TABLE III-29)
- AREA OF OVERLAPPING SPECIAL WELL CASING DEPTH REQUIREMENTS
- 10** SPECIAL WELL CASING DEPTH AREA (SEE TABLE III-29)

NOTE: AREAS 4, 5, 10, 11, 12, AND 13 CONSIST OF OVERLAPPING ZONES AND WILL REQUIRE SPECIAL WELL CASING PIPE DEPTH REQUIREMENTS. SEE TABLE III-29 FOR DESCRIPTIONS OF SPECIFIC AREAS AND REQUIREMENTS.



Source: Wisconsin Department of Natural Resources and SEWRPC.

Table 45

SPECIAL WELL CASING PIPE DEPTH AREAS IN WASHINGTON COUNTY: 2015

Identification Number on Map 38	Location	Contaminant Found	Casing Requirements
1	Town of Barton, T12N R19E Section 27 southeast quarter (that portion lying west of the Milwaukee River)	Volatile organic compounds	Recommended casing to extend 60 feet into bedrock
2	Town of Barton, T11N R19E Section 3 south half of the southwest quarter Section 4 south half of the south half of the southeast quarter Section 9 east half (excluding the southern 620 feet) Section 9 northeast quarter of the southwest quarter Section 9 east half of the northwest quarter Section 10 west half (excluding the 620 southern feet) Section 10 west half of the southeast quarter (excluding the 620 southern feet) Section 10 southwest quarter of the northeast quarter	Volatile organic compounds	Cement-grouted casing required to extend to the base of the Maquoketa shale.
3	Town of Barton, T11N R19E Section 3 south half (excluding the south half of the southwest quarter) Section 4 south half (excluding the south half of the southeast quarter) Section 9 west half of the west half Section 9 southeast quarter of the southwest quarter Section 9 east half (the southern 620 feet) Section 10 east half of the east half Section 10 northwest half of the northeast quarter Section 10 southwest quarter (the southern 620 feet)	Volatile organic compounds	Cement-grouted casing recommended to extend to the base of the Maquoketa shale.
4	Town of Germantown T9N R20E Sections 9 and 10, the portions that are 500 feet to the east, 500 feet to the west, 200 feet to the north, and 300 feet to the south of the intersection of Rockfield Road and CTH G (Division Road)	Gasoline	100 feet of cement-grouted casing required
5	Town of Germantown T9N R20E Section 9 northeast quarter of the southeast quarter Section 10 northwest quarter of the southwest quarter	Bacteria, Gasoline, Nitrate	80 feet of casing recommended
6	Town of Germantown T9N R20E Section 29 southwest quarter of the southwest quarter Section 32 northwest quarter of the northwest quarter	Gasoline	Recommended 150 feet cement-grouted casing pipe
7	Town of Germantown T9N R20E Section 31 south half of southwest quarter	Gasoline	Recommended 220 feet of casing
8	Town of Richfield T9N R19E Section 36 southeast quarter of the southeast quarter	Gasoline	Recommended 220 feet of casing
9	Town of Richfield T9N R19E The portion of Section 12 which lies one-eighth mile north of CTH 167 and the portion of Section 13 which lies one-eighth mile south of CTH 167 and bounded on the west by CTH 175 and on the east by the C. M. St. P. & P Railroad right-of-way.	Gasoline	100 feet of casing into bedrock required
10	Town of Jackson T10N R20E Section 21 south half of the southwest quarter Section 27 southwest quarter of the northwest quarter Section 27 west half of the southwest quarter Section 28 south half	Gasoline	Wells must be double cased through the Maquoketa Shale into the Galena/Platteville Dolomite. Complete specifications available from WDNR Central Office. All newly constructed wells shall be sampled for Petroleum Volatile Organic

Table 45 (continued)

Identification Number on Map 38	Location	Contaminant Found	Casing Requirements
	<p>Section 28 northwest quarter</p> <p>Section 28 west half of the northwest quarter of the northeast quarter</p> <p>Section 28 south half of the northeast quarter</p> <p>Section 29 southeast quarter of the northeast quarter</p> <p>Section 29 east half of the northeast quarter of the northeast quarter</p> <p>Section 29 east half of the southeast quarter</p> <p>Section 32 northeast quarter of the northeast quarter</p> <p>Section 33 north half of the north half</p> <p>Section 34 northwest quarter of the northwest quarter</p>		Compounds within 30 days of completion of well.
11	<p>Town of Jackson T10N R20E</p> <p>Section 27 east half of the northwest quarter</p> <p>Section 27 northwest quarter of the northwest quarter</p> <p>Section 27 west half of the northeast quarter</p> <p>Section 28 northeast quarter of the northeast quarter</p>	Bacteria, Nitrate	Minimum of 220 feet of cement-grouted casing required. Recommended that all wells be sampled for nitrate.
12	<p>Town of Jackson T10N R20E</p> <p>Section 21 southeast quarter</p> <p>Section 22 southwest quarter</p> <p>Section 27 east half of the northeast quarter</p> <p>Section 27 east half of the southwest quarter</p> <p>Section 28 east half of the north west quarter of the northeast quarter</p>	Bacteria, Nitrate	Minimum of 120 feet of cement-grouted casing required. Recommended that all wells be sampled for nitrate.
13	<p>Town of Jackson T10N R20E</p> <p>Sections 21, 22, 27, 28 (entire sections)</p>	Bacteria, Nitrate	Recommended that all new and existing wells be sampled for nitrate.
14	<p>Town of Polk T10N R19E</p> <p>Section 20 southeast quarter</p>	Volatile Organic Compounds	210 feet of casing required
15	<p>Town of Wayne T12N R18E</p> <p>Section 26 the portion of the southwest quarter of the southwest quarter of the Kohlsville River</p> <p>Section 27 the portion of the southeast quarter of the southeast quarter of the southeast quarter lying south of the Kohlsville Mill Pond and 200 feet west of CTH W</p> <p>Section 34 the eastern 200 feet of the northeast quarter of the northeast quarter of the northwest quarter</p> <p>Section 35 the northwest quarter of the northwest quarter of the northwest quarter</p>	Gasoline	150 feet of casing required
16	<p>Town of West Bend T11N R19E</p> <p>Sections 15 and 16 (entire sections)</p>	Volatile organic compounds	Cement-grouted casing recommended to extend to the base of the Maquoketa shale.
17	<p>Town of West Bend T11N R19E</p> <p>Section 27 the portion of the southeast quarter of the southeast quarter within 1,000 feet of 18th Avenue</p>	Methane gas	Construction of a bedrock well recommended to avoid naturally occurring methane gas in gravel aquifer at 108 feet.
18	<p>Town of Trenton T11N R20E</p> <p>Section 1 west half of west half</p> <p>Section 2 east half of east half</p>	Livestock-related bacteria (Bovine <i>Bacteroides</i> )	Cement-grouted casing to a minimum depth of 150 feet required, upper-enlarged drillhole, a minimum diameter of 8-3/4 inches. Use of Bradenhead grouting method only.

Source: Wisconsin Department of Natural Resources.

Supplies of surface water can potentially be interrupted by anything that would partially or fully obstruct flow of water into the user's surface water intake. Because of this, surface water intakes are designed and sited in ways intended to minimize obstruction problems. Despite this, obstructions can sometimes occur. An example of this is that ice can form in water intakes. This happens during extremely cold weather when the water temperature is near 32°F. This ice formation can cause the level of water in the utility's raw water pump station to drop and can make it difficult to maintain flow. No data are available regarding occurrences of such obstructions to surface water users in Washington County.

### **Other Water Supply Issues**

Temporary losses of water supply can also be caused by other factors. Breaks in water mains can interrupt water supply. The impacts of a water main break depend on the size and location of the main. In some instances, a break may only affect a small local area. Other breaks may impact large portions of the distribution system. Frozen service laterals can also interrupt water supply to individual buildings.

Cross-connections are actual or potential connections between potable water supplies and a source of contamination. The most common form of cross-connection is a garden hose, which is easily connected to the public water supply system and can be used to apply a variety of potentially dangerous substances, including chemicals and fertilizer. Other common cross-connections include dishwashers, toilets, pressure washers, boilers, pools, and lawn sprinkler systems. Water normally flows in only one direction in a plumbing system; however, under certain conditions, such as backsiphonage or backpressure, water can flow backwards contaminating potable water supplies within a building or within a water distribution system. Backsiphonage may occur due to a loss of pressure in a water utility distribution system. Such a pressure loss can occur due to a water main break, a repair to the distribution system, or firefighting emergency. This can create a siphon in a plumbing system which can draw water out of a sink or bucket back into the building's water system and through it into the municipal system. Backpressure may be created when a source of pressure such as a boiler or a pump creates pressure greater than pressure supplied through the public water system. This may cause contaminated water to be pushed into the building's water system and through it into the municipal system. State plumbing codes require that approved backflow prevention methods be installed at every point of potable water connection and use.

### **Vulnerability and Community Impacts Assessment**

Water supplies could potentially be interrupted by the following factors:

- Contamination of a groundwater source;
- Major facility malfunction or shutdown; and
- Large numbers of water main breaks or breaks of particularly important water mains.

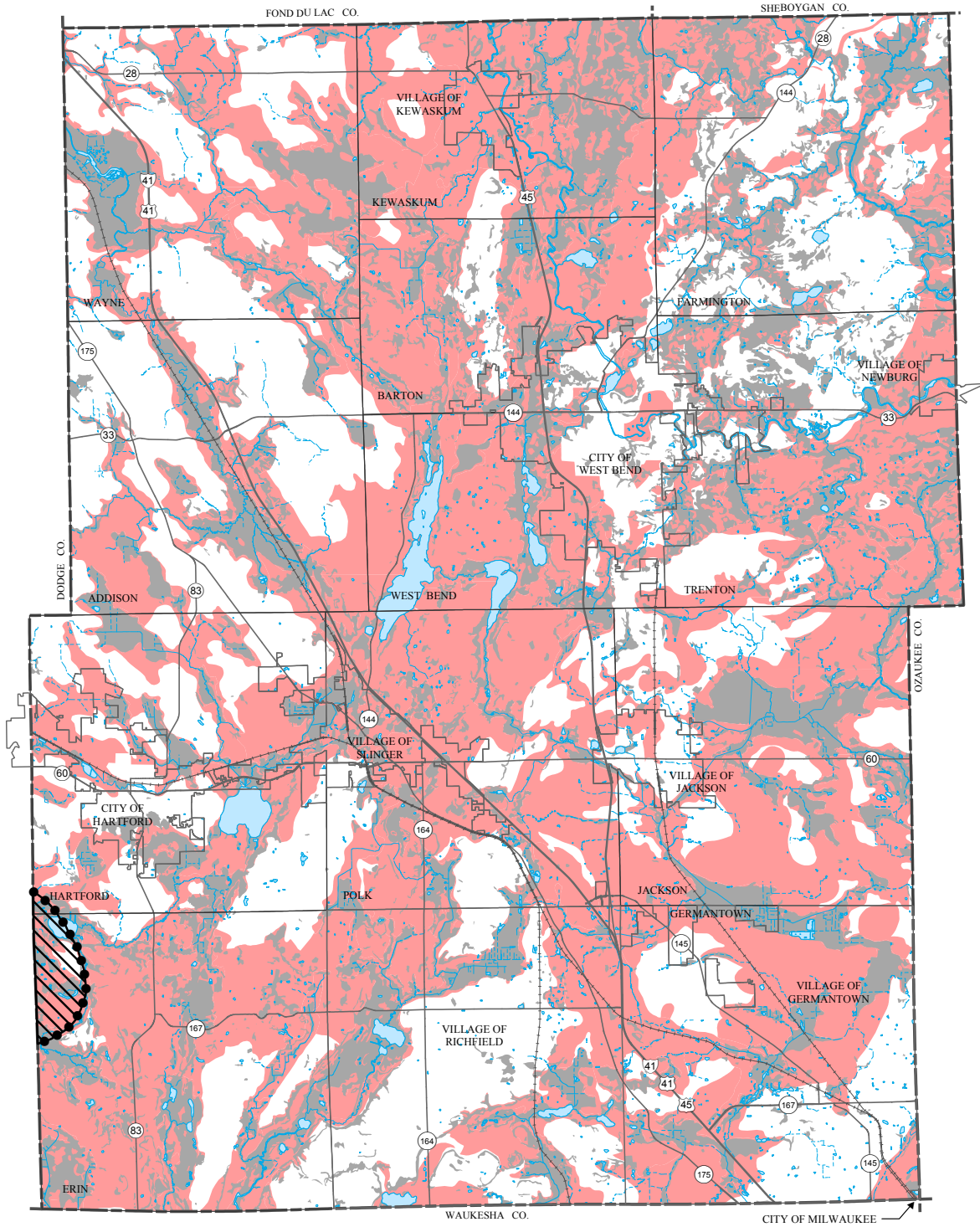
Groundwater monitoring by State agencies to determine the extent of groundwater contamination in Wisconsin and identify the sources of contamination has found that the primary contaminants of concern are volatile organic compounds, pesticides, and nitrates.

There are several factors that affect the contamination potential of groundwater resources. Many of those factors are related to soil physical properties and to the proximity of groundwater to the soil surface. Some of the soil properties that can affect groundwater quality include permeability of the subsoil, depth of the soil above the water table, clay and silt content in the soil profile, and the drainage conditions of the soil. Soils that have a high infiltration rate and high permeability with a low percentage of silt and clay increase the contamination potential of the groundwater. The potential of contamination is further enhanced when these soil conditions are coupled with a naturally occurring high water table or shallow underlying bedrock conditions.

Areas that are naturally the most vulnerable to groundwater contamination are spread throughout Washington County (see Map 39). These areas have soils that consist of glacial sand and gravel outwash material that is very

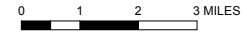
Map 39

AREAS NATURALLY VULNERABLE TO GROUNDWATER CONTAMINATION IN WASHINGTON COUNTY



- AREAS WITH A HIGH CONTAMINATION POTENTIAL BASED UPON A COMBINATION OF FACTORS
- AREAS WHERE SOIL ATTENUATION OF POLLUTANTS IS CATEGORIZED AS LOW
- CRITICAL RECHARGE AREA
- LIMIT OF DEEP SANDSTONE AQUIFER RECHARGE AREA
- SURFACE WATER

NOTE: GROUNDWATER CONTAMINATION POTENTIAL IS RELATED TO SOIL PHYSICAL PROPERTIES AND TO THE PROXIMITY OF GROUNDWATER TO THE SOIL SURFACE. ACTIVITIES THAT MAY CREATE GROUNDWATER QUALITY PROBLEMS ARE LISTED IN TABLE III-28.



Source: Wisconsin Geological and Natural History Survey and SEWRPC.

permeable, of limited thickness, and has a shallow water table, shallow to bedrock conditions, or a combination of these conditions. There are approximately 288 square miles of land, or about 66 percent of the County, that has a high potential for groundwater contamination; about 135 square miles or about 31 percent of the County, has a moderate potential for groundwater contamination; and approximately 11 square miles or slightly over 2 percent of the County, has a low potential for groundwater contamination.<sup>62</sup>

In most of the vulnerable areas in the County, the risk of contamination is highest in the shallow aquifer. This is because an impervious layer of rocks, the Maquoketa shale, separates it from the deep aquifer. This impermeable layer is absent in the extreme northwestern portions of the Town of Erin. Because the separating layer is absent, this area lies within the recharge area for the deep aquifer and the deep aquifer is also naturally vulnerable to contamination here. This area is shown as critical recharge area on Map 39.

Typically, water supply facilities have a history of safe operation with very minimal malfunctions or shutdowns. The industry has been known for providing continuous service due to the use of high-quality and redundancy in equipment. However, the facilities are always subject to the potential for an unanticipated event that could interrupt services. Since 2002, water utilities and related organizations, such as the American Water Works Association have increased efforts to evaluate vulnerability of water supply facilities to a wide range of hazards, including acts of terrorism. The focus of these efforts has been directed toward preparation of vulnerability assessments and emergency response and mitigation plans for each facility.

#### **Multi-Jurisdictional Water Supply Risk Management**

Those water supply systems serving the largest urban areas and populations would be of the most concern with regard to hazard risk. However, each municipality will have to evaluate any special water supply needs that could be a more serious problem if the water supplies were interrupted.

### **VULNERABILITY ASSESSMENT FOR LOSS OF SEWERAGE SYSTEM**

Properly designed, operated, and maintained sanitary sewer systems are meant to collect and transport all of the sewage that flows into them to a publicly-owned wastewater treatment plant (WWTP). At the WWTP, the wastewater is treated prior to being discharged into a waterbody or into groundwater. Although the specific treatment stages and processes differ among WWTPs, several treatment stages are often utilized. Initially, the influent wastewater may go through a pretreatment phase to remove large items such as garbage, rags, diapers, and cans. Following pretreatment, it passes into a primary treatment phase in which solids and floatables are removed. This is followed by a secondary treatment phase which uses aeration and biological processes to degrade organic wastes. This may be followed by additional treatment to reduce concentrations before discharge to surface water or groundwater.

Sewage conveyance and treatment systems provide important public health and environmental benefits. Sanitary wastewater containing feces and urine from humans and animals can carry a variety of disease-causing organisms. These pathogens include bacteria, such as those that cause typhoid fever, paratyphoid fever, bacillary dysentery, gastroenteritis, and cholera; viruses, such as those that cause Hepatitis A, polio, and viral gastroenteritis; parasitic protozoa, such as those that cause amoebic dysentery, giardiasis, and cryptosporidiosis; parasitic worms, such as hookworms, tapeworms, and roundworms; and fungi, such as those that cause ringworm and other dermatitis. Exposure to untreated sanitary wastewater, either through physical contact or contamination of drinking water, can transmit these diseases to members of the public. Conveyance of this wastewater to a WWTP and subsequent treatment substantially reduces the public's exposure to the pathogens carried in wastewater and consequently reduces the risks posed to the public by sanitary wastes.

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<sup>62</sup> *D.I. Siegel, Geochemistry of the Cambrian-Ordovician aquifer system in the northern Midwest, United States (Regional Aquifer-system Analysis report). U.S. Geological Survey Professional Paper 1405-D, 1989.*

Treatment of sanitary sewage also provides environmental benefits. The treatment processes remove solid material suspended in the wastewater. This reduces the amount of suspended solids discharged to receiving waters and results in less siltation in these waterbodies. In addition, treatment reduces concentrations of oxygen-demanding organic materials and nutrients in the wastewater, reducing or preventing degradation of water quality in receiving waters.

Wisconsin requires that all owners of sewage collection systems, including satellite sewage systems, develop and implement a Capacity, Management, Operation and Maintenance Program (CMOM) by August 1, 2016. A CMOM Program is meant to assure that a sewage system is properly managed, operated, and maintained at all times; has adequate capacity to convey peak flows; and all feasible steps are taken to eliminate excessive infiltration and inflow from the system. A CMOM Program must mitigate the impact of sewage overflows on waters of the state, the environment, and public health.

### **Vulnerability and Community Impacts Assessment**

The loss of a sewerage system creates a stressful and emotional situation for all of the system's users. This sort of loss can be caused by incidents affecting the conveyance system which collects and transports the sewage, the WWTP, or both. A number of factors can lead to failure of the conveyance system, including:

- Power failures or interruptions;
- Failure of equipment such as pumps, valves, monitoring equipment, and control equipment;
- Blockages of sewers;
- Physical or chemical deterioration of sewers; and
- Vandalism.

Failures in the conveyance system can disrupt gravity flow and pumping of sewage and can lead to overflows of wastewater, escape of wastewater into groundwater, and backups of wastewater into buildings.

Several factors can also lead to failure of the WWTP, including:

- Natural disasters such as floods and storms;
- Power failures or interruptions;
- Failure of equipment such as pumps, pipes, fittings, valves, monitoring equipment, and control equipment;
- Discharges of hazardous materials into the waste stream; and
- Vandalism.

Depending in part upon the cause, WWTP failures can have a variety of consequences. Such a failure can lead to overflows of wastewater or escape of wastewater to surface waters or groundwater. Plant failures could also reduce the effectiveness of sewage treatment through a variety of mechanisms. For example, a power or equipment failure that reduced or shut down aeration in secondary treatment units could lead to anaerobic conditions in these units, reducing treatment effectiveness. Similarly, discharges of hazardous substances into the waste stream could poison the organisms responsible for biological treatment processes, inhibiting these processes and reducing treatment effectiveness. Other types of failures could lead to damage to plant equipment or the plant itself. In a severe instance, this could lead to plant shutdown.

Occasional unintentional discharges of raw sewage from municipal sanitary sewers occur in almost every system. These types of discharges are called sanitary sewer overflows (SSOs). SSOs have a variety of causes, including but not limited to severe weather, improper system operation and maintenance, and vandalism. The U.S. Environmental

Protection Agency (USEPA) estimates that there are between 23,000 and 75,000 SSOs each year throughout the United States. The untreated sewage from these overflows can contaminate surface and groundwater, causing serious water quality problems. In some cases an overflow may cause health and safety concerns as well as significant property loss. Loss of a sewerage system can lead to a sewer backup, which can lead to disease, destruction of valuables, damage to property, and electrical malfunctions. A proper response to a sewer backup can greatly minimize property damage and diminish the threat of illness.

In 2010, about 18,600 acres, or about 7 percent of Washington County, was provided with public sanitary sewer service. Several areas in the County are served by public sanitary sewer systems, including areas within and near the Cities of Hartford and West Bend; the Villages Germantown, Jackson, Kewaskum, Newburg, and Slinger; and a portion of the Town of Addison (see Map 13 in Chapter II). Outside of these areas, Washington County population is served by onsite sewage disposal systems. Historically, the onsite disposal systems have included conventional gravity-flow septic systems, mound systems, holding tanks, and a few specialized systems.

Typically, municipal sanitary sewerage systems have a history of safe operation with rare failures. While these failures are typically of short duration, there is the potential for longer-duration failures to occur, mostly as the result of natural disasters. The municipal wastewater treatment sector has been known for providing continuous service due to the use of high-quality and redundancy in equipment. However, the facilities are always subject to the potential for an unanticipated event that could interrupt services.

### **Multi-Jurisdictional Risk Management**

With regard to risk of loss of sewerage systems, the greatest concerns are related to those communities in the County that operate sanitary sewage collection and treatment systems. These communities include the Cities of Hartford and West Bend; the Villages Germantown, Jackson, Kewaskum, Newburg, and Slinger; and the Allenton Sanitary District in the Town of Addison. In addition, sanitary sewage collection systems extend into several areas adjacent or near these communities. These areas are located in the Towns of Barton, Hartford, Jackson, Kewaskum, Polk, Trenton, and West Bend.

## **VULNERABILITY ASSESSMENT FOR HAZARDOUS MATERIALS INCIDENTS**

This type of hazard occurs with the uncontrolled release or threatened release of hazardous materials or substances from a fixed site or during transport that may adversely impact public health and safety and/or the environment.

Understanding the potential health effects associated with exposure to a hazardous material contaminant can be complicated and involves determining who may be exposed, how they may be exposed, and how long the exposures may last. Individuals are also known to react differently to chemical exposures depending upon their age and health. In addition, different effects may occur depending on whether exposure occurs through the ingestion or inhalation of the chemical or contact of the chemical with skin. The duration of exposure can also affect the impacts of exposure to the health of the persons exposed. There are several ways in which chemicals may enter the human body and cause detrimental health effects as summarized below:

- Inhalation: breathing the chemical into the lungs;
- Ingestion: swallowing contaminated food, water, or medication, or other chemicals;
- Absorption: assimilation through direct contact with the skin, lungs, and eyes, or indirect contact with clothing or other contaminated items; and
- Injections: penetration through the skin, much less common than other modes of exposure, but can possibly occur due to an explosion or some other type of accident.

In dealing with chemical contaminants, there are two types of exposure, namely, acute and chronic exposure. Acute exposure is defined as short-term, high-level exposure and the effects are usually immediate, whereas chronic



exposure is defined as long-term, lower-level exposure and the effects may take years to appear. Both are dangerous and have immediate and long-term health implications. General symptoms of toxic exposure can include, but are not limited to, dry and red skin upon contact, irritation of the eyes or lungs, headache, nausea, drowsiness, dizziness, insomnia, confusion, and tremors. This plan only addresses acute exposure.

### **Fixed Facilities**

Over the past several decades, the use of chemicals has increased in nearly every sector of the economy. As a result, hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other facilities in the State. There are no areas of the State that are exempt from a possible hazardous material incident. Despite extensive precautions taken to ensure careful handling during manufacture, transport, storage, use, and disposal, accidents and inadvertent releases are bound to occur. The potential impacts of such releases include short and/or long-term health hazards to those exposed, explosions, fires, and environmental contamination. An incident may also necessitate short- or long-term evacuation, which disrupts the social and economic aspects of the affected area.

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986, also known as Title III of the Superfund Amendments and Reauthorization Act (SARA Title III), brings industry, government, and the general public together to address emergency preparedness for accidental chemical releases. The EPCRA program requires communities to prepare for hazardous chemical releases through emergency planning. This program provides essential information for emergency responders and creates a database of hazardous chemical storage information for the community. The community right-to-know provisions increase public awareness of chemical hazards in their community and allows the public and local governments to obtain information about these chemical hazards.

In Wisconsin, facilities that use, store, or produce chemicals at or above the threshold quantities are required to submit a Tier II Reporting Form to the State Emergency Response Board (SERB), the Local Emergency Planning Committee (LEPC), and the local fire department.<sup>63</sup> This form is usually a one or two page document, depending on the number of chemicals being reported. Basic information requested to be submitted includes the facility name and address, emergency contact person and phone number, chemical names, and quantities. The SERB sends the forms out by mid-January each year and they are due back by March 1. Facilities also have the option of completing the form online. Failure to receive a form does not absolve a facility from their reporting obligations. A facility can be a factory, school, gas station, community center, or hospital. Farm Co-ops are exempt from reporting fertilizers and retailers are exempt from reporting goods packaged for resale. Although there are some exemptions, mainly for retailers, any facility that uses, stores, or produces hazardous chemicals may have to report the chemicals stored. However, it should also be noted that the Federal government no longer requires retail gas stations to report. As noted in Chapter II, in Washington County there are 141 facilities that either report their inventory of hazardous materials and/or provide notification that they have an extremely hazardous substance under the requirements of EPCRA.

Under EPCRA, a hazardous material is defined as any chemical that is a physical hazard or health hazard for which the Occupational Safety and Health Administration (OSHA) requires a facility to maintain a Material Safety Data Sheet (MSDS). Under EPCRA there is no specific list of hazardous materials, but some of the most common hazardous chemicals include propane, kerosene, fuel oil, motor oil, and gasoline. If a facility stores 10,000 pounds or more of these products, the owners are required to file a report. Under the law, there are two categories of

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<sup>63</sup> *Wisconsin Emergency Management, Emergency Planning and Community Right-to-Know Act Section. Planning Threshold: Facility has an extremely hazardous substance present at any one time in an amount equal or exceeding the chemical-specific threshold planning quantity (TPQ). Reporting Threshold: Facility has 10,000 pounds of a hazardous substance or either 500 pounds or the threshold planning quantity of an extremely hazardous substance present at any one time and is not exempt from reporting requirements.*

regulated chemicals: hazardous substances and extremely hazardous substances (EHS). EHS chemicals are found on an Environmental Protection Agency list of approximately 366 substances. Common EHS chemicals include chlorine, sulfuric acid, anhydrous ammonia, and nitric acid. Unlike the more common hazardous substances, the minimum reporting quantities of EHSs will vary depending on the chemical.

### **Pipeline**

Natural gas service is provided for all of Washington County by the We Energies Gas Operations, and We Energies is the distributor of natural gas. In Washington County, the main gas supply is primarily provided by ANR Pipeline Company, which owns main and branch natural gas pipelines in Washington County and the surrounding area. In addition, the We Energies natural gas system is connected to other major gas pipelines outside of, but in the vicinity of, Washington County. One petroleum pipeline runs diagonally across the County from the northwest corner of the Town of Addison to the southeast corner of the Village of Germantown, in the Towns of Addison, Hartford, Jackson, and Polk and the Villages of Germantown and Slinger. Another petroleum pipeline extends north through Washington County through the Towns of Germantown, Jackson, and Trenton, along the eastern boundary of the West Bend Airport in the City of West Bend, and through the Town of Farmington.

It should be noted that natural gas service and selected other hazards could be vulnerable to events, such as an earthquake or an act of terrorism. Such possibilities should be considered as facility and system redundancy is carried out.

### **Transportation**

The list of hazardous materials transported by highway or rail is extensive. However, the bulk of the products being transported consist of petroleum products such as gasoline, diesel fuel, jet fuel, fuel oil, asphalt, creosote, and propane; chemicals used for industrial or manufacturing processes such as anhydrous ammonia, sulfuric acid, and chlorine; and waste products such as industrial waste, food waste, medical waste, and animal waste. There are numerous other hazardous materials routinely transported in smaller quantities, such as pesticides, herbicides, and specialized industrial chemicals. The majority of releases are the result of transportation accidents. In addition, some minor releases are the result of illegal dumping of waste materials.

### **Highways**

Trucks are the most common way of transporting hazardous materials, accounting for more than 90 percent of all hazardous materials shipments nationwide according to the U.S. Department of Transportation. Various fuels are the most common cargo that is classified as hazardous. Every roadway in Wisconsin is a potential route for hazardous material transport. IH 41 spans Washington County and runs between the densely populated Milwaukee-Chicago corridor and Green Bay. USH 45 runs through central Washington County. Large tankers conducting inter- and intra-state transportation of hazardous materials and substances use these highways extensively.

### **Rail**

There are two railroad companies that operate in Washington County, as shown on Map 10 in Chapter II. Rail is used for the transport of hazardous materials because of large-load capabilities. Mainline rail transport routes pass through the County. In addition, there is a spur line to the southern boundary of the City of West Bend.

It should be noted that the shipment of crude oil by rail has increased as domestic oil production has increased. The typical train carrying crude oil is over a mile long and consists of 100 or more cars. Each of these cars typically carries 30,000 gallons of crude oil. Much of the increased domestic crude oil production consists of Bakken crude oil. This oil comes from a rock formation located in the States of North Dakota and Montana and the Canadian Provinces of Manitoba and Saskatchewan. Derailments and incidents involving trains carrying crude oil may pose challenges for responding organizations. Such an incident could potentially involve the release and/or ignition of thousands of gallons crude oil. Responses to crude oil incidents may require specialized outside resources that will take time to arrive to the site of the incident. This could be especially the case because crude oil is not a uniform substance and its physical and chemical properties can vary based upon where it was produced. Crude oil often

contains flammable gasses, whose presence can reduce the effectiveness of traditional firefighting techniques. On May 1, 2015, the U.S. Department of Transportation issued rules related to enhanced tank car standards and operational controls for high-hazard flammable trains.<sup>64</sup> Key provisions include enhanced braking systems for trains considered high-hazard flammable trains (HHFT), enhanced design standards for new tank cars, retrofitting of existing tank cars, and operating speeds of HHFTs being limited to 50 mph in most areas and 40 mph in high-threat urban areas.

### ***Transportation-Related Hazardous Material Incidents in Wisconsin***

An incident involving any one of the above modes of hazardous material transport could result in a local emergency, with the potential to affect large numbers of people. The potential effects include health hazards to those exposed to the hazardous materials, explosions, major fires, and environmental contamination. An incident may necessitate short- or long-term evacuation that would disrupt the affected area. Accidents on major transport arteries can disrupt or stop traffic for extended periods of time. In the State of Wisconsin there were 10,632 transportation-related hazardous material incidents reported over the period 1971 through 2014.<sup>65</sup> These resulted in 11 deaths and 308 injuries. In about 75 percent of these incidents, there was no damage to property. Property damages in those incidents that had damages ranged up to about \$6.8 million (2014 dollars). The total damages reported as resulting from these incidents were about \$61.6 million and the average amount of reported damages per incident was about \$5,800 (2014 dollars).

### **Description of Recent Hazardous Materials Incident Events**

Between 2010 and 2014, Washington County averaged about 16 hazardous material spills or releases per year, almost all of which were minor. The majority of these incidents involved vehicle fluids such as gasoline, diesel fuel, antifreeze, hydraulic fluid or other petrochemical substances. Other releases have included mineral oils, paints, solvents, propane or natural gas, and industrial process and wastewater. A complete file on all reported spills is maintained by the Washington County Office of Emergency Management.

Over the period 1971 through 2014, 37 transportation-related hazardous materials incidents were reported in Washington County.<sup>66</sup> All were relatively minor. All of these incidents were related to roadway transportation except for two incidents related to rail transportation and a single incident involving air transportation. The majority of these incidents involved corrosive materials such as hydrochloric, phosphoric, or sulfuric acid; potassium or sodium hydroxide solutions; or cleaning compounds or flammable or combustible liquids such as fuel oil, gasoline, paint or paint thinner, isopropyl alcohol, or resin solutions. Other incidents involved a variety of other materials including, flammable gases, oxidizing agents, organic peroxides, or other hazardous substances. Hazardous materials were released in 26 incidents and all of the reported incidents involved liquids. The amounts of material released in these 37 events ranged between a few ounces and 550 gallons, with an average volume released of about 29 gallons. These hazardous material incidents resulted in no deaths and a total of two injuries. These two injuries occurred as a result of two separate incidents in 2001 that involved corrosive materials. Neither injury required hospitalization. Property damage was reported for nine incidents, with the total damages reported being about \$51,812 in 2014 dollars.

A total of 10 pipeline incidents were recorded in Washington County during a 46-year period between the years 1969 through 2014. These events are documented in terms of their magnitude and impact in Table 46,

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<sup>64</sup> 49 Code of Federal Regulations, *Parts 171, 172, 173, 174, and 179*.

<sup>65</sup> *U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration Incident Report Database, accessed on December 8, 2015.*

<sup>66</sup> *Ibid.*

**Table 46**

**PIPELINE TRANSMISSION AND DISTRIBUTION ACCIDENTS IN WASHINGTON COUNTY: 1969-2014**

Date	Municipality	Accident Type	Fatalities	Injuries	Property Damage <sup>a</sup>
June 27, 1969	Village of Germantown	Hazardous Liquid	0	0	\$ 33,382
July 18, 1970	Village of Germantown	Hazardous Liquid	0	0	1,068
December 28, 1970	-- <sup>b</sup>	Hazardous Liquid	0	0	1,068
December 21, 1978	-- <sup>b</sup>	Natural Gas Distribution	0	1	1,815
May 24, 1979	-- <sup>b</sup>	Natural Gas Transmission	0	0	42,390
August 15, 1979	-- <sup>b</sup>	Hazardous Liquid	0	0	326
July 29, 1980	City of Hartford	Natural Gas Distribution	0	2	718
January 23, 1999	Village of Germantown	Hazardous Liquid	0	0	568,400
October 11, 2004	Village of Richfield	Natural Gas Distribution	0	0	82,711
July 17, 2012	Town of Jackson	Hazardous Liquid	0	0	23,945,759
Total	--	--	0	3	\$24,678,637

<sup>a</sup>Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.

<sup>b</sup>Municipality was not identified in U.S. DOT database.

Source: U.S. Department of Transportation Office of Pipeline Safety and SEWRPC.

based upon data published by the Federal Department of Transportation, Office of Pipeline Safety. Six of these pipeline incidents involved spills from pipelines transporting hazardous liquids. The other four involved natural gas transmission or distribution pipelines. In total, these pipeline incidences have resulted in three injuries and about \$24.7 million in property damages within Washington County (2014 dollars). Most of these damages are related to the July 2012 event in the Town of Jackson which was described previously in the discussion of contamination and loss of water supply. These data indicate that hazardous material incidents are relatively rare and have a relatively low risk in terms of loss of human life or injury, but can cause considerable property damage.

**Vulnerability, Community Impacts, and Multi-Jurisdictional Assessment**

Based on the historical record, Washington County can expect to experience an average of 17 hazardous material incidents per year. It would be expected that 16 of these would be spills or releases from fixed facilities. In an average year, about 0.8 transportation-related incidents and about 0.2 pipeline-related incidents would be expected to occur. On average, it would be expected that transportation-related and pipeline-related incidents would cause about \$538,000 in property damages per year; however, most of the property damages that this estimate is based on were caused by a single event. Because of this it is likely that the amount of property damages caused by most incidents would be considerably lower than this.

There are several factors that should be considered when attempting to identify the scope, magnitude and vulnerability in terms of hazardous materials incidents within specific areas of Washington County. One factor is the density of traffic and development. Certain pipeline sections and certain major highways, rail lines, or pipelines may handle more hazardous material traffic than others. Natural gas and petroleum pipelines are located mostly in eastern, south-central, and west-central portions of the County (see Map 14 in Chapter II). Major transportation routes run through southeastern, central, and northwestern portions of the County (see Maps 9 and 10 in Chapter II). Therefore, most of the County is vulnerable to incidents due to the presence of major highways, rail lines, and pipelines. The condition of the transport routes and seasonal weather effects should also be considered, as well as predominant wind patterns within the County. Developing communication between planning agencies and storage site and transportation system owner/operators can be beneficial in determining the possible risks associated with transporting hazardous materials into or through a particular community.

In 2011, Washington County examined the flow of hazardous materials through the County via several elements of the County's transportation network, including highways and railways.<sup>67</sup> As part of this study, random observations of traffic were conducted on highways at 10 locations and railroads at two locations in the County during late June and early July 2011. These observations noted the information displayed on the required hazardous material placards shown on vehicles carrying hazardous material cargo.

The study found that the number of vehicles displaying placards while traveling along the highway that passed these sites ranged between 0 vehicles per hour and 36.0 vehicles per hour, with an average of 6.1 vehicles per hour. Average numbers of vehicles per hour displaying placards varied among highway sites, ranging between 0.0 vehicles per hour and 14.5 vehicles per hour. Vehicles transporting hazardous materials were observed more frequently on USH-41<sup>68</sup> than on USH-45 or State trunk highways. Average numbers of vehicles observed transporting hazardous materials on USH-41, USH 45, and State trunk highways were 12.39 vehicles per hour, 3.2 vehicles per hour, and 1.9 vehicles per hour, respectively. The study also found that the number of railroad cars displaying placards while passing railroad crossings in the County ranged between 0 cars per hour and 16.0 cars per hour, with an average of 4.5 cars per hour.

The placards indicating eight out of nine general categories of hazardous materials were observed on vehicles traveling on highways in Washington County. No placards indicating the presence of radioactive materials were observed. Flammable liquids, corrosive substances, and compressed gases accounted for 53 percent, 20 percent, and 18 percent, respectively, of the general categories shown on the placards that were observed. Specific placards for 54 different substances were observed. About 44 percent of vehicles carrying placards that specifically identified a substance were carrying gasoline. Six other substances were observed being carried by 3 percent or more of vehicles with placards identifying specific substances: sodium hydroxide solution, liquids held at elevated temperatures, alcohols, liquefied petroleum gas, refrigerated liquefied carbon dioxide gas, and refrigerated liquefied nitrogen gas. The majority of vehicles displaying hazardous material placards while travelling along highways in the County consisted of tanker and semi-trailer trucks. About 94 percent of the railroad cars displaying placards were tanker cars.

The study also examined the types and quantities of extremely hazardous and hazardous substances present at fixed facilities in the County. This was done by examining a random sample of 31 emergency response contingency plans from fixed facilities that are on file with the County. The substances present at these facilities in the largest quantities were sulfuric acid, anhydrous ammonia, aluminum sulfide, nitric acid, and phosphoric acid. Four substances were reported as being present at more than one facility: sulfuric acid, anhydrous ammonia, nitric acid, and chlorine.

The Canadian National Railroad provided the Washington County Emergency Management Office with a list of dangerous goods which it transported through the Village of Slinger for the year 2013. This list included 50 hazardous substances. Materials in seven out of nine general categories of hazardous substances were represented on the list. In addition, the list included substances classified as "combustible liquids," which are not included among the nine general categories. The list did not include any explosive or radioactive substances. Based upon "dangerous goods units" given on the list, the majority of hazardous materials shipped along the Canadian National Railroad through Washington County in 2013 consisted of flammable liquids, combustible liquids, flammable solids, and corrosive substances."

### **Potential Future Changes in Hazardous Materials Incident Conditions**

Although significant hazardous materials incidents are not expected to change in the future, changes in land use can have an influence on the potential magnitude of any particular hazardous materials incidents that occur. Such changes relate to the potential future increase in development within the County. Changing land use patterns within Washington County, as documented in Chapter II of this report, indicate a small potential increased risk of exposure to hazardous materials incidents, damage, and related losses in the expanding urbanized areas within the County.

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<sup>67</sup> *Washington County Local Emergency Planning Committee, "Hazardous Material Commodity Flow Study," August 2011.*

<sup>68</sup> *Since the study was conducted, this highway has been redesignated IH-41.*

## VULNERABILITY ASSESSMENT FOR TERRORISM

Terrorism can be defined as acts that are violent or dangerous to human life that violate Federal or state law and that appear intended to intimidate or coerce a civilian population; influence the policy of a government by intimidation or coercion; or affect the conduct of a government by mass destruction, assassination, or kidnapping.<sup>69</sup> The Federal Bureau of Investigation categorizes two types of terrorism in the United States: domestic terrorism that involves groups or individuals whose activities are directed at elements of our government or population without foreign direction; and international terrorism that involves groups or individuals who are foreign based and/or directed by countries or groups outside the United States, or whose activities transcend national boundaries. Additionally, some acts conducted by gangs, people involved in civil unrest, radical splinter groups or activists, and people involved in illegal drug trade could also be described as terrorism.

An act of terrorism can take several forms, depending on the technological means available to the terrorist, the nature of the political issue motivating the act, and the points of weakness of the terrorism target. Based on guidelines provided by the U.S. Department of Homeland Security, terrorism refers to the use of weapons of mass destruction (WMD), including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous material releases; and “cyber-terrorism.”<sup>70</sup> Several terrorist action possibilities are listed and briefly described below.

### **Terrorist Action Possibilities**

#### ***Incendiary Devices and Arson***

Most terrorist incidents in the United States have involved bombs or incendiary devices, including detonated and undetonated explosive devices, tear gas, pipe and firebombs, and rocket attacks. Often the capacity existed for large-scale damage and/or mass casualties. An example of this would be the bombing of the Alfred P. Murrah Federal Building in Oklahoma City in April 1995. The type of materials and method of delivery utilized in the bombing of the Murrah Federal Building are readily accessible to a potential terrorist. Because of the ready availability of such materials, the potential for mass damage and casualties, and experiences to date in the nation, it is anticipated that the various types of Weapons of Mass Destruction (WMD) and explosive weapons have a high potential for use in the United States.

FEMA defines arson and incendiary attack as the initiation of fire or explosion on or near a target either through direct contact or by remote means. Generally, the extent of damage can be determined by type or quantity of accelerant and the materials present at or near the target. Arson can be further defined as any willful or malicious burning or attempt to burn, with or without intent to defraud, a dwelling, public building, motor vehicle, or other properties. Fires of suspicious or unknown origin are not classified as arson. Nationally, an estimated 19,000 fires were intentionally set in 2014. These arson incidents resulted in 157 civilian deaths and were responsible for \$729 million in property losses in 2014.<sup>71</sup>

#### ***Airline Attack***

After the attacks on the World Trade Center on September 11, 2001, questions were raised regarding the effectiveness of airport and airline security. Since the September 11 attacks, security at airports and onboard airliners has been escalated. Specific changes include the oversight and supervision of passenger and baggage screening by the Transportation Security Administration, access to airplane boarding areas being restricted to passengers, restrictions

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<sup>69</sup> *Title 19 Section 2331 of the United States Code.*

<sup>70</sup> *Federal Emergency Management Agency, State and Local Mitigation Planning How-to Guide, Integrating Manmade Hazards into Mitigation Planning, Version 2.0, September 2003.*

<sup>71</sup> *Hylton J.G. Haynes, Fire Loss in the United States during 2014, National Fire Protection Association, September 2015.*

being set on the articles that can be taken onboard an airliner, deployment of additional Federal air marshals on airliners, and improvements to cockpit security. Despite these efforts, it is possible that incidents may occur. Such incidents could include airplane bombing, sabotage or hijacking, airport bombings or shootings, or the tampering with air navigation and control systems, resulting in plane crashes or collisions.

### ***Weapons of Mass Destruction: Chemical/Biological/Nuclear/Radiological Attack***

Terrorists can use chemical and biological agents or weapons to either extort or deliberately try to kill in order to further political goals. Toxins or even some radiological materials, such as water-soluble plutonium chloride, could become a credible threat to municipal water supplies. An example of this would be the gas attack on the Tokyo subway system that occurred in March 1995.

### ***Hostage Taking***

The taking of hostages can provide terrorist groups publicity for their political or social objectives, allow negotiation for furtherance of their aims or result in events that are designed to invoke sympathy for their causes. The main goal of response agencies is to end the incident, with the absolute minimum loss of innocent lives. The common belief that most response agencies are willing to agree to any demand to prevent endangering the safety of the hostages is not a true statement in all cases.

### ***Infrastructure Attack***

An individual or group of terrorists could coordinate an attack against utilities and other public services such as the water supply, electric power generation and transmission, or telephone service. Another form of infrastructure attack is against computer resources such as networks, databanks, and software by infiltrating computer networks and altering, stealing, or destroying programs and data. As society becomes more dependent on computers, this form of cyber-terrorism is a legitimate concern.

### ***Response to Terrorism Incidents***

The emergency management community in the United States must accept that national security and intelligence organizations may not always be successful in preventing terrorist incidents. It is up to State and local emergency management personnel and services to respond should these attacks occur. The ramifications of responding to a terrorist incident may not be the same as traditional large-scale emergencies. The safety of emergency service providers must be an early, primary consideration. The media will take an active interest in this type of incident. The public has high expectations for emergency managers and service providers in a terrorist situation and extraordinary efforts are demanded. Federal and State government agencies depend directly on local managers and emergency response personnel and their initial and follow-on actions during any terrorist incident.

### ***Historical Terrorism Problems***

There are no reports of historical terrorism incidents occurring in Washington County. Several historical incidents occurred in the State of Wisconsin.

One of the deadliest cases of domestic terrorism in the State occurred in the City of Milwaukee on November 24, 1917. A bomb suspected of having been planted by anarchists was discovered by children and brought to a police station in the Third Ward. It detonated in the police station, killing nine police officers.

A global database of terrorism incidents lists 25 incidents that occurred in the State of Wisconsin during the period 1970 through 1989.<sup>72</sup> Several of these occurred during the early 1970s and were related to protests against the Vietnam War.

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<sup>72</sup> National Consortium for the Study of Terrorism, *Global Terrorism Database*, <http://www.start.umd.edu/gtd>, accessed January 20, 2016.

In 1970, there was a series of five pipe bombings and fire bombings in the City of Milwaukee that were attributed to suspected leftist revolutionaries. Targets included two industrial research laboratories, a building containing Federal offices, a military reserve headquarters, and a fuel line at a petroleum terminal in the Milwaukee Harbor. While some of these incidents caused property damage, there were no fatalities or injuries reported.

On August 24, 1970, a stolen van containing 2,000 pounds of explosives detonated on the campus of the University of Wisconsin in Madison. This bomb was placed by an anti-war group known as the New Year's Gang and targeted the campus' Army Mathematics Research Center in Sterling Hall. A postdoctoral researcher was killed in the blast. In addition, three persons were injured. The explosion caused extensive damage to Sterling Hall and damaged 26 other buildings on the campus. The estimated damages to the University exceeded \$12.8 million (2014 dollars).

### **Description of Recent Terrorism Events**

There are no reports of recent terrorism incidents occurring in Washington County. A global database of terrorism incidents lists 12 incidents that occurred in the State of Wisconsin since 1989.<sup>73</sup>

On July 19, 2000, a former Air National Guard pilot broke into the 128th Air Refueling Wind airbase at General Mitchell International Airport in Milwaukee, placing a bomb, as well as scrawling graffiti calling for an end to U.S. intervention in Kosovo. The bomb failed to explode and the perpetrator was arrested. No injuries or fatalities occurred as a result of this incident and only minor property damage was reported.

Since 2000 three terrorism incidents have been documented in Kenosha County. Kenosha County experienced a terrorist incident involving an anthrax threat in September 2000. The substance involved was not anthrax and did not pose an actual threat. In May 2003, the City of Kenosha Clerk's office and the Kenosha Area Chamber of Commerce received letters with green powder postmarked from Brazil stating that people were now exposed to anthrax. The substance was sent to a State lab for testing, where it turned out to be negative for anthrax.

On April 1, 2012, an assailant set fire to a Planned Parenthood clinic in the Town of Grand Chute in Outagamie County. There were no casualties. The clinic suffered minor damage to an examination room.

On August 5, 2012, a member of a white supremacist group attacked a Sikh temple in the City of Oak Creek. The assailant killed six persons and wounded four others before being shot by a responding police officer. The assailant subsequently died from a self-inflicted gunshot wound.

### **Vulnerability, Community Impacts, and Multi-Jurisdictional Assessment**

The groups that have conducted terrorism, the issues that they are concerned with, and their objectives are widely varied. The groups and individuals responsible for or participating in terrorist incidents in Wisconsin between 1970 and 2014 have cited a variety of issues for their actions including antiwar activism, extreme left wing revolutionary activities, extreme right wing revolutionary activities, antiabortion activities, animal rights, and white supremacist activities. Because the objectives of these groups and individuals are so widely varied, there are numerous potential targets of terrorist action. Any public facility, utility, element of infrastructure, or gathering place could be a potential target for terrorist activity. In addition, certain types of businesses and governmental institutions may be more prone to terrorist activities due to the specific nature of their business or size. For example, businesses such as banks, financial institutions, health care facilities, or businesses engaged in controversial activities are likely to be at risk. In addition, local, State and Federal government facilities; public schools; and colleges and universities are also potential terrorist targets.

As previously indicated, no terrorism incidents have occurred in Washington County. Over a 45-year period, 37 incidents have been documented in the State of Wisconsin. While the probability that the County will experience

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<sup>73</sup> Ibid.



a terrorism incident and the frequency at which such incidents are likely to occur in the County are unknown, they are assumed to be very low.

A review of the community assets described in Chapter II indicates a limited potential for terrorism-related impacts to:

1. A variety of residential, commercial, and other developed land uses;
2. The roadway and other transportation systems;
3. Utility infrastructure;
4. Critical community facilities; and
5. Historic sites in the vicinity of the incident.

It is safe to assume that any type of facility on which a terrorist attack could generate desired publicity or further terrorism objectives could be classified as a potential target for terrorist activity, including large-scale public events. Based on past events, the probability of a terrorist attack occurring in Washington County is negligible.

In 2015, the total equalized assessed property value in Washington County was estimated at almost \$13.4 billion. About \$9.3 billion of this total is comprised of buildings and other improvement and almost \$207 million is comprised of manufacturing or non-manufacturing personal property. Due to the unpredictability and lack of precedent concerning terrorism events in Washington County, all buildings, infrastructure, and critical facilities within the County are considered at risk.

## **VULNERABILITY ASSESSMENT FOR CYBERATTACK ON LOCAL GOVERNMENT**

Local government uses information technology and computer networks in many of its operations and activities. While there are differences among units of local government in the functions they perform with these technologies, typical functions performed include accounting, distributing and receiving payments, budgeting, planning and engineering, correspondence, record keeping, materials management, mapping, communicating with residents, monitoring and controlling utility systems and other infrastructure, and training staff. Because of the pervasive use of these technologies, the operations of local governments depend upon having information technology systems that are reliable and secure.

The threat of cyberattack is an emerging threat to the security and reliability of local government information systems. A cyberattack on a local government is a disruption of its information system. In information technology systems, computers are connected to one another through networks, including the internet. This places them at risk of cyberattack. The nature of such an attack may vary. In some instances, an attack may be deliberate effort to gain access to a local government's systems or processes. In other instances, an attack may be the result of a randomly initiated threat, such as a computer virus or an electronic mail phishing attempt. Unlike physical threats that are often readily apparent and prompt immediate action, cyberattacks can be difficult to identify and recover from.

### **Cyberattack Action Possibilities**

Cyberattacks can take several forms, depending on the motives of the attacker, the technological means available to the attacker, and the weakness of the information system that is attacked. The forms that a cyberattack on a local government could take include:

- Disabling an information system—Disruption of information structures to crash or disable a system or otherwise make it unavailable. Examples of this include denial of service attacks, email bombing, and spamming;

- Information theft—Penetration of a system in order to steal information or sensitive data. Examples of this include password cracking and packet sniffing;<sup>74</sup>
- Modifying system output—Penetration of a system to embed code, such as Trojan horses or logic bombs, to perform unauthorized functions at a later time;
- Modifying system data—Penetration of a system to alter data stored within the system. Examples of this include defacing of websites and ransomware software which encrypts files or data to make it inaccessible; and
- Taking control of a system—Transfer of control of all or part of an information system from the intended operator or user either to an automated function, such as inclusion in a botnet,<sup>75</sup> or an unauthorized user.

There are at least four major means through which a cyberattack could be effected. It should be noted that these means are not mutually exclusive and some attacks could involve two or more of these techniques. These major means an attacker could use to execute a cyberattack include:

- Hacking—Examples of which include gaining unauthorized access to a computer system via the use of stolen user names and passwords, exploitation of backdoors in software, and brute force attacks to discover passwords;
- Malware—Programs such as viruses, worms, and Trojans are installed in a computer system via means such as email links or attachments, websites, software upgrades, or portable data storage media. These malware programs can perform a variety of actions, including inserting backdoors allowing access into the system, disabling security controls, or capturing data and/or sending it to an external site;
- Social engineering—Using email, telephone, internet, or in-person presence to gain sensitive information through posing as a trusted individual, solicitation, bribery, or extortion; and
- Physical theft or loss of information technology assets such as computers, storage media and devices, and documents.

A recent analysis of cyberattack incidents involving data breaches found that about 95 percent of the incidents that were reported during the period 2011-2013 fell into nine broad categories:<sup>76</sup>

1. Point of sale intrusions in which remote attacks are made against retail environments in which purchases are made with credit or debit cards,
2. Web application attacks in which the application acts as vector of the attack either by exploiting a weakness in the application or using stolen authentication credentials to impersonate a valid user,
3. Unapproved use or misuse of organizational information technology resources by authorized users, usually for personal or financial gain,
4. Loss or theft of an information asset either through misplacement or malice,

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<sup>74</sup> *A packet sniffer is a computer program that can intercept and log traffic that passes over a computer network.*

<sup>75</sup> *A botnet is a group of computers connected to the internet which have been set up to forward transmissions, such as spam or viruses, to other computers on the internet. Usually, the owners of the affected computers are unaware of the fact that their computers are doing this.*

<sup>76</sup> *Verizon, 2014 Data Breach Investigations Report, 2015.*

5. Unintentional actions which directly compromise the security of an information asset,
6. Payment card skimmers implanted on a card reader such as an automatic teller machine that reads data from the card,
7. Cyber-espionage,
8. Denial of service attacks intended to compromise the availability of a site, system, or network, and
9. Miscellaneous malware not fitting the previous patterns that is intended to gain control of a system for illicit uses.

It is likely that local governments are more vulnerable to some of these types of attacks than others. The 2011-2013 national analysis indicated that public sector entities tend to be most affected by unapproved use or misuse of resources by authorized users, loss or theft of information assets, unintentional actions that compromise security, denial of service attacks, and miscellaneous malware. In addition, utilities operated by local governments may also be vulnerable to web application attacks. The analysis also noted that public agencies were highly affected by cyber-espionage; however, it did not indicate how much of this activity was directed at units of government other than the Federal government.

### **Description of Recent Cyberattack Events**

Review of planning documents, news reports, and other sources turned up no recent, major cyberattack incidents on local governments in Washington County; however, there have been several recent incidents involving local governments elsewhere in Wisconsin.

In 2009, hackers used malicious keylogging software to track keystrokes on a City of Glenwood City computer. This allowed them to gain access to the City's bank account information. Action taken by the City's bank prevented theft from the account.

In January 2010, a computer belonging to Eau Claire County was compromised through infection with a computer virus. This virus allowed hackers to acquire the credentials necessary to attempt to transfer about \$800,000 from County accounts. The attempt was thwarted when the County's bank contacted the County Treasurer's office regarding suspicious wire transfers.

The City of Eau Claire's website was hacked and temporarily unavailable on April 5, 2012. This attack defaced the website. No other computer systems were impacted.

On or about November 21, 2012, hackers accessed and rerouted direct deposit files from the payroll system of the Stanley-Boyd School District, stealing about \$150,000. It appeared that the hackers managed to reroute the money en route between the school district's account and employee bank accounts. Investigators concluded that no other school district data were compromised.

In 2014, the Forest County Sheriff's Department's computer systems were affected by the CryptoLocker trojan. This is a ransomware virus that makes data stored within a computer system inaccessible. As a result of this attack, the Department lost about one month of data from its file server, including documents, pictures, and other files. In addition, one departmental database had to be rebuilt.

On March 9, 2015, a cyberattack was launched against City of Madison and Dane County computer systems. The attack affected several systems, including the City's website and email system, and internet-based connections to city government, including mobile data public safety computers used by law enforcement, fire, and emergency medical agencies. The attack affected several other City and County websites with varying levels of intensity, blocking legitimate Internet traffic to and from the governmental agencies.

## **Vulnerability and Community Impacts Assessment**

During the planning process, no data source was identified that could provide a historical or current information regarding incidents of cyberattack upon local governments in Washington County, the losses caused by such attacks, and the impacts of these attacks upon local government operations. Because of this, data are not available to directly estimate the level of risk to cyberattack that local governments in the County currently face. It may be possible, however, to get a sense of the risks from other available data related to cyberattack and computer crime.

Reports from local government information technology managers suggest that a large number of attack attempts are made on a daily basis. For example, Brown County's chief information officer indicated that the County's systems experience between 8,000 and 20,000 attack attempts per day.<sup>77</sup> Other data suggest that most of these attempts are probably unsuccessful. For example, a recent national study surveyed 402 information system and information system practitioners in state and local government who are familiar with their organizations ability to defend against cyberattacks and have responsibility in directing cybersecurity activities.<sup>78</sup> About 80 percent of the respondents reported that their organization had experienced at least one material security breach over the previous 24 months. The average number of such incidents reported was 9.4 incidents over the 24-month period surveyed. This indicates an average rate of 4.7 such incidents per year or about one incident every 11-12 weeks.

The difference between the two estimates given in the last paragraph is large. When expressed as an annual number of incidents, the estimates differ by a factor of about one million. The likely explanation for the difference between the high number of reported attack attempts and the much lower number of reported security breaches is that a substantial portion of the attack attempts are detected and/or thwarted by the information technology security measures that local governments have in place. Still, the difference between the two estimates indicate that there is considerable uncertainty in the level of risk that cyberattack poses to local governments that take normal information technology security precautions.

Other data related to internet-based crime suggest that the level risk of a local government experiencing a cyberattack that would result serious consequences may be near the lower end of the range. Through the Internet Crime Complaint Center (IC3), the U.S. Federal Bureau of Investigation and the National White Collar Crime Center collect and disseminate statistics on complaints of internet-based crimes.<sup>79</sup> During the period 2008-2014, the annual number of internet-based crimes reported to IC3 from the State of Wisconsin varied between about 2,500 and 4,100, with an average of 3,394 complaints per year. When this average is prorated based on the fraction of the State's population that lives in Washington County,<sup>80</sup> it suggests that, on average, residents of Washington County

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<sup>77</sup> *WBAY-TV. "Brown County Unsuccessfully Cyber-Attacked Thousands of Times a Day," April 23, 2015, <http://wbay.com/2015/04/23/brown-county-unsuccessfully-cyber-attacked-thousands-of-times-a-day/>, accessed February 22, 2015.*

<sup>78</sup> *Ponemon Institute. LLC, State of Cybersecurity in Local, State & Federal Government, October 2015.*

<sup>79</sup> *U.S. Federal Bureau of Investigation and National White Collar Crime Center, 2014 Internet Crime Report, 2015; U.S. Federal Bureau of Investigation and National White Collar Crime Center, 2013 Internet Crime Report, 2014; U.S. Federal Bureau of Investigation and National White Collar Crime Center, 2012 Internet Crime Report, 2013; U.S. Federal Bureau of Investigation and National White Collar Crime Center, 2011 Internet Crime Report, 2012; U.S. Federal Bureau of Investigation and National White Collar Crime Center, 2010 Internet Crime Report, 2011; U.S. Federal Bureau of Investigation and National White Collar Crime Center, 2009 Internet Crime Report, 2010; and U.S. Federal Bureau of Investigation and National White Collar Crime Center, 2008 Internet Crime Report, 2009.*

<sup>80</sup> *Based on the 2010 census, Washington County's population was 131,887 and the State's population was 5,686,986. Dividing through gives a proration factor of 0.0232.*

are victims of about 79 internet-based crimes per year. If these data reflect the general level of cyber-threat, it would suggest that local governments in Washington County would each expect to experience a few to a few dozen serious threats of security breach per year. Given that the National White Collar Crime Center was able to document only 629 instances of data breaches over a 10-year period in which a state, county, or municipal government was the victim,<sup>81</sup> even this estimate might be on the high end.

Depending on the specific nature of the incident, a cyberattack on a local government could have a variety of impacts. The potential severity of these impacts range from relatively trivial to disastrous. A cyberattack could potentially disrupt a local government's operations and communications which could have a number of impacts. An attack could interfere with or disrupt monitoring and control of infrastructure such as sewer collection and treatment systems, municipal water systems, and traffic control systems, reducing their effectiveness or causing damage to infrastructure elements. For example, disturbance or disruption of traffic signals due to a cyberattack could result in confusion and traffic congestion, potentially causing traffic accidents. Disruption by a cyberattack could interfere with or prevent the performance of critical government functions, including the collection of taxes, the maintaining of tax records, and billing for services. Disruption of communications by a cyberattack could adversely impact the provision of emergency services.

Cyberattacks that result in data breaches could be problematic for local governments due to the potential release of confidential information. For example, a data breach could expose taxpayers, residents, employees, and contractors to risks of identity theft. The impacts of a data breach affecting a local law enforcement agency could be particularly severe because law enforcement agencies have access to databases and information that most other entities lack. Breach of a law enforcement agency's information technology system could compromise sensitive information related to topics such as confidential informants, witnesses in criminal prosecutions, victims of sex crimes, child abuse cases, domestic abuse cases, and legally protected information related to juvenile offenses. Such a breach could potentially compromise the administration of justice or pose a threat to the safety of crime victims, witnesses, informants, or undercover officers.

It should be noted that responding to and recovering from a cyberattack is likely to be expensive for a local government. It has been estimated that the average amount of time required to investigate a cybersecurity breach, restore service, and verify the resolution is about one month.<sup>82</sup> This could be costly for a municipal government relying on a compromised information technology system to handle even a moderate amount of routine business. For example, costs attendant to a data breach include information technology personnel to work to determine the source of the attack, determine the extent to which sensitive information was compromised, recover lost information, and plug holes; clerical personnel and other staff to make appropriate notifications, assist residents in navigating the damaged system, and perform critical services until the information technology system is back online; and investigation and prosecution of the instigators of the attack. It should also be noted that in the event of data breaches that cause the exposure of customers' personally identifiable information, private sector entities generally follow a protocol that includes providing potential victims with some level of identity theft protection, such as credit monitoring services. Taking this sort of action could greatly increase the costs of responding to a data breach. Nationally the average costs per record compromised related to data breaches for public and private sector entities have recently been estimated at \$73 and \$217, respectively.<sup>83</sup> Much of the difference between public and private sector costs are related to providing potential victims with identity theft protection.

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<sup>81</sup> *National White Collar Crime Center, Cyber Intrusions and Data Breaches (2015), 2015.*

<sup>82</sup> *Ponemon Institute, LLC, Cybersecurity Incident Response: Are We As Prepared As We Think? January 2014.*

<sup>83</sup> *Ponemon Institute, LLC, 2015 Cost of Data Breach Study: United States, May 2015.*

## **Multi-Jurisdictional Cyberattack Risk Management**

All of the communities in Washington County make use of information technology. All have websites and all perform a variety of functions using computers. Thus, there are no specific municipalities that have unusual risks. Rather, the potential of a cyberattack is considered to be a countywide concern.

## **VULNERABILITY ASSESSMENT FOR ELECTRICAL SYSTEM OUTAGES**

Electrical system outages are primarily caused by lightning and other weather-related hazard events, and, to a lesser extent, by equipment problems, fallen trees, animal contact, and human error.<sup>84</sup> Hence, this category was also considered to be a significant potential component of and, therefore, incorporated as part of the appropriate natural and human-induced hazards as potential utility damages among the hazard categories previously analyzed. In addition, because of the importance of this type of incident to the Washington County Hazard Mitigation Plan Local Planning Team, this section of the report specifically analyzes vulnerability to power outages. Power outages in this context are those that last for some extended period of time. Momentary outages generally are a sign that the power supply system is working. Brief outages occur when the system detects a problem that affects the flow of electricity on a power line. The brief automatic interruption is designed to prevent hazards and equipment damage. In most cases, power is restored within a few seconds.

### **Description of Power Outage Events**

Power outages in Washington County occur periodically and are usually the most widespread when caused by weather-related events. A recent severe event occurred on June 30, 2014. A major thunderstorm raced across southern Wisconsin causing straight line wind damage in many areas. Numerous trees were uprooted and tree debris knocked down several power-lines. The power lines were also impacted by lightning. We Energies reported a total power outage to about 110,000 homes in southern Wisconsin. Another major outage occurred on July 22, 2001, when severe thunderstorms passed through southeastern Wisconsin. This storm toppled trees and power lines. About 11,200 utility customers in southern Washington and Ozaukee Counties lost power due to this storm.

Most recent power outage events affecting Washington County are short term, lasting from a few hours to, at most, a few days. Long-term events can happen. Two examples from outside Wisconsin illustrate this. In January 1998, the Montreal, Canada area experienced a major ice storm. The power outages resulting from this storm impacted over four million residents. Portions of the Montreal area were without power for over three weeks. Similarly, an ice storm hit the State of Kentucky in January 2009. At the peak of the storm, about 700,000 customers were without power. Two weeks after the storm, 50,000 customers were still without power. It took 38 days to restore power to all of the affected customers.

### **Vulnerability and Community Impacts Assessment**

While likely to be rare, the impacts of a long-term power outage affecting Washington County could be large. Such an event would likely involve many downed trees and power lines. Downed power lines can present safety hazards for residents, travelers, and emergency responders. The response to such an event would be hampered by roads blocked by power lines and debris.

Given experiences like the Montreal and Kentucky events and the 1976 Washington County ice storm described in the section on winter storms, it is possible that a significant portion of Washington County's population and facilities could be without power for one to three weeks, should a particularly severe event occur. Following the 2009 Kentucky ice storm, about 37 percent of affected customers were without power one week after the storm. About

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<sup>84</sup> *Federal Emergency Management Agency, State and Local Mitigation Planning How-to Guide, "Understanding Your Risks, Identifying Hazards and Estimating Losses," Publication No. FEMA 386-2, August 2001. See also Federal Emergency Management Agency, State and Local Plan Interim Criteria Under the Disaster Mitigation Act of 2000, July 11, 2002.*

7 percent were still without power after two weeks. The Kentucky event resulted in 36 fatalities. The largest cause of death related to this event was carbon monoxide poisoning resulting from improper generator use. Given that the average high and low temperatures in Washington County during the winter are considerably colder than those in Kentucky,<sup>85</sup> the impacts on human life of an ice storm causing a power outage of similar severity in Washington County may be even greater.

A review of the community assets described in Chapter II indicates the potential for significant, yet short-term, power outage impacts to a variety of residential, commercial, and other developed land uses; including critical community facilities. Significant impacts may also be possible to other infrastructure or utility systems. During a power outage, the normal operation of homes, businesses, public buildings, and other critical community facilities may be interrupted.

### **Potential Future Changes in Power Outage Conditions**

Changes in land use can have an impact on the potential for power outage events and related hazards to occur. Such changes relate to the potential future increase in development within the County. As noted above, changing land use patterns within Washington County, as documented in the adopted regional land use plan, the County comprehensive plan, and County land and water resource management plan, and summarized in Chapter II, indicate a continuing level of moderate risk of power outages in the County. Because of the actions that have been taken by the power companies and individuals, the current vulnerability to power outages may have been decreased somewhat. These ongoing mitigation measures are described further in Chapter V.

### **Multi-Jurisdictional Power Outage Risk Management**

Based upon a review of the historic patterns of power outage events in Washington County, there are no specific municipalities that have unusual risks. Rather, the events are considered to be relatively uniform and of a countywide concern.

## **VULNERABILITY ASSESSMENT FOR COMMUNICABLE DISEASE OUTBREAK**

A communicable disease is an illness caused by a specific infectious agent that results from transmission of that agent from an infected person, animal, or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector, or inanimate environment. Examples of communicable diseases include air-borne diseases such as influenza, measles, and tuberculosis; waterborne diseases such as cholera, dysentery, and poliomyelitis; sexually transmitted diseases such as chlamydia, gonorrhea, and syphilis; and vector-borne diseases such as Lyme disease, Rocky Mountain spotted fever, and West Nile virus. The Washington County Health Department monitors for and investigates disease outbreaks affecting the County's population.<sup>86</sup>

Several terms are used to describe episodes of communicable diseases. A "disease outbreak" describes a limited area of disease occurrence in a community at a particular time. An "epidemic" describe the outbreak and spread of a disease in a community that affects a significant number of people and/or animals over a relatively short period of time. Epidemics may also occur as part of the aftermath of natural disasters, such as floods, or tornadoes, or human-induced hazard events, such as terrorist incidents. A "pandemic" is an epidemic that has spread over a large region, such as a country, a continents, or the world.

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<sup>85</sup> For example, average high temperatures during January are 43°F and 26°F, respectively, in Louisville and West Bend. Average low temperatures during January are 27°F and 11°F, respectively, in Louisville and West Bend.

<sup>86</sup> Effective January 1, 2016, the Washington County Health Department merged with the Ozaukee County Health Department. The new entity serves both Counties.

### Historical Disease Outbreak Problems

The “Spanish” influenza pandemic of 1918-1920 was a world-wide disaster. This virus infected an estimated 500 million persons.<sup>87</sup> Estimates of the total number of deaths caused by this pandemic range between 50 million and 100 million.<sup>88</sup> About 675,000 people in the United States died from this disease outbreak. This strain of influenza was unusual in several ways. Influenza cases caused by this strain had a very rapid onset, and this virus was more virulent than typical influenza strains. In about 20 percent of cases, infection with this strain led to the development of pneumonia. While the fatalities caused by most strains of influenza occur among juvenile, elderly, or weakened patients, this strain predominantly killed healthy young adults. The pandemic struck the United States in three waves. The first wave erupted as a wave of mild influenza during the late spring and early summer of 1918. The second wave struck as severe influenza during fall 1918. The third wave struck during spring 1919. At least 103,000 Wisconsin residents developed “Spanish” influenza during the second wave of the outbreak and it caused about 8,460 deaths in the State. An estimated 32 deaths from this disease occurred in Washington County. Based upon a recommendation from the U.S. Surgeon General, the Wisconsin State Health Officer ordered all public institutions in the State closed. This order included schools, churches, theaters, and other places of amusement and public gathering. Almost every local government in the State put this order into effect.<sup>89</sup>

Two other world-wide influenza pandemics occurred during the twentieth century. The “Asian flu” pandemic of 1957-1958 was responsible for an estimated two million deaths world-wide and an estimated 69,800 deaths in the United States. The “Hong Kong flu” pandemic of 1968-1969 caused an estimated one million deaths world-wide and an estimated 34,000 deaths in the United States.

Poliomyelitis is an infectious viral disease that is caused by the poliovirus. In most people, infection with poliovirus does not produce symptoms; however, in about 0.1 to 0.5 percent of cases infection results in muscle weakness that can cause paralysis. The weakness most often affects the legs, but may involve the muscles of the head and neck or the diaphragm. Poliovirus is transmitted from person to person through infected feces entering the mouth. Small, localized epidemics of paralytic poliomyelitis began to appear in the United States around 1900.<sup>90</sup> Outbreaks reached pandemic levels in the early twentieth century. Major outbreaks occurred in 1916, 1949, and 1952. The 1952 outbreak was the worst one reported in the United States. About 58,000 cases were reported in that year, resulting in 3,145 deaths and 21,269 persons left with mild to disabling paralysis. Beginning in the 1950s, the widespread availability of vaccines for the poliovirus reduced the annual number of cases. Through the use of vaccines, poliomyelitis was eradicated from the Americas by 1994.

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<sup>87</sup> F. Burnet and E. Clark, *Influenza: A Survey of the Last 50 Years in the Light of Modern Work on the Virus of Epidemic Influenza*, Mac Millan, 1942.

<sup>88</sup> Naill P.A.S. Johnson and Juergen Mueller, “Updating the Accounts: Global Mortality of the 1918-1920 ‘Spanish’ Influenza Pandemic,” *Bulletin of the History of Medicine*, Volume 76, Pages 105-115, 2002.

<sup>89</sup> Steven Burg, “Wisconsin and the Great Spanish Flu Epidemic of 1918,” *Wisconsin Magazine of History*, Pages 37-56, Autumn 2000.

<sup>90</sup> Barry Trevelyan, Matthew Smallman-Raynor, and Andrew D. Cliff, “The Spatial Dynamics of Poliomyelitis in the United States; From Epidemic Emergence to Vaccine-Induced Retreat, 1910-1971,” *Annals of the Association of American Geographers*, Volume 95, pages 269-293, 2005.



### **Description of Recent Communicable Disease Outbreaks**

Table 47 lists the annual numbers of cases of reportable communicable diseases in Washington County for the years 2005 through 2013.<sup>91</sup> The annual number of cases reported in the County ranged from a low of about 258 cases in 2006 to high of about 552 in 2012. In 2013, the most recent year for which data were available, about 477 cases were reported. The majority of these diseases were sexually transmitted diseases which comprised about 287 of these reported cases. The data show considerable variation among years in the number of cases reported. Some of this variability reflects changes from year to year in which diseases are considered reportable. This variability also reflects outbreaks of individual diseases that occurred in specific years, such as the 2012 outbreak of pertussis or the 2009 pandemic of H1N1 influenza.<sup>92</sup> Despite this variability, the annual number of cases of reportable communicable diseases in the County appears to be increasing over time. Some of this reflects a marked increase in the numbers of sexually transmitted diseases—especially chlamydia—reported since about 2010.

Table 47 also shows the numbers of children in grades K through 12 that had received all of the appropriate immunizations. While the percentage of children compliant with the recommended immunizations varied from year to year, in most years it exceeded 98 percent. Despite this, in 2013 there were 211 children in the County who were noncompliant and posed a potential health risk in Washington County.

During 2009, there was a world-wide outbreak of a novel strain of type-A influenza. This new virus was designated strain H1N1 and was also known as “the swine flu”. This virus is transmitted through coughing and sneezing by infected individuals. Cases caused by this influenza were first reported in the United States in April 2009. By the end of the month, cases had been confirmed in Milwaukee. The number of reported cases in Wisconsin peaked in mid-June and declined to low levels by mid-July. A second increase occurred in autumn 2009 with the number of reported cases reaching peak values in late October or early November. During 2009, 9,587 cases were reported in the State. The majority of these cases occurred in the Southeastern Wisconsin Region. In addition, 1,317 hospitalizations and 55 deaths in Wisconsin were attributed to the H1N1 virus. About 128 cases were reported in Washington County in 2009 (Table 47).

In 2011 and 2012, the United States experienced an outbreak of pertussis, which is also known as whooping cough. Pertussis is a bacterial disease of the respiratory tract that is transmitted through coughing by infected individuals. The symptoms and impacts are generally most severe in infants and young children. Wisconsin had the highest incidence of pertussis in the nation during this outbreak, with an incidence of 130.7 cases per 100,000 population. The outbreak began in July 2011. From July 1, 2011 through December 31, 2012, 5,322 confirmed cases and 2,132 probable cases were reported in the State. While the highest number of cases occurred in southeastern Wisconsin, the highest incidences were seen in northern portions of the State. During the July 2011 through December 2012 outbreak, about 182 cases were reported in Washington County.

### **Vulnerability and Community Impact Assessment**

The location of disease outbreaks is dictated by the proximity that residents have to infected people or to infected vectors. Residents in rural areas of the County may be at a slightly higher risk to some vector-borne diseases, but ultimately, all County residents will be at some risk to these diseases.

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<sup>91</sup> *Reportable diseases are diseases considered to be of great public health importance. Local, state, and national agencies (for example, county and state health departments or the U.S. Centers for Disease Control and Prevention) require that these diseases be reported when they are diagnosed by doctors or laboratories. The list of reportable diseases are periodically revised, with some diseases being added to the list as new pathogens emerge and others being removed from the list as their incidences decrease.*

<sup>92</sup> *The cases related to the H1N1 influenza outbreak are included in the numbers shown in Table 47 for Influenza A, Novel.*

Table 47

## REPORTED CASES OF SELECTED COMMUNICABLE DISEASES REPORTED IN WASHINGTON COUNTY: 2005-2013

Disease	2005	2006	2007	2008	2009	2010	2011	2012	2013
Communicable Diseases									
Arboviral Illness, West Nile Virus .....	--	--	--	--	--	--	--	<5	--
Babesiosis .....	--	--	--	<5	<5	<5	0	0	0
Blastomycosis .....	--	--	--	28	28	48	<5	<5	<5
Campylobacter Enteritis .....	33	39	41	17	10	38	14	20	36
Cryptosporidiosis .....	--	--	--	--	--	--	--	11	12
Cryptosporosis .....	--	--	--	--	<5	--	--	--	0
<i>E. coli</i> , O157 .....	--	--	--	5	<5	--	--	--	--
<i>E. coli</i> , non-O157 .....	--	--	--	<5	<5	--	--	--	--
<i>E. coli</i> , Shiga Toxin-producing .....	--	--	--	0	0	<5	4	6	8
Ehrlichiosis/Anaplasmosis .....	--	--	--	8	13	9	7	<5	7
Giardiasis .....	2	21	16	0	0	0	0	0	0
<i>Haemophilus influenzae</i> , Invasive .....	--	--	--	0	0	<5	<5	<5	<5
Hepatitis Type A .....	<5	<5	<5	<5	0	<5	0	0	<5
Hepatitis Type Ba .....	<5	<5	8	5	11	8	5	<5	<5
Hepatitis Type NANB/C .....	15	21	26	18	34	31	24	32	25
Histoplasmosis .....	--	--	--	--	--	--	0	--	--
Influenza A, Novel .....	--	--	--	--	128	0	8	17	--
Kawasaki Disease .....	--	--	--	--	0	--	--	--	24
Legionnaire's Disease .....	<5	<5	<5	0	<5	<5	<5	<5	<5
Listeriosis .....	--	<5	<5	0	18	0	--	--	--
Lyme Disease .....	0	<5	<5	8	18	21	16	6	7
Malaria .....	--	--	--	0	--	--	--	--	--
Measles .....	0	0	0	0	0	0	0	0	0
Meningitis, Meningococcal .....	7	<5	<5	<5	0	0	0	0	0
Meningitis, Bacterial .....	0	<5	0	0	<5	0	0	0	<5
Mumps .....	0	18	0	<5	0	0	0	<5	0
Pertussis .....	25	0	11	6	17	9	9	178	25
Salmonellosis .....	17	21	23	17	21	16	18	24	15
Shigellosis .....	7	7	10	5	7	0	<5	<5	0
<i>Streptococcus pneum.</i> , Invasive .....	--	--	--	11	7	13	9	12	8
All Streptococcal Diseases .....	--	--	--	10	11	7	7	12	17
Tuberculosis .....	<5	0	<5	0	<5	--	<5	<5	0
Sexually Transmitted Diseases									
Chlamydia trachomatis .....	103	78	110	138	127	150	137	191	249
Genital Herpes .....	61	32	51	--	--	--	--	--	--
Gonorrhea .....	20	15	22	21	14	23	37	33	37
Syphilis .....	0	0	<5	0	0	0	0	<5	<5
Immunizations (Children in grades K-12) by Compliance									
Compliant .....	22,279	23,192	23,898	23,367	20,045	23,191	23,515	23,109	22,989
Noncompliant .....	1,366	103	68	584	452	464	217	243	211
Percent Compliant .....	94.2	99.6	99.7	97.6	97.8	98.0	99.1	99.0	99.1

<sup>a</sup>Includes all positive HBsAg test results.

Source: Wisconsin Department of Health Services Division of Public Health.

The severity of a communicable disease outbreak can be evaluated from the perspective of the individual who has been infected or from the perspective of how many complications and deaths the disease causes in the population. Several factors can determine the severity of a disease outbreak. For example, the severity of a pandemic influenza outbreak can be influenced by:

- Properties of the virus: The inherent virulence and contagiousness of the virus influences the severity of a pandemic's impact. Pandemics can have a concentrated adverse impact within specific age groups. Concentrated illnesses and deaths in young, economically productive age groups will be more disruptive to societies and economies than when the very young or very old are most severely affected;
- Subsequent waves of virus spread: Cases of illness in a pandemic often occur in waves. These waves may last for six to twelve weeks and recur over a period of a year or longer. For example, the "Spanish" Influenza pandemic occurred in three waves in the United States throughout 1918 and 1919. Virus mutation and the emergence of more virulent strains can influence the severity of subsequent waves;
- Vulnerability of the population: In many communicable disease outbreaks, specific populations are at a greater risk than the general population. Examples of this include people with underlying health conditions or weakened immune systems and the very young or old. Nutritional factors also play a role and may influence the severity of a disease outbreak; and
- Community capacity to respond: The quality of health services available influences the impact of any pandemic. A virus that causes only mild symptoms in communities with strong health systems can be devastating in other communities where health systems are weak. Vaccine shortages and distribution problems can also impact the ability to respond to a disease outbreak.

In general, the frequency of disease outbreaks are hard to predict. This is due in part to the fact that communicable diseases differ from one another in their infectivity, virulence, and mode of transmission. For many diseases, these properties can be related to changes in the disease agent. For example, influenza pandemics have been related to genetic changes in the influenza virus.<sup>93</sup> While seasonal outbreaks of influenza occur annually, influenza pandemics are relatively rare events. A total of four influenza pandemics have occurred in the last 100 years, resulting in a rough average of one influenza pandemic every 25 years. The frequency of other diseases may be different from this. For example, cases of Lyme disease, a vector-borne disease, are detected in Washington County almost every year (Table 47).

The duration of individual disease outbreaks can be similarly difficult to predict. Based on the history of previous influenza pandemics it is likely that a pandemic wave could last for 3 to 4 months, with community outbreaks lasting from 6 to 8 weeks. Vector-borne pathogens, on the other hand, are most prevalent during the spring through fall seasons when disease carrying agents such as mosquitos and ticks are active. Transmission of vector-borne diseases is likely to occur mostly during these seasons.

The specific probability that a communicable disease outbreak will occur in Washington County cannot be predicted, however most health experts agree that future outbreaks and pandemic events are inevitable. It should be noted that Wisconsin, including Washington County, is located within a region of the country that has a high risk for Lyme disease. While the incidence of Lyme disease in the State varies from year to year, the average incidence for the period 2005 through 2014 was 29.9 cases per 100,000 population. This was greater than three times the national average of 8.3 cases per 100,000 population.<sup>94</sup>

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<sup>93</sup> Edwin D. Kilbourne, "Influenza Pandemics of the 20th Century," *Emerging Infectious Diseases, Volume 12*, pages 9-14, 2006.

<sup>94</sup> U.S. Centers for Disease Control and Prevention, "Lyme Disease Incidence Rates by State, 2005-2014," <http://www.cdc.gov/lyme/stats/Tables.html>, accessed January 19, 2016.

The economic impact of a communicable disease outbreak is likely to be dependent upon the particular disease and disease strain. For some diseases, the impacts could be major. A pandemic flu event, for example, could have severe economic repercussions, with significant costs associated with hospitalization and care for those afflicted. Broader economic impacts associated with lost productivity and wages could also be expected. In general, most economic functions would be challenged by the high rate of absenteeism associated with such a pandemic.

While anyone can be affected by a communicable disease outbreak, some individuals may be at greater risk than others. Young persons and the elderly can be more sensitive to or suffer greater impacts from some diseases than other members of the population. In 2010, the total population of Washington County was 131,887 people (Table 3 in Chapter II). In the same year about 26.7 percent of the County's population was between 0 and 19 years of age and about 13.5 percent of the County's population was 65 years of age or older. Thus about 40 percent of the County's population consists of members of these more sensitive age groups. Persons with some chronic medical conditions or who are immunosuppressed may also be more sensitive to some communicable diseases. Finally for those diseases for which vaccines are available, persons who are not immunized are at greater risk than those who are immunized. For some communicable diseases and segments of the population, the rates of vaccination in Washington County are high. As shown in Table 47, the vast majority of school children in the County are compliant with the required immunizations. For other diseases for which vaccines are available, immunization rates in the County are likely to be much lower. Based on survey data, the CDC estimated that only about 44 percent of the persons older than six months old in the State of Wisconsin received the seasonal influenza vaccine for the 2014-2015 influenza season.<sup>95</sup>

While a communicable disease outbreak will not directly impact critical facilities and infrastructure, it could severely impact local health care services.

### **Potential Future Changes in Communicable Disease Conditions**

Based upon historical national trends of infectious diseases, as well as the continued threat of bio-terrorism, there is a potential for continued risk of medical communicable disease outbreaks to occur within Washington County. For the five-year term of this plan, the probability of a communicable disease outbreak occurring is unknown. One reason for this is that numerous viruses, bacteria, fungi, and protozoa cause communicable diseases. Each of these disease agents have their own specific characteristics, such as source, infectivity, and mode of transmission. In addition, for some disease agents such as pandemic influenza, changes in the properties of the disease agent contribute to the development of major outbreaks.

As the 21st century proceeds, changes in climate may affect the incidence of communicable diseases in Washington County in a number of ways.

Heavy rainfalls have been shown to be associated with outbreaks of waterborne diseases. This can happen through several pathways. Runoff resulting from heavy rains can become contaminated with animal wastes from agricultural activities and/or human wastes from improperly maintained or failing septic systems. This runoff can carry disease agents into surface waters. It can also result in the contamination of wells and, in areas with aging infrastructure, water distribution systems. Depending on the disease agents that are present in the wastes, this can lead to a variety of gastrointestinal and respiratory illnesses. The projected increase in the frequency of heavy rainfall events could lead to an increase of these sorts of disease outbreaks.

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<sup>95</sup> U.S. Centers for Disease Control and Prevention, "Influenza Vaccination Coverage Estimates by State, HHS Region, and the United States, National Immunization Survey-Flu (NIS-Flu) and Behavioral Risk Factor Surveillance System (BRFSS), 2015-15 Influenza Season: Wisconsin," <http://www.cdc.gov/flu/fluview/reportshtml/reporti1415/reportii/index.html>, accessed January 19, 2016.

The projected increase in heavy rain events could also affect the likelihood of disease outbreaks resulting from use of recreational waters. Increases in water temperatures resulting from climate change and runoff from intense storms may create environments that deposit and support pathogens on beaches. At the same time, the projected increases in air and water temperatures are likely to lengthen the period of the year that is suitable for water-based recreational activities such as swimming. A longer swimming season is likely to increase the amount of exposure to any waterborne pathogens that are present. Thus, between now and the middle of the 21st century, the projected change in climate could increase the incidence of waterborne diseases among recreation water users. This would be likely to lead to more frequent closures of inland beaches in order to protect human health.

The projected changes in climate could also affect the risk posed by vector-borne diseases. The dynamics of many of these diseases are sensitive to fluctuations in climate. For example, outbreaks of West Nile virus in humans are associated with prolonged periods of hot, dry weather that are followed by a significant rain event.<sup>96</sup> Changes in temperature and moisture can change the geographic ranges of animals that carry diseases. For example, Wisconsin is currently not within the range of the mosquito *Aedes aegypti*, which is the vector for several disease-causing viruses including the Zika virus and those that cause chikungunya, dengue fever, and yellow fever. This mosquito is a tropical species and exposure to temperatures below 32°F kill it. As a result, the distribution of this species is currently restricted to southern portions of the United States. The increases in winter temperatures that are projected to occur over the 21st century could allow the range of this mosquito species to expand northward,<sup>97</sup> creating potential for the transmission of the diseases it carries to occur in areas, such as Wisconsin, where these diseases rarely occur today. While an effective vaccine exists for yellow fever, the current lack of available vaccines for chikungunya, dengue fever, and Zika suggests that there may be some potential for outbreaks to develop in Wisconsin later in the 21st century.

It should be noted that changes in the ranges of disease vectors resulting from climate change could also reduce the risks posed by some vector-borne diseases. For example, preliminary results suggest that climate change may be causing the range of the deer tick that transmits Lyme disease to shift northward. The may result in the range of the tick moving out of Wisconsin and into Minnesota and Canada by the end of the 21st century.<sup>98</sup>

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<sup>96</sup> Paul R. Epstein, "West Nile Virus and the Climate," *Journal of Urban Health, Volume 78, pages 367-371, 2001.*

<sup>97</sup> César Caphinha, Jorge Rocha, and Carla A. Sousa, "Macroclimate Determines the Global Range Limit of *Aedes aegypti*," *EcoHealth, Volume 11, pages 420-428, 2014.*

<sup>98</sup> *Wisconsin Initiative on Climate Change Impacts, 2011, op. cit.*

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## Chapter IV

# HAZARD MITIGATION GOALS

Planning may be defined as a rational process for formulating and meeting goals and objectives. Consequently, the formulation of goals and objectives is an essential task that must be undertaken before plans can be prepared. This chapter sets forth hazard mitigation goals and objectives for use in the consideration of alternative hazard mitigation strategies for Washington County and in the selection of recommended strategies from among those alternatives.

In formulating and setting forth goals and objectives, their differing natures and purposes must be kept in mind. In this regard, the definition of goals and objectives used herein is as promoted by the Federal Emergency Management Agency (FEMA). Goals are general guidelines that explain what a community desires to achieve. Based upon the selected goals, a community can then develop the specific objectives or standards needed to attain the goals. Objectives and standards more narrowly define strategies for meeting the selected goals and are more specific than goals.

### RELATIONSHIP OF HAZARD MITIGATION GOALS AND OBJECTIVES TO OTHER RELEVANT PLANNING EFFORTS

Washington County and eleven of its local governments have prepared a comprehensive plan that will provide a basis for broad-based decision-making on land use-related matters by County and local government officials, and will increase the awareness and understanding of County, city, village, and town planning goals and objectives by landowners, developers, and other private interests.<sup>1</sup> That plan incorporates and updates elements from other pertinent County and Regional Plans as appropriate. Local comprehensive plans based on the multi-jurisdictional plan were adopted by the Village of Kewaskum and the Towns of Addison, Erin, Farmington, Hartford, Kewaskum,

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<sup>1</sup> *SEWRPC Community Assistance Planning Report No. 299, A Multi-Jurisdictional Comprehensive Plan for Washington County: 2035, April 2010; Washington County Planning and Parks Department and Southeastern Wisconsin Regional Planning Commission, Amendment No. 1 (2013-1) to A Multi-jurisdictional Comprehensive Plan for Washington County: 2035, December 10, 2013; Washington County Planning and Parks Department, A Farmland Preservation Plan for Washington County: Amendment No 2—Appendix T of A Multi-jurisdictional Comprehensive Plan for Washington County: 2035, December 10, 2013; Washington County Planning and Parks Department and Southeastern Wisconsin Regional Planning Commission, Amendment 2014-1 to A Multi-jurisdictional Comprehensive Plan for Washington County: 2035, April 14, 2014.*

Polk, Trenton, and Wayne.<sup>2</sup> The Town of Germantown adopted the multi-jurisdictional plan document as the Town comprehensive plan. In addition, the Villages of Germantown, Jackson, Newburg, and Slinger, and the Towns of Jackson and Richfield<sup>3</sup> participated in intergovernmental meetings for the general purpose of accomplishing coordinated, adjusted, and harmonious development within Washington County. While these local governments prepared their own local plans, either individually or in partnership with one another, they cooperated in the multi-jurisdictional planning process.<sup>4</sup> The Town of West Bend, and the Cities of Hartford and West Bend have adopted their own comprehensive plans.<sup>5</sup>

Washington County has prepared and adopted a park and open space plan<sup>6</sup> to guide the County and local units of government in preserving and developing recreational and other open space uses. Several Washington County municipalities have also prepared land use plans within the framework of the regional land use plan.<sup>7</sup> In addition, comprehensive watershed plans<sup>8</sup> have been developed for three of the four major watershed areas that include areas

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<sup>2</sup> *SEWRPC Community Assistance Planning Report No. 289, A Comprehensive Plan for the Town of Addison, 2035, June 2009; SEWRPC Community Assistance Planning Report No. 291, A Comprehensive Plan for the Town of Barton, April 2008; SEWRPC Community Assistance Planning Report No. 290, A Comprehensive Plan for the Town of Barton, 2035, April 2008; A Comprehensive Plan for the Town of Erin, 2035, December 2009; SEWRPC Community Assistance Planning Report No. 292, A Comprehensive Plan for the Town of Farmington, 2035, January 2010; SEWRPC Community Assistance Planning Report No. 293, A Comprehensive Plan for the Town of Hartford, 2035, April 2009; SEWRPC Community Assistance Planning Report No. 294, A Comprehensive Plan for the Town of Kewaskum, 2035, October 2009; SEWRPC Community Assistance Planning Report No. 298, A Comprehensive Plan for the Village of Kewaskum, 2035, November 2009; SEWRPC Community Assistance Planning Report No. 295, A Comprehensive Plan for the Town of Polk, 2035, September 2009; SEWRPC Community Assistance Planning Report No. 296, A Comprehensive Plan for the Town of Trenton, 2035, April 2009; and SEWRPC Community Assistance Planning Report No. 297, A Comprehensive Plan for the Town of Wayne, 2035, March 2009.*

<sup>3</sup> *The Town of Richfield incorporated as a Village on February 13, 2008.*

<sup>4</sup> *Village of Germantown, Village of Germantown 2020 Smart Growth Plan, October 2004; Village of Jackson and Town of Jackson, Village and Town of Jackson Comprehensive Plan: 2035, August 10, 2009; Village of Newburg, Village of Newburg Comprehensive Plan Update, 2014; Village of Richfield, Village of Richfield Comprehensive Plan: 2035, November 2014; and Village of Slinger, Village of Slinger Comprehensive Plan—Conservation, Connectivity, Walkability: A Plan for 2025, August 6, 2007.*

<sup>5</sup> *City of Hartford, City of Hartford 2030 Smart Growth Plan, n.d. and City of West Bend, 2020 Comprehensive Plan for the City of West Bend, April 12, 2004, amended May 12, 2012, December 3, 2012, February 18, 2013, and February 17, 2014.*

<sup>6</sup> *SEWRPC Community Assistance Planning Report No. 136, A Park and Open Space Plan for Washington County (3rd Edition), March 2004.*

<sup>7</sup> *SEWRPC Planning Report No. 48, A Regional Land Use Plan for Southeastern Wisconsin: 2035, June 2006.*

<sup>8</sup> *SEWRPC Planning Report No. 12, A Comprehensive Plan for the Fox River Watershed, Volume One, Inventory Findings and Forecasts, April 1969, and Volume Two, Alternative Plans and Recommended Plan, February 1970; SEWRPC Planning Report No. 13, A Comprehensive Plan for the Milwaukee River Watershed, Volume One, Inventory Findings and Forecasts, December 1970, and Volume Two, Alternative Plans and Recommended Plan, October 1971; and SEWRPC Planning Report No. 26, A Comprehensive Plan for the Menomonee River Watershed, Volume I, Inventory Findings and Forecasts, December 1976, and Volume 2, Alternative Plans and Recommended Plan, October 1976.*



in Washington County. These plans included evaluation of alternatives and recommended flood mitigation plans developed on a comprehensive watershedwide basis. As comprehensive planning, park and open space planning, land use, and floodplain management planning is carried out in Washington County and in the related watersheds, an integration and coordination of the goals and objectives has taken place. Park and open space and land use planning goals and objectives are integrated and coordinated with floodplain management planning. This is accomplished at the watershed level by developing comprehensive watershed plans that include floodplain management, land use, park and open space, and water quality planning in one integrated planning program. These watershed plans form a potential framework for subwatershed-level planning programs. As an example, the comprehensive watershed planning objectives, principles, and standards for the comprehensive plan for the Menomonee River watershed<sup>9</sup> include six specific objectives related to land use, as well as objectives relating to flood control.

## **HAZARD MITIGATION GOALS AND OBJECTIVES**

The following goals have been established for the Washington County hazard mitigation planning program. The goals have been established based, in part, upon goals previously established in watershed, park and open space, and land use planning programs.

1. A spatial distribution of the various land uses that minimizes hazards and dangers to health, welfare, and safety as well as further enhancing the economic base of the County, and will result in a compatible arrangement of land uses properly related to the existing and proposed supporting transportation, utility, public safety systems, and public facility systems.
2. A spatial distribution of the various land uses that maintains connectivity among and that will result in the protection and wise use of the natural resources of the County, including its soils, inland lakes and streams, groundwater, wetlands, woodlands, wildlife, and natural areas and critical species habitats.
3. An integrated transportation system that, through its location, capacity, and design, will safely, economically, and effectively serve the existing and proposed land use pattern and promote the implementation of the land use plan, meeting the current and anticipated travel demand and minimizing the potential for accidents and the associated toll on life and property damage.
4. The provision of facilities necessary to maintain a high quality of fire and police protection and emergency medical services throughout the County.
5. The development of a stormwater and floodplain management system that reduces the exposure of people to drainage- and flooding-related inconvenience and to health and safety hazards and that reduces the exposure of real and personal property to damage through inundation resulting from flooding and inadequate stormwater drainage.
6. The identification and development of programs that complement County and local emergency operations plans to mitigate the potential exposure to health and safety and the exposure of real and personal property resulting from a broad range of hazards that are unpredictable and not geographically specific in nature.

Complementing each of these goals is a set of objectives and standards that can be used to define more-specific actions or strategies to achieve the goals. The goals, objectives, and standards that are set forth in Table 48 incorporate the goals, objectives, and related County planning programs, where there was the most direct relationship to hazard mitigation planning. There are a number of other objectives and standards associated with the stated goals that are relevant to other planning activities, but not specifically to hazard mitigation planning. However, these have not been restated herein, but are documented in the referenced reports.

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<sup>9</sup> *SEWRPC Planning Report No. 26*, op. cit.

**Table 48**

**GOALS AND OBJECTIVES FOR WASHINGTON COUNTY HAZARD MITIGATION PLAN**

**GOAL NO. 1**

A spatial distribution of the various land uses that minimizes hazards and dangers to health, welfare, and safety as well as further enhancing the economic base of the County, and will result in a compatible arrangement of land uses properly related to the existing and proposed supporting transportation, utility, public safety systems, and public facility systems.

**OBJECTIVES AND STANDARDS**

1. Urban high-, medium-, and low-density residential uses should be located within planning units that are served with centralized public sanitary sewerage and water supply facilities and contain, within a reasonable walking distance, necessary supporting local service uses, such as neighborhood parks, local commercial, and educational facilities, and should have reasonable access through the appropriate component of the transportation system to employment, commercial, cultural, and governmental centers, and elementary and secondary schools and higher educational facilities; and should be provided with readily available fire and police protection and emergency medical services.
2. Rural- and suburban-density residential uses should have reasonable access through the appropriate component of the transportation system to local service uses; employment, commercial, cultural, and governmental centers; and elementary and secondary schools and higher educational facilities and should have reasonable access to fire and police protection and emergency medical services.
3. Industrial uses should be located to have direct access to arterial street and highway facilities and reasonable access through an appropriate component of the transportation system to residential areas and to railway, seaport, and airport facilities, and should not be intermixed with commercial, residential, governmental, recreational, or institutional land uses; and should be provided with readily available fire and police protection and emergency medical services.
4. Major commercial uses should be located in centers of concentrated activity on only one side of an arterial street and should be afforded direct access to the arterial street system; and should be provided with readily available fire and police protection and emergency medical services.

**GOAL NO. 2**

A spatial distribution of the various land uses that maintains connectivity among and will result in the protection and wise use of the natural resources of the County, including its soils, inland lakes and streams, groundwater, wetlands, woodlands, wildlife, and natural areas and critical species habitats.

**OBJECTIVES AND STANDARDS**

1. Floodplains should not be allocated to any urban development that would cause or be subject to flood damage.
2. No unauthorized structure or fill should be allowed to encroach upon and obstruct the flow of water in perennial stream channels.
3. The types and distribution of land uses should be developed considering the potential impacts on flood flows, on surface water quality, and on groundwater quality and quantity.
4. The types and distribution of land uses should be developed to minimize loss and fragmentation of Primary Environmental Corridors and isolated natural resource areas and wetlands (particularly those adjacent to streams and lakes) and promote connectivity among those natural resource areas in order to protect and preserve the ecological resilience and resistance to natural hazards.

**Table 48 (continued)**

**GOAL NO. 3**

An integrated transportation system that, through its location, capacity, and design, will safely, economically, and effectively serve the existing and proposed land use pattern and promote the implementation of the land use plan, meeting the current and anticipated travel demand and minimizing the potential for accidents and the associated toll on life and property damage.

**OBJECTIVES AND STANDARDS**

1. Because accidents take a heavy toll on life and cause property damage and human suffering, contribute substantially to overall transportation costs, and increase public costs for police and welfare services, every attempt should be made to reduce both the incidence and severity of accidents through proper design and operation of the arterial street and highway system.
2. The total number of accidents, and the severity of traffic accidents, on arterial highways should be minimized by the identification and improvement of those facilities that exhibit above average accident rates based upon accepted standards.

**GOAL NO. 4**

The provision of facilities necessary to maintain a high quality of fire and police protection and emergency medical services throughout the County.

**OBJECTIVES AND STANDARDS**

1. Because adequate fire and police protection and emergency medical services are essential to the protection of the public health and safety and of real property values, and is a public service that enhances the economic development potential of an area, fire and police stations and emergency medical equipment should be developed and distributed based upon the accepted standards for such services.

**GOAL NO. 5**

The development of a stormwater and floodplain management system that reduces the exposure of people to drainage- and flooding-related inconvenience and to health and safety hazards and that reduces the exposure of real and personal property to damage through inundation resulting from flooding and inadequate stormwater drainage.

**OBJECTIVES AND STANDARDS**

1. In order to prevent significant property damage and safety hazards, the major components of the stormwater management system and the floodplain management system should be designed to accommodate runoff from a 100-year recurrence interval storm event.
2. In order to provide for an acceptable level of access to property and of traffic service, the minor components of the stormwater management system should be designed to accommodate runoff from a storm event to be determined appropriate by each community.
3. In order to provide an acceptable level of access to property and of traffic service, the stormwater management system should be designed to provide two clear 10-foot lanes for moving traffic on existing arterial streets, and one clear 10-foot lane for moving traffic on existing collector and land access streets during storm events up to and including the 10-year recurrence interval event.
4. Flow of stormwater along and across the full pavement width of collector and land access streets shall be acceptable during storm events exceeding a 10-year recurrence interval when the streets are intended to constitute integral parts of the major stormwater drainage system.
5. Plan components shall be designed to comply with the requirements of Chapter NR 116 of the *Wisconsin Administrative Code*.
6. All new and replacement bridges and culverts over waterways shall be designed so as to accommodate, according to the categories listed below, the designated flood events without overtopping of the related roadway or railway track.

**Table 48 (continued)**

- a. Minor and collector streets used or intended to be used primarily for access to abutting properties: a 10-year recurrence interval flood discharge.
  - b. Arterial streets and highways, other than freeways and expressways, used or intended to be used primarily to carry heavy volumes of through traffic: a 50-year recurrence interval flood discharge.
  - c. Freeways and expressways: a 100-year recurrence interval flood discharge.
  - d. Railways: a 100-year recurrence interval flood discharge.
7. All new and replacement bridges and culverts along waterways shall be designed so as not to inhibit fish passage in areas that are supporting, or that are capable of supporting, valuable recreational sport and forage fish species.
  8. Provide for the capability to provide fire and police protection and emergency medical services and for adequate operation of wastewater treatment facilities during a 100-year recurrence interval flood event.

**GOAL NO. 6**

The identification and development of programs that complement County and local emergency operations plans to mitigate the potential exposure to health and safety and the exposure of real and personal property resulting from a broad range of hazards that are unpredictable and not geographically specific in nature.

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*Source: SEWRPC.*

## Chapter V

# HAZARD MITIGATION STRATEGIES

Hazard mitigation planning may be defined as the systematic evaluation of the nature and vulnerability of hazards present, along with the development and implementation of sustained actions to reduce or eliminate long-term risks from hazards and their effect. Specific purposes of hazard mitigation include eliminating loss of life, reducing danger to human health and safety, minimizing monetary damage to private and public property, reducing the cost of utilities and services, and minimizing disruption in community affairs. Hazard mitigation also involves both avoiding intensifying existing hazards and creating new hazards.

The preparation of an all hazards mitigation plan for Washington County involves the development and evaluation of alternative mitigation measures and plan elements and the synthesis of the most effective elements into an integrated plan. Some of the mitigative measures described are ongoing or committed actions, which do not require the evaluation of alternative measures, but are proposed to be integrated into the mitigation plan as such. For other hazards, there may be only one or a number of integrated viable options. In these cases, alternatives are not presented and cost-effectiveness is not specifically addressed, but is implied by the nature of the mitigation measures. In other instances, where there are viable alternatives, such alternatives are described and evaluated. This chapter describes the hazard mitigation measures considered to resolve the identified hazard problems within Washington County.

Measures have been identified and evaluated for each of the hazards for which a vulnerability analysis was developed as set forth in Chapter III.

### **HAZARD MITIGATION PLAN COMPONENT FOR FLOODING AND RELATED STORMWATER DRAINAGE PROBLEMS**

As described in Chapter III of this report, flooding and related stormwater drainage problems represent the third most damaging hazard affecting Washington County (see Table 19). Given that most of the damages associated with the first and second most damaging hazards, tornadoes and winter storms were the result of single events, it is likely that flooding and related stormwater drainage problems will continue to be a major source of damages resulting from natural hazards affecting the County in the future. This highlights the need for effective mitigation measures for this hazard. This section describes alternative and selected strategies to mitigate the impacts of this hazard.

#### **Identification of Alternative Mitigation Strategies**

A variety of strategies are available for mitigating impacts of flood and related stormwater runoff events. These strategies may be broadly divided into two categories—nonstructural measures and structural measures. Nonstructural measures include reservation of floodplains for conservation, recreation, and other open space uses; floodplain use regulations; land use and related stormwater management measures designed to limit rainfall runoff; structure floodproofing and/or elevation; structure removal; channel maintenance; flood insurance; lending institution policies;

realtor policies; community utility policies; and emergency programs. Structural measures include floodwater storage facilities, such as reservoirs and impoundments; floodwater diversion facilities, such as dikes and channels; floodwater containment facilities, such as earthen dikes and concrete floodwalls; floodwater conveyance facilities, such as channel modifications; and bridge and culvert modifications or replacements. Structural measures typically are most effective where structures are concentrated, such as urban areas, while nonstructural measures are most effective when the flooded structures are scattered in the watershed.

Alternatives for mitigating the effects of flooding in Washington County include:

- **Preservation of Floodplains and Environmentally Sensitive Lands:** By preventing or limiting development in high-risk areas, these measures can limit the County's and its constituent municipalities' future vulnerability to impacts from flooding. This alternative includes:
  - Development and enforcement of floodplain, wetland, and shoreland zoning regulations. This can be especially effective in areas where development has not occurred, and
  - Preservation of open space and environmentally sensitive lands. This approach can reduce impacts of flood hazards by preserving or restoring functions of environmental systems. It may also serve the dual purpose of protecting lives and property while addressing other community goals such as improving water quality or enhancing recreational opportunities.
- **Actions to Remove Structures from High-Risk Areas or Enable Them to Better Withstand Flooding:** Damages to structures from flooding can be reduced by either removing them from the floodplain or modifying them to resist damage from flooding. This alternative includes:
  - Acquisition of properties containing structures that are located within the floodplain and demolition of the structures, with the property being placed into open space land uses,
  - Acquisition of properties containing structures that are located within the floodplain and relocation of the structures, with the property being placed into open space land uses, and
  - Floodproofing or elevation of structures located within the floodplain.
- **Stormwater Management Measures:** Because of the relationship between stormwater management and floodplain management, consideration of stormwater management actions is an important aspect of flood mitigation. Such actions include:
  - Development of stormwater management plans,
  - Development and enforcement of stormwater-related regulations, and
  - Maintenance of stormwater management facilities.
- **Participation in the National Flood Insurance Program (NFIP):** Residents of participating communities that comply with minimum standards for floodplain management are eligible for flood insurance coverage.
  - In addition to this, the County and incorporated municipalities could consider participating in the NFIP's Community Rating System. This program offers reduced flood insurance premiums for the community's property owners based on FEMA-specified community efforts that go beyond meeting minimum floodplain management standards.
- **Actions to Manage the Potential Flood-Related Impacts of Dam Failure:** Failure of some dams may result in downstream flooding. As described in Chapter II, one dam in Washington County has been assigned a high hazard rating by the Wisconsin Department of Natural Resources (WDNR), indicating that failure or misoperation of this dam poses the potential for loss of human life as well as economic loss, environmental

damage, or disruption of lifeline facilities. Two dams in the County have been assigned a significant hazard rating, indicating the potential for economic loss, environmental damage, or disruption of lifeline facilities during failure or misoperation. In addition, the hazard potentials of 29 dams in the County have not been determined. Actions that could be taken to manage the potential impacts of dam failure include:

- Conducting dam failure analyses and assigning hazard potential ratings to those dams in the County that currently lack such ratings,
  - Developing dam failure emergency plans for high and significant hazard potential dams,
  - Conducting regularly required inspections and maintenance of dams, and
  - Monitoring of high and significant hazard potential dams and dams with identified maintenance issues during high water events.
- **Improving the Available Data Related to Flooding in Washington County:** While the flood hazard areas and estimates of flood damages presented in Chapters II and III of this report reflect the best available data at the time that this plan was developed, more complete and better data would allow for the refinement of flood hazard areas and damage estimates and more specific targeting of recommendations. Desirable improvements in the data include:
    - Continued updating of flood insurance maps,
    - Documentation of the extent of future flood events, including both riverine and lacustrine floods and stormwater-related floods,
    - Installation or reactivation of stream gages along rivers in Washington County,
    - Identification and documentation of localized flooding and stormwater drainage problems, such as complaints about roads or bridges flooding during heavy rain or snowmelt events, and
    - Surveys of buildings in and near the one-percent-annual-probability floodplain.
  - **Continuation of desirable policies by lending institutions and realtors concerning sales of properties located in the one-percent-annual-probability flood hazard area:** These policies include lending institutions continuing their practice of determining the floodprone status of properties before mortgage transactions. These institutions should consult with the appropriate local zoning department to inquire about any additional flood hazard studies for areas not identified in the Federal Flood Insurance Study (FIS). These policies also includes real-estate brokers and salespersons continuing to inform potential purchasers of property of any flood hazard that may exist at the site being traded in accord with rules of the Wisconsin Department of Safety and Professional Services. Such policies can discourage placement of structures in flood hazard areas.
  - **Public Outreach and Community Education Programs:** Public awareness of issues like the risks associated with building structures in the floodplain and the possible effects of actions such as dumping debris in a stream channel, localized channelization, and removal of obstructions to flow on flood flows and stages may serve to prevent an increase in flooding problems. Programs to increase County residents' awareness present a strategy to prevent future flood-related problems.
  - **Emergency Services:** Certain types of emergency services can reduce injuries and loss of life associated with flooding. These actions are typically taken immediately prior to, during, or in response to a hazard event. Examples include:
    - Warning systems,
    - Search and rescue, and

- Evacuation planning and management.
- **Structural Flood Control Measures:** These measures reduce the impacts of flooding by controlling the flow of water in rivers and streams. Structural measures include:
  - Dams,
  - Dikes and floodwalls,
  - Diversions,
  - Creation of floodwater storage,
  - Channel modifications, and
  - Bridge and culvert alteration or replacement.

### **Selection of Priority Mitigation Measures**

In the initial assessment of potential mitigation measures for flooding and in examining alternative approaches to mitigate the impacts of flooding problems in Washington County, the full range of nonstructural and structural approaches was considered. However, given the existing floodplain zoning practices in the County; the fact that much of the County is in, and is expected to remain in, open space uses; and the relatively dispersed nature of many of the structures in the County that could be subject to flooding, it was found that nonstructural measures are especially well-suited to mitigating the impacts of many of the flooding problems in the County.

An important factor in selecting mitigation measures is to consider incorporating recommendations from other planning efforts such as Washington County’s park and open space plan<sup>1</sup> that may either act to mitigate the impacts of flooding when it occurs or prevent such impacts from occurring. Including such recommendations in the hazard mitigation plan furthers the goal of integrating the elements of the various plans that seek to provide guidance to the County for a variety of issues. Similarly, it was judged important that the set of priority mitigation measures incorporate existing programs and efforts that reduce the exposure of people and property to risks posed by flooding or that act to mitigate the impacts of flooding when it occurs. Examples of such programs include floodplain zoning, continued participation in the National Flood Insurance Program (NFIP), updating of NFIP maps, and stormwater management regulation and planning.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk, the flooding and related stormwater drainage problem mitigation plan for Washington County consists of five elements: a floodplain and environmentally sensitive lands preservation element, a floodplain management element, a stormwater management element, a public information and education element, and a secondary plan element. Each element of the plan is an important component of the overall strategy for reducing flood risk and flood damage. Some aspects of the overall plan are already being implemented in the form of existing and ongoing activities being carried out by the County and local units of government.

#### ***Floodplain and Environmentally Sensitive Lands Preservation Element***

Floodplain management regulations and programs perform critical roles toward assuring that flood mitigation efforts are properly implemented. As detailed in Chapter II, Washington County and the municipalities within the County currently have several pertinent floodplain management regulations and programs in place, most notably in the form of zoning regulations and other ordinances, and environmentally sensitive area and open space preservation

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<sup>1</sup> *SEWRPC Community Assistance Planning Report No. 136, A Park and Open Space Plan for Washington County (3rd Edition), March 2004.*



policies. The significant portion of the environmentally sensitive lands within the County, including wetlands, woodlands, and floodplains, are under protective ownership and/or zoning.

#### *Floodplain Zoning and Wetland Preservation Zoning*

As summarized in Table 5 in Chapter II of this report, floodplain management regulations include the floodplain district zoning ordinances and shoreland or shoreland wetland zoning ordinances.<sup>2</sup> The floodplain zoning ordinances are intended to preserve the floodwater conveyance and storage capacity of floodplain areas to prevent the location of new flood-damage-prone development in flood hazard areas. The wetland preservation zoning ordinance seeks to maintain the stormwater and floodwater storage capacity of wetlands in the County and prohibits certain land uses detrimental to wetland areas. More information regarding each of these ordinances is set forth in Chapter II of this report. Implementation of these ordinances on an ongoing basis is an integral part of the County flood mitigation strategy.

#### *Environmentally Sensitive Area and Open Space Preservation Actions*

As noted in Chapter II of this report, the preservation of environmental corridors and important natural features can assist in the prevention of increased flood flows and associated problems. These areas often include the most significant floodplains and wetlands within a given area. The preservation of wetlands is of particular importance because wetlands often afford floodwater storage. In addition, the intrusion of intensive urban land uses into environmentally sensitive areas may result in the creation of serious and costly problems, such as failing foundations for pavements and structures, wet basements, excessive operation of sump pumps, excessive clear-water infiltration into sanitary sewerage systems, and poor drainage. Destruction of ground cover may result in soil erosion, stream siltation, more rapid runoff, and increased flooding.

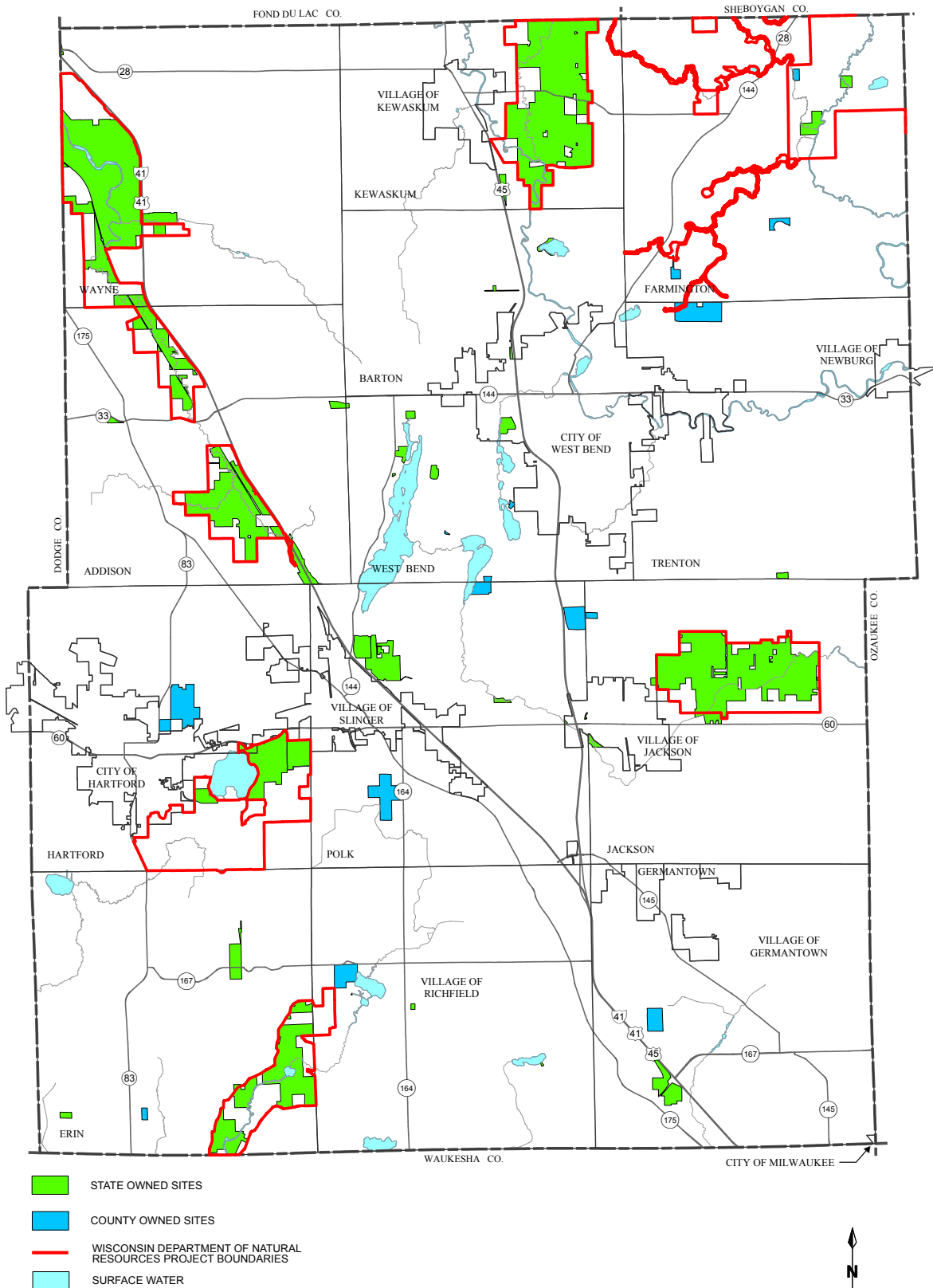
The regional land use plan described in Chapter II of this report includes provisions to preserve the environmental corridors and isolated natural resource areas. This regional plan forms the framework for local land use planning that is ongoing and has been or is carried out by the local units of government in the County. In Washington County, in 2016, there were 45 park and open space sites of 40 or more acres, encompassing 16,218 acres. Of these park and open space sites, eight were owned and maintained by the County; 14 were owned and maintained by State of Wisconsin departments, including the Wisconsin Department of Natural Resources (WDNR) and the Wisconsin Department of Transportation; and 23 were owned and maintained by local units of government, including cities, village, towns, and school districts. The County- and State-owned sites are shown on Map 40. In addition, the WDNR, the Milwaukee Metropolitan Sewerage District (MMSD), and private land trusts and conservancies had conservation easements on 68 sites in the County, with 25 of these sites consisting of 40 acres or more. These sites encompass 2,235 acres. The locations of these easements are shown on Map 41. Through its Greenseams project, the MMSD has acquired ownership or easements on about 26 open space sites in Washington County encompassing about 1,006 acres. These sites are shown on Map 42.

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<sup>2</sup> *The 2015-2017 State Budget (Act 55) changed State law relative to shoreland zoning. Under Act 55 a shoreland zoning ordinance may not regulate a matter more restrictively than it is regulated by a State shoreland-zoning standard unless the matter is not regulated by a standard in Chapter NR 115, "Wisconsin's Shoreland Protection Program," of the Wisconsin Administrative Code. (Examples of unregulated matters may involve wetland setbacks, bluff setbacks, development density, and stormwater standards). In addition, Under Act 55, a local shoreland ordinances may not require establishment or expansion of a vegetative buffer on already developed land and may not establish standards for impervious surfaces unless those standards consider a surface to be pervious if its runoff is treated or is discharged to an internally drained pervious area.*

Map 40

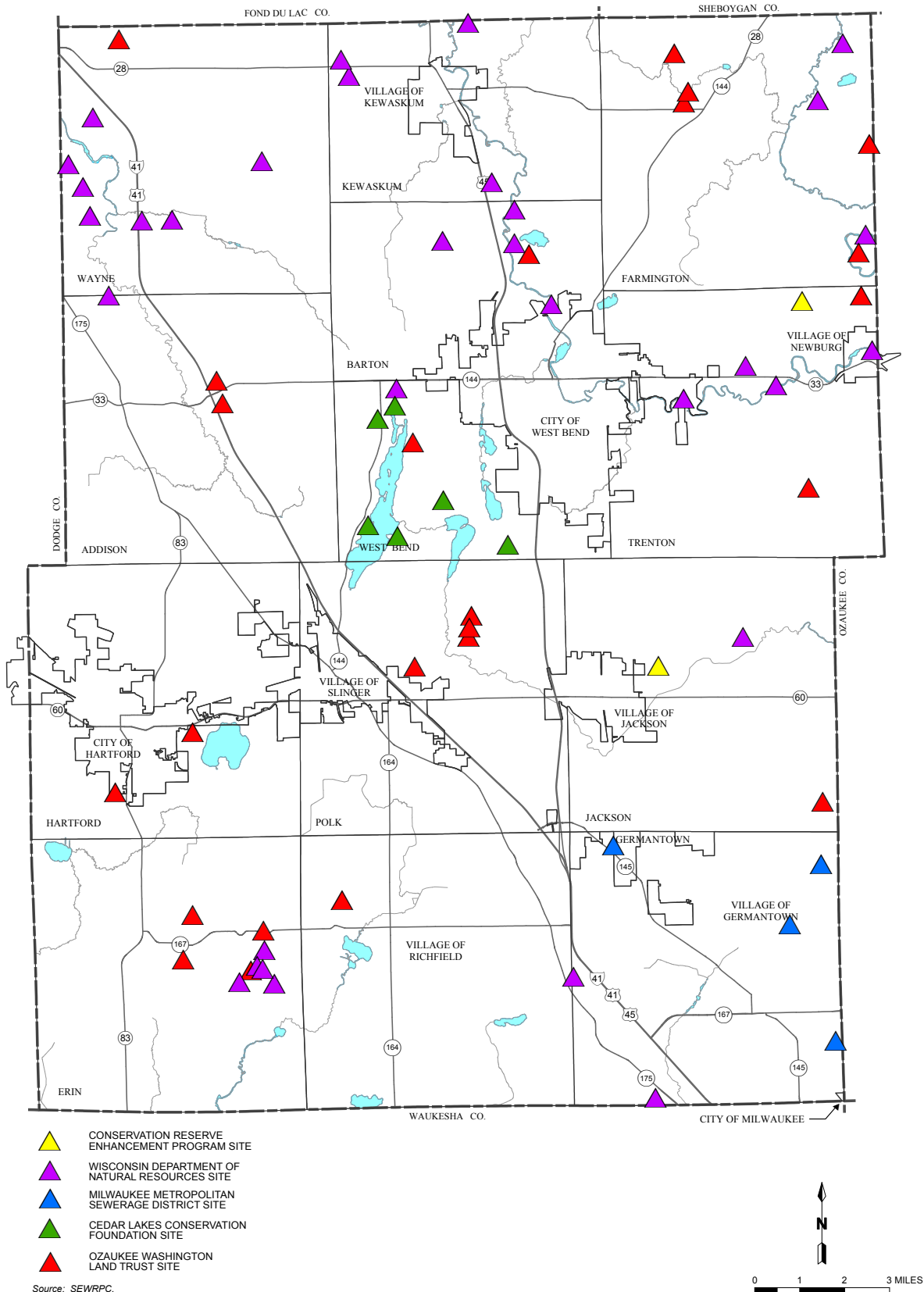
COUNTY AND STATE-OWNED PARK AND OPEN SPACE SITES IN WASHINGTON COUNTY: 2016



Source: Wisconsin Department of Natural Resources, Washington County, and SEWRPC.

Map 41

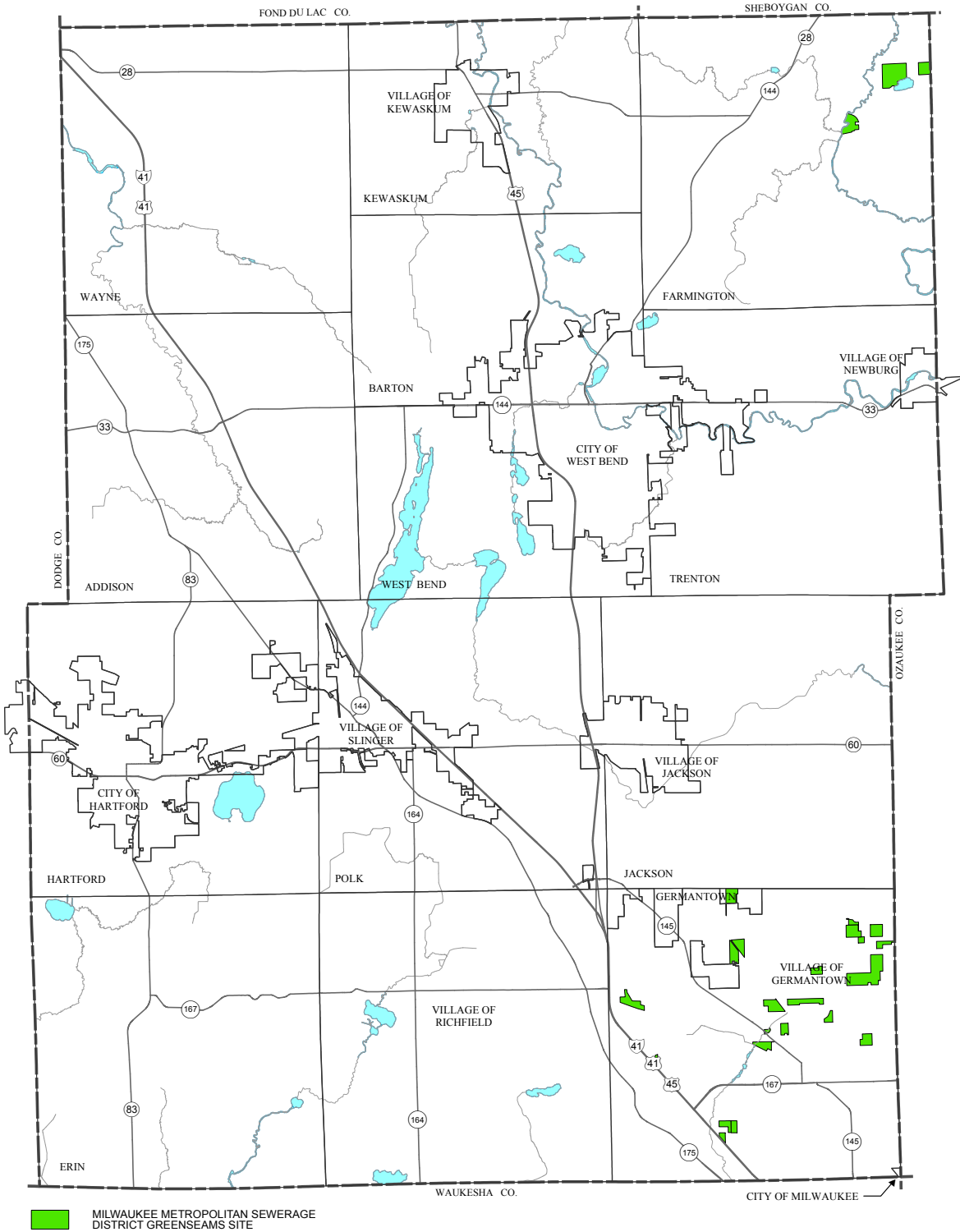
STATE OF WISCONSIN AND NONPROFIT CONSERVATION ORGANIZATION CONSERVATION EASEMENTS IN WASHINGTON COUNTY: 2016



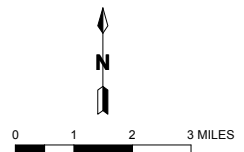
Source: SEWRPC.

Map 42

MILWAUKEE METROPOLITAN SEWERAGE DISTRICT GREENSEAMS SITES IN WASHINGTON COUNTY



Source: SEWRPC.



The 1989 Washington County park and open space plan,<sup>3</sup> updated in 1997<sup>4</sup> and 2004,<sup>5</sup> provides for the preservation of environmental corridors and isolated natural resource areas. The open space preservation and outdoor recreation elements of that plan are summarized on Maps 43 and 44, respectively. Washington County has been active in promoting and assisting local units of government in the County in preparing land use plans that are consistent with the Regional and County objectives for preservation of environmentally sensitive lands. In addition, all of the municipalities with significant areas of environmental corridors and/or isolated natural resource areas, have local land use and/or park and open space plans completed or underway that are consistent with the Regional and County plans with regard to preservation of environmentally sensitive lands. The Washington County hazard mitigation plan incorporates the open space and environmentally sensitive land preservation recommendations of the Washington County park and open space plan. The cost, in 2014 dollars, of full implementation of this recommendation is estimated to be about \$101.2 million.

The MMSD Conservation Plan identifies land parcels that are recommended to be protected for multiple purposes, including flood reduction potential and stormwater management benefits, as well as wildlife habitat, water quality, and recreational benefits.<sup>6</sup> The Conservation Plan identified sites throughout the Menomonee River, Root River, and Oak Creek watersheds within the District and includes the Village and Town of Germantown in Washington County. Map 45 shows the MMSD's Conservation Plan and the open space preservation element of the plan as it relates to the Village and Town of Germantown. Partnerships between MMSD and public or private agencies and organizations may increase the prospects for funding assistance through the Wisconsin Stewardship program in support of land acquisition or the purchase of conservation easements. It is envisioned that the sites acquired by the MMSD would eventually be conveyed to the appropriate county or local unit of government or private nonprofit conservation organization, with MMSD retaining a conservation easement on such lands. All land acquisitions or purchases of conservation easements by the MMSD or any other public agency would be on a willing-seller basis.

**WETLAND RESTORATION TO REDUCE FLOOD-RELATED AGRICULTURAL AND PROPERTY DAMAGES**  
Wetlands and floodplains can provide natural storage areas for floodwaters during heavy rain or snow melt events. Restoring the natural function of former wetland areas can be an effective strategy to reduce potential flood damages in downstream areas. According to the U.S. Environmental Protection Agency (USEPA), a one-acre wetland can typically store about three acre-feet or about one million gallons of water. Wetland vegetation can slow the movement of floodwater and can evapotranspire some of this water into the atmosphere. Increasing flood storage capacity in Washington County through the expansion of wetland acreage may also help communities adapt to, and reduce the potential impacts of climate change.<sup>7</sup>

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<sup>3</sup> *SEWRPC Community Assistance Planning Report No. 136, A Park and Open Space Plan for Washington County, March 1989.*

<sup>4</sup> *SEWRPC Community Assistance Planning Report No. 136, A Park and Open Space Plan for Washington County (2nd Edition), August 1997.*

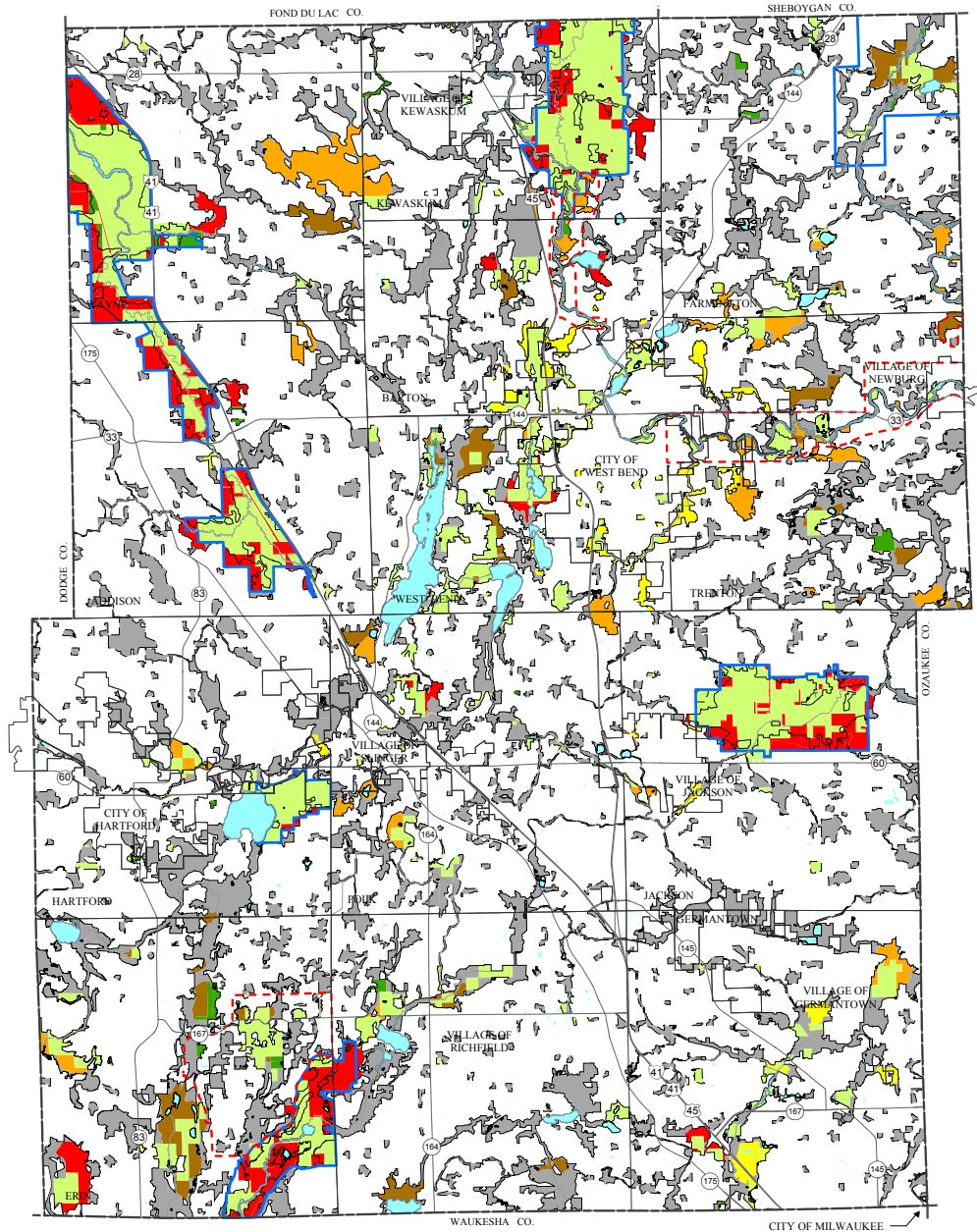
<sup>5</sup> *SEWRPC Community Assistance Planning Report No. 136, (3rd Edition), op. cit.*

<sup>6</sup> *The Conservation Fund; Applied Ecological Services, Inc.; Heart Lake Conservation Associates; Velasco and Associates; and K. Singh and Associates, Conservation Plan, Technical Report Submitted to the Milwaukee Metropolitan Sewerage District, October 31, 2001; SEWRPC Memorandum Report No. 152, A Greenway Connection Plan for the Milwaukee Metropolitan Sewerage District, December 2002.*

<sup>7</sup> *Detailed modeling would need to be conducted on a subwatershed or subbasin level to estimate changes in flood flows resulting from wetland restorations and projected climate change conditions. Such modeling would need to be based on multiple parameters, including the specific acreages of land converted and the previous land use categories of such sites.*

# Map 43

## OPEN SPACE PRESERVATION ELEMENT OF THE WASHINGTON COUNTY PARK AND OPEN SPACE PLAN



### EXISTING PUBLIC INTEREST OWNERSHIP OF OPEN SPACE LANDS

- STATE, COUNTY, LOCAL, NONPROFIT CONSERVATION ORGANIZATION, LAKE OR SANITARY DISTRICT, OR COMPATIBLE PRIVATE OUTDOOR RECREATION OR OPEN SPACE SITES
- LANDS UNDER CONSERVATION EASEMENT

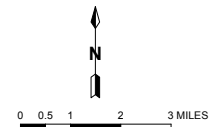
### PROPOSED PUBLIC INTEREST OWNERSHIP OF OPEN SPACE LANDS

- STATE
- COUNTY
- CITY, VILLAGE, TOWN
- NONPROFIT CONSERVATION ORGANIZATION

- OPEN SPACE LANDS TO BE PROTECTED BY PUBLIC LAND USE REGULATION
- SURFACE WATER
- PRIMARY ENVIRONMENTAL CORRIDOR
- SECONDARY ENVIRONMENTAL CORRIDOR
- ISOLATED NATURAL RESOURCE AREA
- PROJECT BOUNDARY ADOPTED BY THE WISCONSIN NATURAL RESOURCES BOARD
- OZAUKEE WASHINGTON LAND TRUST FOCUS AREA

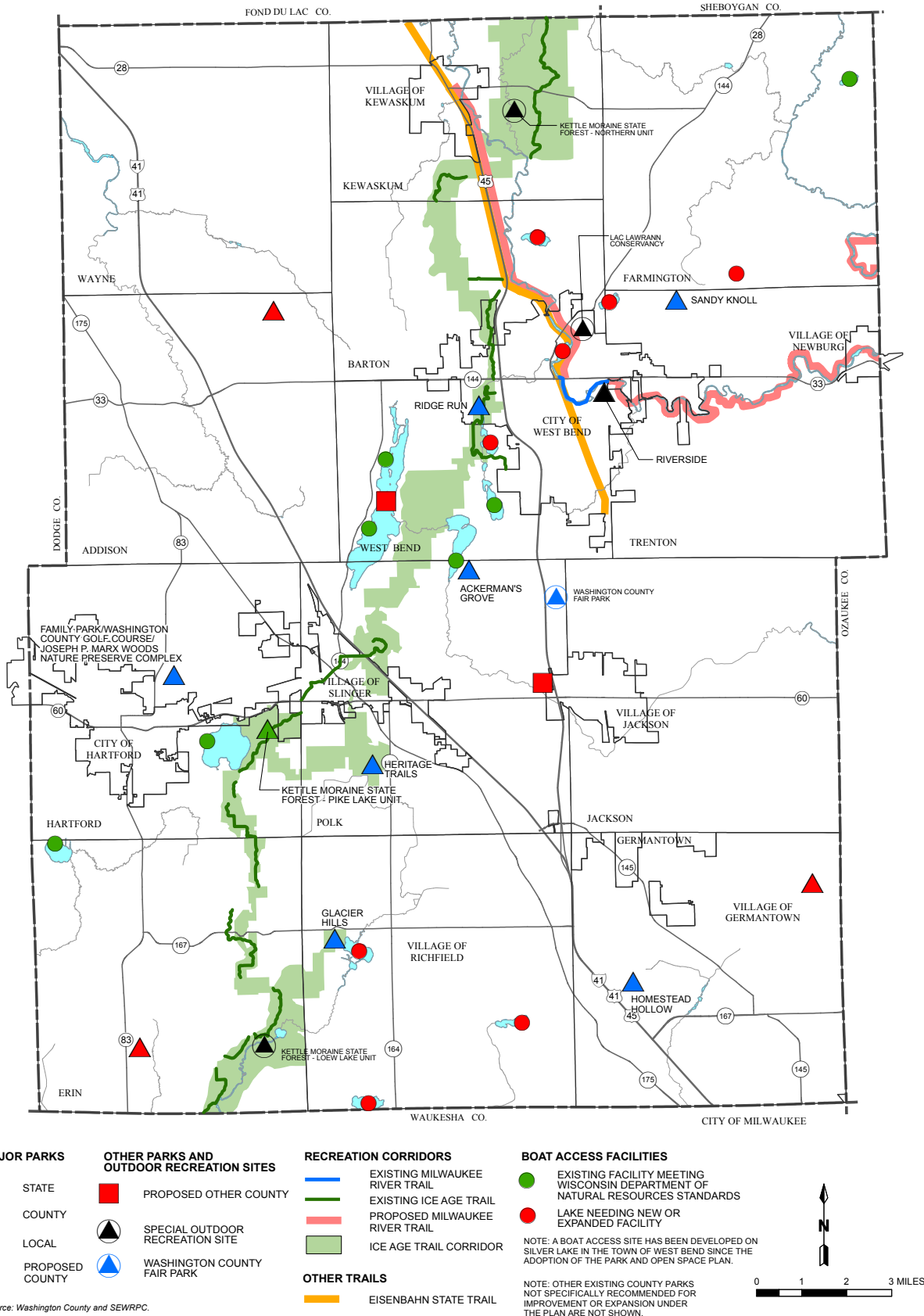
NOTE: EXISTING OWNERSHIP HAS BEEN UPDATED TO REFLECT ACQUISITIONS MADE SINCE THE ADOPTION OF THE COUNTY PARK AND OPEN SPACE PLAN.

Source: SEWRPC.



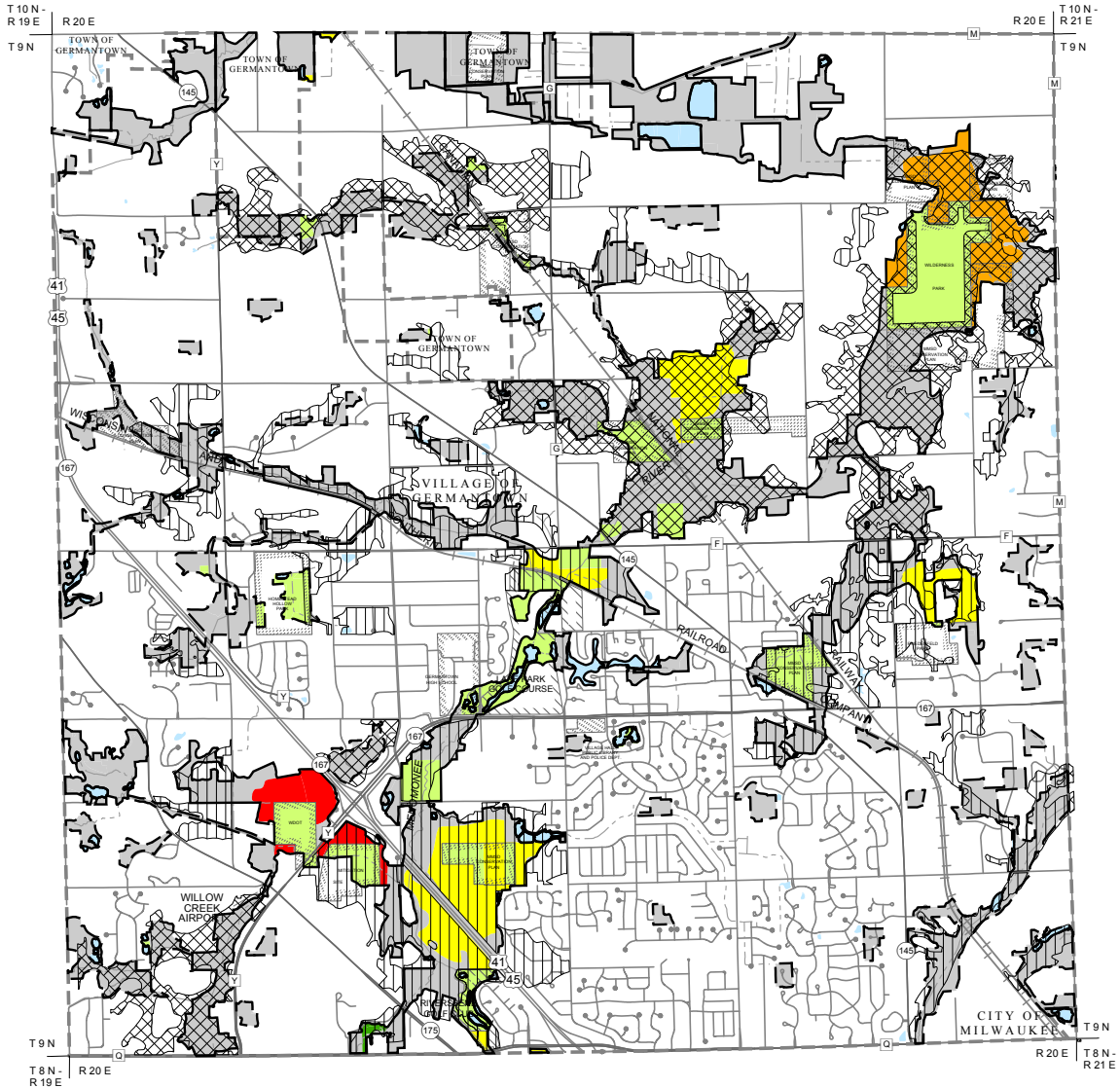
# Map 44

## OUTDOOR RECREATION ELEMENT OF THE WASHINGTON COUNTY PARK AND OPEN SPACE PLAN: 2020



Map 45

**OPEN SPACE ELEMENT OF THE WASHINGTON COUNTY  
PARK AND OPEN SPACE PLAN AND CONSERVATION AREAS IN THE MMSD  
CONSERVATION PLAN AS IT PERTAINS TO THE VILLAGE AND TOWN OF GERMANTOWN**



**EXISTING PUBLIC INTEREST OWNERSHIP OF OPEN SPACE LANDS**

- STATE, COUNTY, LOCAL, NONPROFIT CONSERVATION ORGANIZATION, LAKE OR SANITARY DISTRICT, OR COMPATIBLE PRIVATE OUTDOOR RECREATION OR OPEN SPACE SITES
- LANDS UNDER CONSERVATION EASEMENT

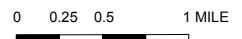
**PROPOSED PUBLIC INTEREST OWNERSHIP OF OPEN SPACE LANDS**

- STATE
- COUNTY
- CITY, VILLAGE, TOWN
- OPEN LANDS TO BE PROTECTED BY PUBLIC LAND USE REGULATION

- SURFACE WATER
- PRIMARY ENVIRONMENTAL CORRIDOR
- SECONDARY ENVIRONMENTAL CORRIDOR
- ISOLATED NATURAL RESOURCE AREA

**MMSD CONSERVATION PLAN**

- HIGH PRIORITY CONSERVATION AREA
- LOW-MEDIUM PRIORITY CONSERVATION AREA



SOURCE: SEWRPC.



As discussed in Chapter II of this report, Washington County had about 46,528 acres of wetland in 2010 (see Table 7 in Chapter II). This is a fraction of the wetland area that existed in the County in pre-settlement years. Urbanization and agricultural development have altered the landscape with regard to wetlands and surface water drainage characteristics in the County. To facilitate drainage of wetlands and other low-lying areas for cultivation, networks of drainage tile were installed, agricultural drainage ditches were constructed, and some existing streams were channelized. These measures were intended to protect crops by lowering the groundwater table and increasing the capacity to convey water downstream. However, such channelization reduces, or eliminates, the connection between the stream channel and overbank areas during floods, with the effect of reducing floodwater storage in the overbanks, resulting in larger flood flows downstream.

In addition to providing storage for floodwaters and potentially reducing downstream property damages due to flooding, reconnecting agricultural drainage channels to the floodplain and returning some agricultural lands to their original wetland condition would reduce damages to crops due to flooding. In 2010 there were approximately 7,860 acres of agricultural land located within the one-percent-annual-probability flood hazard area in Washington County, making them susceptible to riverine flooding during large storm events. As indicated in Chapter III of this report, over \$15.9 million in crop damages were reported due to flooding in Washington County between 1958 through 2014 (2014 dollars). The average annual crop damages due to flooding are approximately \$279,000. It should be noted that these economic losses likely represent an underestimate of the actual damages to crops due to flooding in the County, because damages to crops often go unreported and records of crop losses prior to 1989 are spotty.

The WDNR has developed a digital dataset of potentially restorable wetlands consisting of areas of former wetland that were drained and converted to agricultural uses.<sup>8</sup> Areas identified as potentially restorable wetlands must have hydric soils and a current land use that is compatible with wetland restoration techniques and must not be currently mapped as a wetland. There are about 13,550 acres of potentially restorable wetlands in Washington County; however, not all of these are good candidates for restoration. About 2,700 acres of potentially restorable wetland are located within the one-percent-annual-probability flood hazard area and are currently in agricultural- use per the SEWRPC 2010 land use inventory. These areas are shown on Map 46.

Agricultural lands are prime candidate for wetland restoration because they are in undeveloped, open space uses and there are Federal and State conservation programs available to support the conversion of certain agricultural lands to wetland. Conversion of agricultural lands to wetlands could be accomplished through a variety of means, including installation of agricultural best management practices or through purchase of land or easements. Some conservation programs may provide cost share funding for a percentage of the costs of wetland restoration as well as providing an annual rental rate for taking the land out of production. Under some programs, farmers might still be able to harvest forage from converted lands.

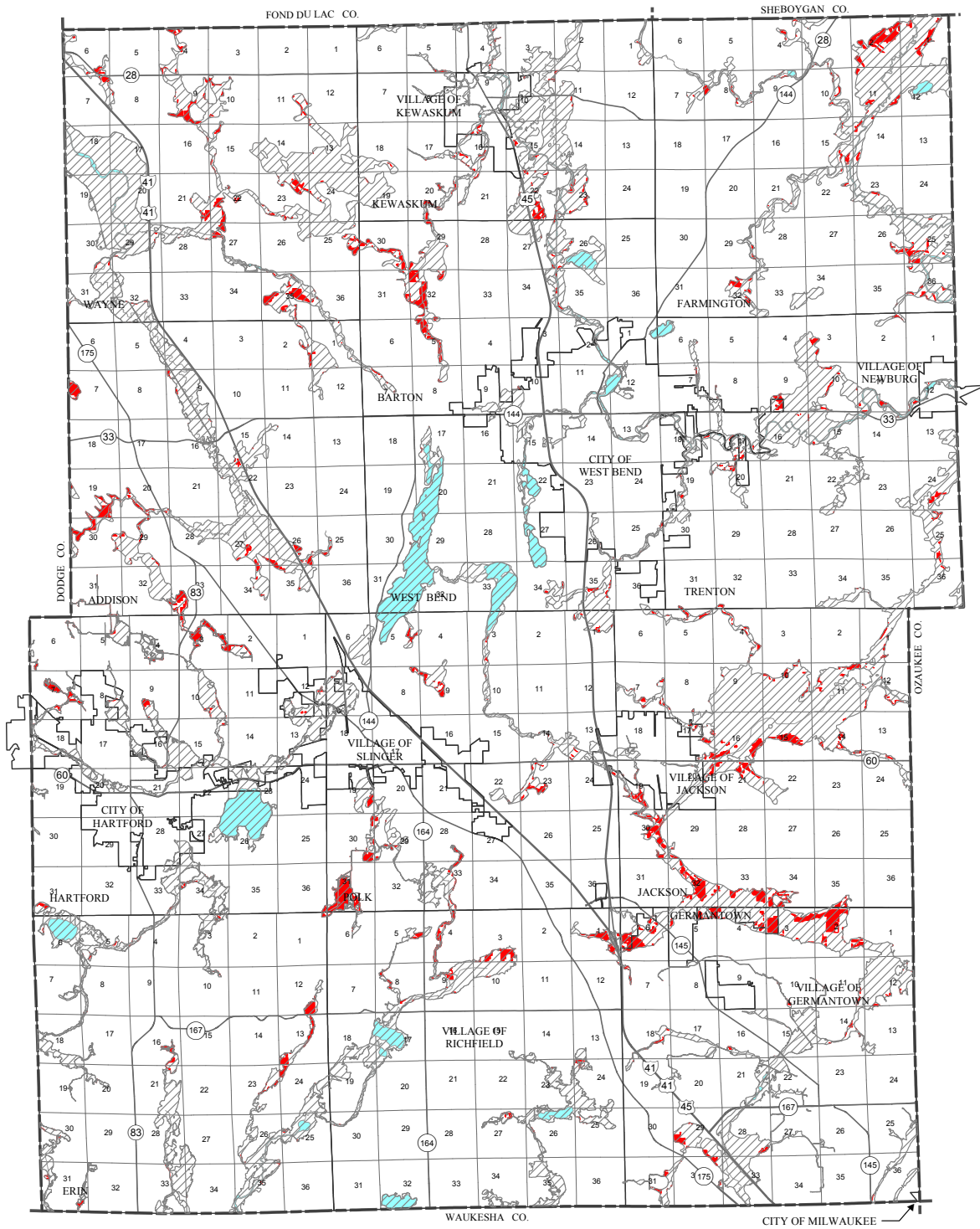
As previously described, Map 46 shows those areas of potentially restorable wetland in Washington County that are both located in the one-percent-annual-probability flood hazard area and currently in agricultural land uses. If all of these lands were restored as wetlands, average annual crop losses due to flooding would be reduced by about 35 percent. Based upon reported losses, this would result in an average annual reduction in crop losses due to flooding of at least \$97,000 (2014 dollars). Partial implementation would result in smaller reductions in average annual losses. It is also possible that additional mitigation of potential downstream property damage might result from converting these lands to wetlands; however, detailed modeling would need to be conducted to determine the amount of flood flow reduction that would be associated with restoring wetlands on these lands. It should also be noted that restoring wetlands at the sites shown on Map 46 could potentially result in other benefits not related to hazard mitigation, such as improvements in fish and wildlife habitat, improvements in water quality, enhancement of recreational opportunities, and/or erosion control benefits.

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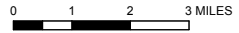
<sup>8</sup> *Wisconsin Department of Natural Resources, Mapping Potentially Restorable Wetlands in the Rock River Basin, August 2008.*

Map 46

AGRICULTURAL LAND TO BE CONSIDERED FOR WETLAND RESTORATION



- AGRICULTURAL LAND TO BE CONSIDERED FOR WETLAND RESTORATION  
(These areas indicate agricultural land that is located within the 100-year Floodplain and considered by WDNR to be Potentially Restorable Wetland) (2012)
- ONE-PERCENT-ANNUAL-PROBABILITY  
(100-YEAR RECURRENCE INTERVAL)  
FLOODPLAINS (2012)



Source: Wisconsin Department of Natural Resources and SEWRPC.

When opportunities present themselves on a particular tract of land (see Map 46), wetland restoration should be considered. It is recommended that such restoration be implemented on a voluntary basis at the discretion of the property owner.

It should be noted that estimates of costs for wetland restoration vary greatly depending upon the type of wetland, the specific restoration techniques employed, local construction costs, and whether the restoration costs include the cost of land acquisition. A sense of the range of wetland restoration costs is given in the following two examples. The average per acre cost of projects on about 8,800 acres in Iowa during fiscal year 2004 was about \$2,500 (2014 dollars).<sup>9</sup> Estimates of per acre restoration costs for perennial marshes, seasonal marshes, and wet meadows for the San Francisco region ranged between \$26,700 and \$93,500 (2014 dollars).<sup>10</sup> For the purpose of this recommendation, the estimated wetland restoration per acre cost developed for the Des Plaines River Watershed Plan of \$5,100 was used.<sup>11</sup> Thus the estimated cost of restoring all 2,700 acres of potentially restorable wetland that are located within the one-percent-annual-probability flood hazard area and are currently in agricultural land uses would be about \$13.8 million.

### ***Floodplain Management Element***

The main emphasis of the floodplain management element of the Washington County hazard mitigation plan is addressing the structures identified in the parcel-based analysis as potentially being located in the one-percent-annual-probability floodplains. The principal features of this element and associated costs are given in Table 49.

As noted in Chapter III of this report, based on information from large-scale topographic maps, the parcel-based analysis identified 987 structures as potentially being located in the one-percent-annual-probability floodplains in Washington County (see Maps 28 and 29). Based upon the County's 2015 assessment, the assessed value of these structures was estimated to be about \$132.9 million. It was also estimated that the damages resulting from a one-percent-annual-probability flood that affected the entire County would be about \$22.9 million (2014 dollars).

Included among these structures are two repetitive loss structures that have had at least two flood insurance claims exceeding \$1,000 and two severe repetitive loss structures that have had at least four flood insurance claims exceeding \$5,000. All four of these structures are single-family residential structures. The 2015 assessed value of these structures was about \$605,000. Since 1984, the National Flood Insurance Program has paid indemnities of about \$211,000 in response to flood claims on these four properties. The damages to these four properties that would result from a one-percent-annual-probability flood are estimated to be about \$187,400 (2014 dollars).

The following priority mitigation measures are recommended for addressing the structures identified as potentially being located in the one-percent-annual-probability floodplain:

- Acquisition and demolition of the four repetitive loss/severe repetitive loss properties that have been identified in the County. Following demolition of the structures, the land should be kept in open space uses. This plan element is presented as an option, subject to the preference of each individual property owner. The

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<sup>9</sup> *Natural Resources Conservation Service, Restoring Iowa Wetlands: A Snapshot of Iowa's Wetland Types, Benefits, Restoration Processes, and Programs for Land Users, January 2005.*

<sup>10</sup> *John Zentner, Jeff Glaspy, and Devin Schenk, "Wetland and Riparian Woodland Restoration Costs," Ecological Restoration, volume 214, pages 166-173, 2003. It should be noted that because the estimates in this article only addressed the costs of construction, 35 percent was added to the estimates for costs of planning, engineering, permitting, and contingencies.*

<sup>11</sup> *SEWRPC Planning Report No. 44, A Comprehensive Plan for the Des Plaines River Watershed, June 2003.*

**Table 49**

**PRINCIPAL FEATURES AND COST OF THE RECOMMENDED  
FLOODPLAIN MANAGEMENT PLAN ELEMENT FOR WASHINGTON COUNTY**

Component	Capital Cost <sup>a</sup>		Annual Operation and Maintenance Cost (thousands of dollars) <sup>a</sup>	Implementation Status
	Description	Cost (thousands of dollars) <sup>a</sup>		
1. Repetitive loss and severe repetitive loss structures	Remove four structures <sup>b</sup>	\$1,740.0	--	Not implemented
2. Floodplain map updating and refining	Several projects	--	--	Ongoing
3. Surveys of structures identified as being potentially located in flood hazard area	Survey up to 983 structures <sup>c</sup>	1,180.0 <sup>c</sup>	--	Not implemented
4. Floodproofing structures identified as being potentially located in the flood hazard area	Floodproof up to 211 structures <sup>d</sup>	10,096.0 <sup>d</sup>	--	Not implemented
5. Acquisition and demolition of structures identified as being potentially located in flood hazard area	Remove up to 635 structures <sup>e</sup>	212,500.0 <sup>e</sup>	--	Not implemented
6. Removal of mobile homes identified as being potentially located in the flood hazard area	Remove up to 137 mobile homes <sup>f</sup>	6,468.0 <sup>f</sup>	--	Not implemented
	Total	\$231,984.0	--	--

<sup>a</sup>Amounts shown are in 2014 dollars.

<sup>b</sup>Structure removal to be carried out at discretion of property owners.

<sup>c</sup>Surveys to be conducted at the discretion of property owners. The number of structures to be surveyed and the associated costs are likely to be lower based upon the results of recommended floodplain map updating and refining. Costs are based upon costs of field survey. It is likely that the costs of evaluating flood hazard status of structures using LiDAR data would be lower. These surveys should be conducted in conjunction with floodproofing and/or acquisition and demolition projects.

<sup>d</sup>Floodproofing to be conducted at the discretion of property owners.

<sup>e</sup>Structure removal to be carried out at the discretion of property owners.

<sup>f</sup>Mobile home removal to be carried out at the discretion of property owners.

Source: SEWRPC.

damages that these properties would experience from a one-percent-annual-probability flood are estimated to be about \$187,400 (2014 dollars). Based on the land and improvement values from the County's 2015 assessment, it is estimated that the cost of this measure would be about \$1.74 million.

- There are currently several ongoing efforts to refine delineation and mapping of floodplains and estimate flood elevations for portions of the watershed in Washington County. These efforts are described in the subsection on the National Flood Insurance Program and floodplain map updating efforts later in this chapter. Following completion of each map updating effort and approval of the revised Flood Insurance Rate Map (FIRM) by the Federal Emergency Management Agency (FEMA), the status of the structures identified as potentially being located in the associated one-percent-annual-probability floodplain should be re-evaluated.
- When implementation of floodproofing, relocation, or removal measures is being considered, field surveys should be made of those structures identified as being potentially located within one-percent-annual-probability floodplains in order to obtain a more definitive assessment of their flood hazard status. It should

be noted that where LiDAR<sup>12</sup> topographic data are available, applicants for Letters of Map Amendment (LOMA) may submit LiDAR data to FEMA in lieu of a certified elevation survey by a professional engineer or land surveyor provided that certain standards are met.<sup>13</sup> This may allow a more definitive assessment of a structure's flood hazard status to be obtained at a lower cost. This plan element is presented as a voluntary option, subject to the preference of the individual property owner. The estimated cost of implementing this element for all structures that have been identified as potentially being located within the one-percent-annual-probability floodplains is \$1.180 million.

- In portions of the County where floodplain maps are being refined and updated, field surveys as called for in the preceding recommendation should be pursued only for those structures that have been determined to be potentially located within the updated flood hazard area following the map updating.
- Because many of the structures identified as potentially being located within the one-percent-annual-probability floodplain are dispersed throughout the County, the decision to conduct the proposed surveys should generally be made on a case-by-case basis. Despite this, there are some areas within the County that have large enough numbers of such structures that it may be worthwhile for the County or the affected communities to consider conducting such surveys as part of a larger program. These areas are shown on Map 47 and include areas within and adjacent to: 1) the Village of Jackson; 2) the Village of Kewaskum; and 3) areas along and adjacent to Friess Lake, Bark Lake, Druid Lake, and Little Cedar Lake.
- Floodproofing of up to 211 structures identified in the parcel-based analysis (using geographic information system techniques and color orthophotography) as potentially being located in the one-percent-annual-probability floodplains. These structures consist of multi-unit residential buildings such as condominiums and apartment buildings, commercial structures, agricultural structures, government and other structures. Locations of these structures are shown on Map 47. For any particular structure, this recommendation should be implemented following confirmation of the structure's flood hazard status through the floodplain map updating and field surveys previously described.<sup>14</sup> This plan element is presented as a voluntary option, subject to the preference of the individual property owner. The damages that these properties would experience from a one-percent-annual-probability flood are estimated to be about \$7.6 million (2014 dollars). The estimated cost of floodproofing all 211 structures is \$10.1 million.
- Acquisition and removal of up to 635 structures identified in the parcel-based analysis (using geographic information system techniques and color orthophotography) as potentially being located in the one-percent-annual-probability floodplains.<sup>15</sup> Locations of these structures are shown on Map 47. Following demolition of the structures, the land should be kept in open space uses. These structures consist of single-family residential buildings and some associated structures. For any particular structure, this recommendation should be implemented following confirmation of the structure's flood hazard status through the floodplain map updating and field surveys previously described. This plan element is presented as a voluntary option,

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<sup>12</sup> *LiDAR stands for Light Imaging, Detection, and Ranging.*

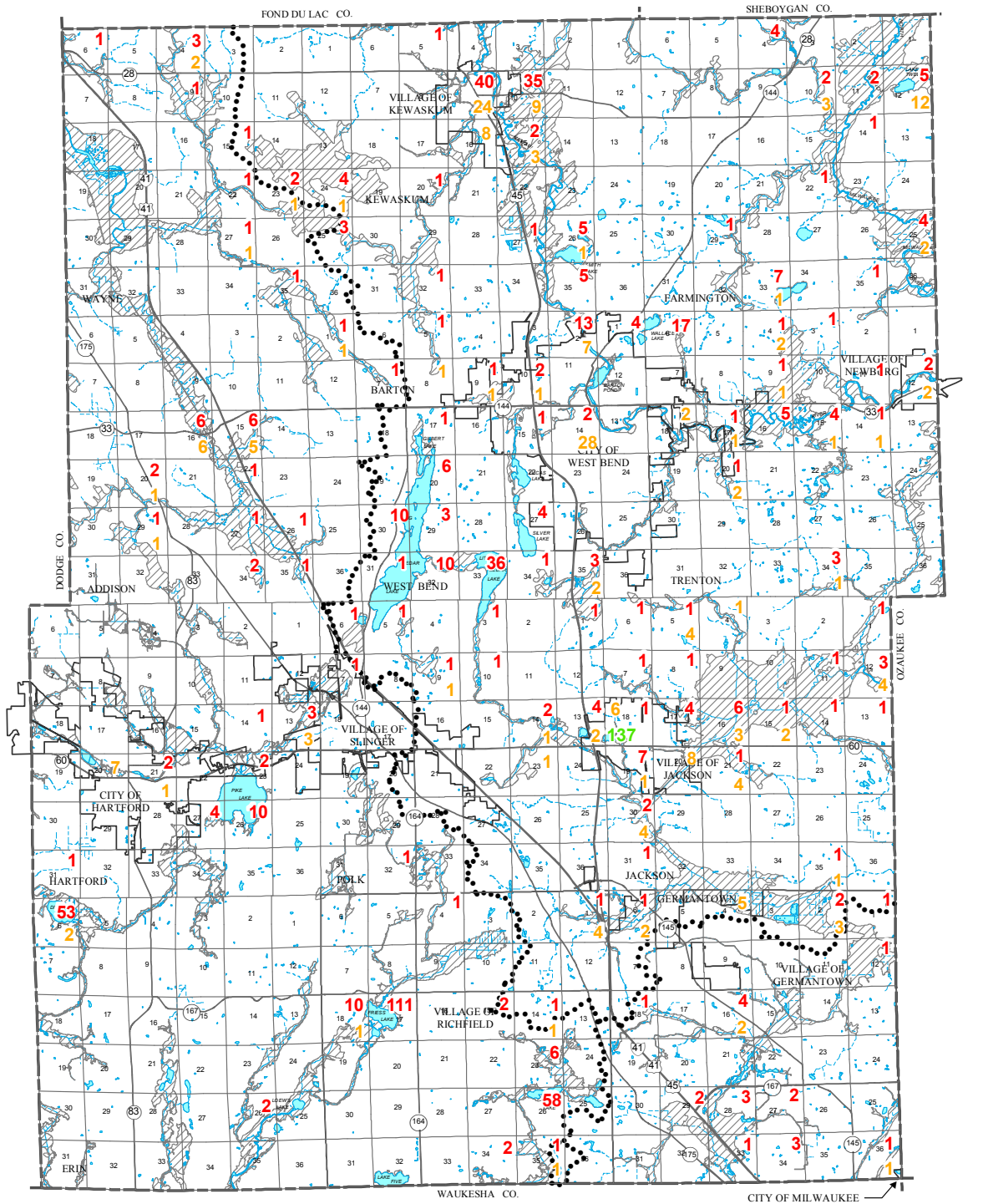
<sup>13</sup> *The standards are summarized in Wisconsin Department of Natural Resources, "FEMA Announces New Letter of Map Amendment Guidance," Floodplain and Shoreland Management Notes, Volume 11, Number 3, page 3, Fall 2012.*

<sup>14</sup> *It is anticipated that the results of the floodplain map updating efforts and the field surveys may reduce the number of structures that are confirmed to be in the flood hazard area and that may require floodproofing.*






<sup>15</sup> *Note that this total and the associated costs do not include the four repetitive loss/severe repetitive loss properties previously described.*

Map 47

RECOMMENDED FLOODPLAIN MANAGEMENT MEASURES FOR THE WASHINGTON COUNTY HAZARD MITIGATION PLAN: 2017



- 639** STRUCTURES TO BE CONSIDERED FOR ACQUISITION AND DEMOLITION (NUMBER OF STRUCTURES IN U.S. PUBLIC LAND SURVEY SECTION)
- 211** STRUCTURES TO BE CONSIDERED FOR FLOODPROOFING (NUMBER OF STRUCTURES IN U.S. PUBLIC LAND SURVEY SECTION)
- 137** MOBILE HOMES TO BE CONSIDERED FOR REMOVAL FROM THE FLOODPLAIN (NUMBER OF STRUCTURES IN U.S. PUBLIC LAND SURVEY SECTION)

-  ONE - PERCENT - ANNUAL - PROBABILITY (100 - YEAR RECURRENCE INTERVAL) FLOODPLAINS (2012)
-  SURFACE WATER
-  PERENNIAL STREAM
-  INTERMITTENT STREAM
-  MAJOR WATERSHED BOUNDARY



Source: SEWRPC.

subject to the preference of the individual property owner. The damages that these properties would experience from a one-percent-annual-probability flood are estimated to be about \$14.3 million (2014 dollars). The estimated cost of acquiring and removing all 635 structures is \$212.5 million.

- Removal of up to 137 mobile homes identified in the parcel-based analysis (using geographic information system techniques and color orthophotography) as potentially being located in the one-percent-annual-probability floodplains and acquisition of the land on which they are located. Following removal of the mobile homes, the land should be kept in open space uses. This recommendation should be implemented following confirmation of the structure's flood hazard status through the floodplain map updating and field surveys previously described. This plan element is presented as a voluntary option, subject to the preference of the individual property owner. The damages that these properties would experience from a one-percent-annual-probability flood are estimated to be about \$795,000 (2014 dollars). The estimated cost of acquiring and removing all 137 mobile homes is about \$6.5 million.

In addition to the measures outlined above, the floodplain management element contains several accessory measures to meet additional needs within the County. These include:

- Application of the standards set forth in Chapter IV relative to bridge replacement to ensure that major streets and highways remain operable during flood events;
- Continued participation in the National Flood Insurance Program;
- Purchase of Federal flood insurance by property owners in floodprone areas;
- Continuation of desirable policies by lending institutions and realtors concerning the sale of properties along rivers and lakes, including determination of the floodprone status of properties prior to granting a mortgage;
- Continued enforcement of floodplain regulations within the County; and
- Maintenance of U.S. Geological Survey (USGS) stream gages on streams and rivers downstream of Washington County.<sup>16</sup> Gages that should be maintained include:
  - The gage on the Menomonee River in Village of Menomonee Falls. This gage is operated by USGS in cooperation with Waukesha County, the WDNR, and the Southeastern Wisconsin Regional Planning Commission (SEWRPC);
  - The gage on the Milwaukee River near the City of Cedarburg. This gage is operated by USGS in cooperation with the MMSD and SEWRPC;
  - The gage on Cedar Creek at the City of Cedarburg. This gage is operated by USGS in cooperation with the WDNR;
  - The gage on the Rock River at the City of Horicon. This gage is operated by USGS in cooperation the WDNR; and
  - The gage on the Rock River at the City of Watertown. This gage is operated by USGS in cooperation with the WDNR and the U.S. Army Corps of Engineers (USACE).

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<sup>16</sup> Locations of current and historical U.S. Geological Survey stream-gaging station are shown on Map 21 of the SEWRPC 2015 annual report. This can be downloaded at: <http://www.sewrpc.org/SEWRPCFiles/Publications/AnnualReport/2015-annual-report.pdf>

Some additional discussion of elements and accessory elements are included in the subsections below.

#### *Survey of Buildings in and near the 100-Year Floodplain*

The extent of the one-percent-annual-probability floodplain has been delineated on the Washington County large-scale topographic maps, and much of that information is reflected on the FEMA digital flood insurance rate maps (DFIRMs) that have been prepared. While those maps are adequate in detail to identify the extent of flooding for planning and zoning purposes, they can only be considered approximate in regards to establishing building grades. Thus, when flood mitigation actions are being considered for a given structure or group of structures, this plan calls for Washington County, or the appropriate municipality, to survey the low-grade elevations adjacent to buildings and the first-floor elevations of buildings that have been identified as being in or near the one-percent-probability floodplain. Such surveys will provide a more definitive identification of the flood hazard for those properties, and will assist property owners in deciding upon a course of action regarding flood mitigation options.

#### *National Flood Insurance Program and Floodplain Map Updating Efforts*

Washington County and all its cities and villages have been designated by FEMA as having flood hazard areas and have taken the steps needed to make residents eligible to participate in the NFIP. A Flood Insurance Study (FIS) has been completed by FEMA for Washington County and all municipalities identified by FEMA as having flood hazards. This plan calls for the continued participation of Washington County and the municipalities in the NFIP. The plan also calls for the appropriate County or incorporated municipality to request FEMA to revise, as necessary, the flood insurance study to reflect new flood hazard data when such data become available. The plan recommends that owners of property in Washington County to purchase flood insurance to provide some financial relief for losses sustained in floods that may occur in floodprone areas. Flood insurance is needed both where no flood control measures are recommended and in other floodprone areas before the implementation of any flood mitigation measures included in the plan. Finally, as the flood control measures are implemented, the plan calls for FEMA to make the necessary revisions to the FIS. Participation in the NFIP by the communities in Washington County is summarized in Table 50.

In 2013, FEMA completed an update of the Washington County FIS as part of its Map Modernization program. The Map Modernization products include a countywide FIS and digital flood insurance rate maps (DFIRM). The floodplain areas in the County were mapped on large-scale topographic mapping prepared at a scale of one inch equals 200 feet, with a contour interval of two feet. The floodplain mapping is shown on the FEMA digital flood insurance rate maps for Washington County which were finalized in 2013 and are available as a digital file layer for the Washington County cadastral mapping system which covers the entire County. Floodplain areas for the portions of the Rock River watershed in western Washington County were mapped using geographical information systems (GIS) techniques through FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) Program. The floodplain mapping for this portion of the County is shown on the FEMA digital flood insurance rate maps for Washington County which were finalized in October 2015 and is available as a digital file layer for the Washington County cadastral mapping system which covers the entire County.

FEMA has begun additional examinations of floodplains in several portions of Washington County through its Risk MAP Program. This program provides communities with more precise flood mapping products, risk assessment tools, and planning and outreach support in order to reduce the risks due to flooding.

On May 16, 2013, Initial Discovery meetings were held by the WDNR for the Milwaukee River watershed. This watershed encompasses portions of Dodge, Fond du Lac, Milwaukee, Sheboygan, Ozaukee, Washington, and Waukesha Counties. Following this meeting, FEMA issued an initial discovery report.<sup>17</sup> Additional discovery meetings were held with communities in the watershed in February 2014. A final discovery report was issued to

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<sup>17</sup> *Federal Emergency Management Agency, Discovery Report: Milwaukee Watershed, HUC 04040003, May 16, 2013.*



Table 50

**PARTICIPATION IN THE NATIONAL FLOOD INSURANCE PROGRAM BY WASHINGTON COUNTY JURISDICTIONS**

Civil Division	Participating in Washington County Hazard Mitigation Plan	Participating in National Flood Insurance Program	Date Initial Flood Hazard Boundary Map Identified	Date Initial Flood Insurance Rate Map (FIRM)	Current Effective Map Date	Entry Date into National Flood Insurance Program
<b>Cities</b>						
Hartford .....	Yes	Yes	01/09/1974	12/04/1984	10/16/2015	12/04/1984
West Bend.....	Yes	Yes	12/28/1973	08/02/1982	11/20/2013	08/02/1982
<b>Villages</b>						
Germantown.....	Yes	Yes	06/28/1974	05/03/1982	10/16/2015	05/03/1982
Jackson .....	Yes	Yes	12/28/1973	08/17/1981	11/20/2013	08/17/1981
Kewaskum.....	Yes	Yes	12/28/1973	01/06/1982	11/20/2013	01/06/1982
Newburg.....	Yes	Yes	--	12/04/2007	11/20/2013	11/13/2008
Richfield.....	Yes	Yes	08/12/1977	09/01/1982	10/16/2015	09/30/2008
Slinger .....	Yes	Yes	10/21/1977	11/20/2013	10/16/2015	11/20/2013
<b>Towns</b>						
Addison .....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
Barton.....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
Erin.....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
Farmington .....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
Germantown.....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
Hartford .....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
Jackson .....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
Kewaskum.....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
Polk .....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
Trenton.....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
Wayne .....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
West Bend.....	Yes	Yes	08/12/1977 <sup>a</sup>	09/01/1983 <sup>a</sup>	10/16/2015 <sup>a</sup>	09/01/1983 <sup>a</sup>
<b>County</b>						
Washington County....	Yes	Yes	08/12/1977	09/01/1983	10/16/2015	09/01/1983

<sup>a</sup>In Wisconsin, towns are covered under county eligibility in the National Flood Insurance Program.

Source: Federal Emergency Management Agency.

reflect additional comments from the communities and set priorities for floodplain revisions.<sup>18</sup> As part of this Risk MAP project, detailed studies are being conducted by the WDNR for the mainstem of the Milwaukee River in Washington County, as well as several tributary streams in the northeastern and northcentral portions of the County and some tributaries to the Menomonee River in the southeastern portion of the County. The WDNR is currently conducting hydraulic and hydrologic modeling; however, as of April 2017 FEMA funding for the production of DFIRMs for these streams has not been allocated.

Washington County is currently updating approximate floodplain mapping for the East Branch of the Rock River and its tributaries in the northwestern portion of the County. As of April 2017, survey work has been completed and detailed hydrologic and hydraulic modeling are underway. County staff anticipates that the analysis will be completed and ready for review by the WDNR and FEMA in 2018.

A project to update the floodplains along the mainstem of the Menomonee River, including the portion in Washington County, is currently being conducted under a floodplain map updating program being conducted cooperatively by

<sup>18</sup> Federal Emergency Management Agency, Discovery Report: Milwaukee Watershed, HUC 04040003, June 12, 2014.

the Milwaukee County Land Information Council,<sup>19</sup> the Milwaukee Metropolitan Sewerage District (MMSD), and SEWRPC. Hydrologic modeling has been completed and floodplain mapping is underway.

In 2016, Washington County and the WDNR submitted updated floodplain mapping and modeling for the Cedar Creek watershed to FEMA. As of April 2017, these proposed revisions are under review by FEMA.

#### *Lending Institution and Real-Estate-Agent Policies*

This plan calls for lending institutions to continue their practice of determining the floodprone status of properties before mortgage transactions. To that end, these institutions should consult with the appropriate local zoning department to inquire about any additional flood hazard studies for areas not identified in the FIS. The plan also calls for real-estate brokers and salespersons to continue to inform potential purchasers of property of any flood hazard that may exist at the site being traded in accord with rules of the Wisconsin Department of Safety and Professional Services.

#### ***Stormwater Management Element***

Because of the relationship between stormwater management and floodplain management, stormwater management actions are an important element of the flood mitigation plan. This element of the plan includes the status of stormwater management planning and stormwater ordinances and related regulations.

#### *Stormwater Management Plans*

Chapter 283 of the *Wisconsin Statutes* and Chapter NR 216 of the *Wisconsin Administrative Code* requires certain municipalities to obtain State stormwater discharge permits to discharge stormwater to receiving streams and watercourses from municipal storm sewer systems. The State *Statutes* and implementing *Administrative Code* require municipalities to file applications for the State permits. The permit applications must demonstrate that the municipality concerned has the legal authority to control pollutant contributions to storm sewer systems from various sources. The permit application must provide stormwater management-related data, most of which would be provided through a properly prepared, technically sound, stormwater management system plan.

Within Washington County, certain municipalities are required to obtain State stormwater discharge permits under the Wisconsin Pollution Discharge Elimination System (WPDES). Those municipalities with permits include Washington County, the Cities of Hartford and West Bend; the Villages of Germantown, Jackson, Kewaskum, Richfield, and Slinger; and the Towns of Germantown, Hartford, and West Bend.

The Washington County Land Conservation Department, the Big Cedar Lake Protection and Rehabilitation District, and the Cedar Lakes Conservation Foundation developed a stormwater management plan for Big Cedar Lake.<sup>20</sup> While this much of this plan's focus was related to water quality issues, it included development of stormwater management plans for three of the twenty subbasins that drain to Big Cedar Lake. Relative to stormwater quantity, this plan recommended: 1) the purchase and preservation of a wooded depression adjacent to State Trunk Highway (STH) 144 located to the northwest of Gilbert Lake; 2) Some relatively minor modifications of the drainage system downstream from this depression; and 3) construction of three wet detention basins, or alternatively construction of a single larger basin. The plan also recommended development of stormwater management plans for the remaining 17 subbasins that drain to the Lake.

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<sup>19</sup> *Formerly the Milwaukee County Automated Mapping and Land Information System (MCAMLIS) Steering Committee.*

<sup>20</sup> *SEWRPC Memorandum Report No. 137, A Water Quality Protection and Stormwater Management Plan for Big Cedar Lake, Washington County, Wisconsin, Volume One: Inventory Findings, Water Quality Analyses, and Recommended Management Measures, Volume Two: Stormwater Management Plans for Three Pilot Subbasins, August 2001.*

The City of West Bend developed and adopted a stormwater management plan.<sup>21</sup> This plan specified design criteria for stormwater management in the City. It examined and assessed the capacity of components of the City's stormwater management system. Based on this assessment, it identified components of the minor stormwater management system with insufficient capacity to pass the peak runoff from the 10-percent-annual-probability storm and components of the major stormwater management system with insufficient capacity to pass the peak runoff from the one-percent-annual-probability storm. The plan also recommended actions to remedy the identified problems. Chapter 23, "Stormwater Management," of the *City of West Bend Municipal Code* requires that stormwater management facilities be constructed consistent with this plan. In addition, where this Chapter requires that a stormwater management plan be developed as a part of land development activities, it requires that the plan be consistent, to the extent practicable, with the City stormwater management plan.

A drainage study was prepared for the Village of Slinger in 1988.<sup>22</sup> This study identified three areas in the Village that had experienced flooding problems related to stormwater drainage. The study examined alternatives to address these problems.

The remaining urban communities in the County are encouraged to prepare stormwater management plans. In those towns that are anticipated to remain mostly rural under the adopted land use plan, stormwater management planning is considered to be needed only for certain site-specific areas where urbanization is expected or where isolated urban areas already exist and stormwater-related problems have developed.

#### *Stormwater-Related Regulations*

In 2002 the WDNR issued Chapter NR 151 of the *Wisconsin Administrative Code*, outlining standards governing stormwater runoff from both agricultural and nonagricultural lands. Those standards include controls for both the quantity and quality of runoff from newly developed and redeveloped lands. These rules are administered by the WDNR through the Chapter NR 216 stormwater discharge permit system, although local municipalities have the option of adopting their own ordinances consistent with the *Administrative Code*. Chapter NR 152 of the *Administrative Code* contains model ordinances covering both agricultural and nonagricultural operations. Those communities that are required to obtain a stormwater discharge permit are required to have a stormwater management program which most often results in adoption of a stormwater management ordinance.

As noted previously, communities with approved State stormwater discharge permits include Washington County, the Cities of Hartford and West Bend; the Villages of Germantown, Jackson, Kewaskum, Richfield, and Slinger; and the Towns of Germantown, Hartford, and West Bend. Washington County, the Cities of Hartford and West Bend; and the Villages of Germantown, Kewaskum, Richfield, and Slinger have adopted stormwater management ordinances as part of their discharge permit program. In addition, the Towns of Kewaskum and Trenton have adopted stormwater management ordinances. The County ordinance applies to all unincorporated areas not covered by their own ordinances. In those Towns that also have a stormwater management ordinance, it is recommended that the County and the Towns work to ensure that the objectives of each ordinance are met in a coordinated manner.

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<sup>21</sup> *SEWRPC Community Assistance Planning Report No. 173, A Stormwater Management Plan for the City of West Bend, Washington County, Wisconsin, Volume One: Inventory Findings, Objectives, and Design Criteria, October 1989; Volume Two: Alternatives and Recommended Plan for the Silver Creek Subwatershed, June 1990; Volume Three: Alternatives and Recommended Plan for the Milwaukee River Drainage Area, June 1995; and Volume Four: Alternatives and Recommended Plan for the Quaas Creek Subwatershed, July 1996.*

<sup>22</sup> *Ruekert-Mielke, A Drainage Study for the Village of Slinger, Village of Slinger, Washington County, Wisconsin, October 1988.*

### ***Public Information and Education Element***

Public information, education, and participation constitute an integral aspect of Washington County's flood mitigation and related efforts. This element includes two subelement activities to be carried out, namely public education activities and public information programming and coordination associated with detailed stormwater and floodplain management plans.

#### *Public Education Activities*

This subelement involves preparation and distribution of educational and self-help materials and provision of educational programs. With regard to this subelement, Washington County and the various municipalities will, as needed, collaborate to prepare and distribute various public informational and educational materials, including materials oriented toward homeowners and designed to help them consider and potentially undertake actions to mitigate damage caused by stormwater flooding and sanitary sewer backups. Methods available for distributing information include, but are not limited to, print and broadcast media, cable television, pamphlet development, individual seminars, the World Wide Web, social media, and community speaking engagements. The Wisconsin Department of Health Services has prepared a flooding toolkit for citizens.<sup>23</sup> The toolkit provides general flood information, preparedness tips, and guidelines on cleaning up after a flood has occurred. A factsheet prepared by the Wisconsin Division of Emergency Management (WEM) explains the different types of flood watches and warnings and provides information on what citizens should do if a flood is likely to occur in their area.<sup>24</sup>

Residents of Washington County are able to receive weather warnings, including warnings related to flooding, through NOAA All Hazard Weather Radio. NOAA Weather Radio is available throughout Washington County via three 24-hour transmitters located near Delafield in Waukesha County, Taycheedah in Fond du Lac County, and the Town of Sheboygan in Sheboygan County. These transmitters operate at frequencies of 162.400 megahertz (MHz), 162.500 MHz, and 162.525 MHz, respectively. In addition, hazard warnings from NOAA Weather Radio are relayed to other media via the Federal Communication Commission's Emergency Alert System (EAS). The EAS allows officials to send emergency information targeted to specific geographical areas. The EAS sends alerts out to broadcast media, cable television providers, satellites, pagers, direct broadcast satellites, high definition television, and video dial tone. This system uses the same digital protocols as NOAA Weather Radio. Nationally, the National Weather Service generates about 80 percent of EAS activations primarily for short-duration weather warnings and watches. Federal, State, and local emergency personnel can also access this system to disseminate nonweather emergency messages through the National Weather Service's HAZCollect system.

In addition, county emergency management representatives from southeastern Wisconsin have worked with computer science students from the University of Wisconsin-Parkside's "App Factory" to develop the *Ready Badger* app for wireless devices.<sup>25</sup> The app is designed to speed the process of sharing and gathering hazard-related information. This app allows emergency managers to send custom-made alerts for any type of emergency, including severe thunderstorm and high-wind related events. It also provides users with access to emergency preparedness information specific to their county. Users can also use the app to submit digital damage reports to County emergency managers, allowing them to assess damages and respond to disasters more quickly.

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<sup>23</sup> *The Wisconsin Flood Toolkit is available for download at <https://www.dhs.wisconsin.gov/publications/p0/p00631.pdf>*

<sup>24</sup> *The ReadyWisconsin flood informational handout is available for download at <http://readywisconsin.wi.gov/media/pdf/Flooding.pdf>*

<sup>25</sup> *The Ready Badger app can be downloaded for free in the Apple App Store and Android Google Play Store.*

### *Public Participation Activities and Coordination with Other Agencies and Units of Government*

The second subelement of this program involves direct public participation and coordination with other agencies during detailed stormwater and floodplain management plan development. Much of this input has occurred in conjunction with floodplain map updating activities.

Risk Mapping, Assessment, and Planning (Risk MAP) is a FEMA program that provides communities with both flood information and tools and the DFIRMs that communities can use to make better informed decisions and to take action to reduce risk to life and property. Discovery meetings for the Milwaukee River watershed were held in 2013 and 2014. At the meetings, communities from around the watershed, WDNR, and FEMA exchanged information regarding flooding history, development plans, flood risks, floodplain management activities, and study needs. These meetings are documented in an initial discovery report and a final discovery report.<sup>26</sup> Technical work has begun on the Risk MAP effort within the Milwaukee River Watershed, including Washington County. The schedule for completing the Risk MAP deliverables in the Milwaukee River watershed has not yet been finalized. Local knowledge and participation from the public through community representatives in Risk MAP discovery meetings is an essential component of a successful Risk MAP program. A similar public process was conducted as part of map modernization and Risk MAP activities in the Upper Rock River watershed.

Toward further informing the public regarding flood mitigation, stormwater and floodplain management, and related issues, this hazard mitigation plan calls for concerned units and agencies of government, including Washington County and all cities and villages within the County, to involve members of the general public and to seek public input in the preparation and implementation of recommendations regarding such issues.

### ***Secondary Plan Element***

In addition to the above-recommended measures, several secondary measures are included in the floodplain management element. These secondary measures are described below.

#### *Documentation of the Extent of Future Floods*

It is recommended that when flooding occurs in Washington County, the County and affected municipalities document the extent of the floods. A number of methods could be used to accomplish this, including aerial, satellite, or ground-based photography showing locations of flooded areas; mapping of the elevation of debris lines resulting from floods; or other mapping techniques.

While FIRMs and the associated Flood Insurance Studies (FIS) are based upon the best data available at the time of their development, the inundation patterns depicted on and described in them are not those of actual historical flood events. Instead they represent estimates of the extent of a hypothetical one-percent-annual-probability event. These estimates are developed using models that are based upon topography; land use; the geometry of, and conditions within, stream channels and adjacent overbank areas; and the presence, configuration, and condition of structures within and adjacent to the stream channel. Actual inundation patterns will vary among floods and are affected by a number of factors, such as local intensity and duration of rainfall, which affects the magnitude of flood flows; blockages of drains and structures; the state of vegetation coverage; and changes that have occurred within the watershed since the development of the FIRM and FIS. It should also be noted that FIRMs only depict flooding related to waterbodies overflowing their banks and do not depict areas inundated by stormwater runoff as it travels to a receiving stream.

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<sup>26</sup> *Federal Emergency Management Agency, Discovery Report: Milwaukee Watershed, HUC 04040003, May 16, 2013; Federal Emergency Management Agency, Discovery Report: Milwaukee Watershed, HUC 04040003, June 12, 2014.*

Data developed through the documentation of the extent of future floods can be used to periodically refine the hydrologic and hydraulic simulation models used to develop the FIRMs and FIS. In addition, such data may also be useful in bridge and culvert design and in water quality management planning.

#### *Stream Channel Maintenance*

This plan calls for Washington County and local municipalities and drainage districts to work cooperatively to continue and expand programs for regular stream channel maintenance within their respective jurisdictions. These programs would include the periodic removal of sediment deposits, selected heavy vegetation, and debris from all watercourses in the County, including bridge openings and culverts, subject to obtaining any necessary local and State permits.

#### *Stormwater Management Facilities Maintenance*

The effectiveness of stormwater management conveyance and detention facilities and other management measures can be sustained only if proper operation, repair, and maintenance procedures are carefully followed. Important maintenance procedures include the periodic repair of storm sewers, clearing of sewer obstructions, maintenance of open channel vegetation linings, clearing debris and sediment from open channels, maintenance of the infiltration capacity of stormwater infiltration facilities, maintenance of detention facility inlets and outlets, maintenance of detention basin vegetative cover, and periodic removal of sediment accumulated in detention basins. The plan calls for these maintenance activities to be carried out on a continuing basis to maximize the effectiveness of the stormwater management facilities and measures and to protect the capital investment in the facilities.

#### *Dam Failure Subelement*

Flooding can be caused by dam failure. Dam failure flooding may occur when flood flows exceed the hydraulic capacity of dam spillways, resulting in water overtopping the dam or abutments and possible structural failure of the dam. The potential impacts of such a failure are related both to the size and configuration of the dam and to the amount, types, and locations of development downstream of the dam.

As discussed in Chapter II of this report, there are 57 dams located in Washington County (see Table 10 and Map 8). One of these dams has been assigned a high hazard rating by the WDNR, indicating the potential for loss of human life as well as economic loss, environmental damage, or disruption of lifelines during failure or misoperation of the dam. Two have been assigned significant hazard ratings by the WDNR, indicating the potential for economic loss, environmental damage, or disruption of lifelines during failure or misoperation of the dam. In addition, 25 dams have been assigned low hazard ratings by the WDNR and the hazard potentials of 29 of these dams have not been determined.

The following mitigation measures are recommended to address the risk of flooding due to dam failure in Washington County:

- All dams in Washington County should be regularly inspected and maintained. Chapter 31, “Regulation of Dams and Bridges Affecting Navigable Waters,” of the *Wisconsin Statutes*, requires inspection of dams by a professional engineer with experience in dams at a frequency based upon the dam’s hazard rating. High hazard dams are required to be inspected every two years, significant hazard dams are required to be inspected every three to four years, and low hazard dams are required to be inspected every 10 years. In addition, it is recommended that owners and operators of dams inspect their dams both on a regular basis and following any high water event.
- Owners or operators of dams should monitor their dams during high water events.
- Owners and operators of high hazard and significant hazard dams should develop, maintain, and periodically update emergency action plans for their dams. Owners and operators of low hazard dams should consider developing, maintaining, and periodically updating such plans. Requirements for emergency action plans

and guidance and templates for developing such plans are available from the WDNR.<sup>27</sup> Such a plan should include:

- Procedures to be followed to warn the public in the event that a dam failure occurs or is likely to occur,
  - Procedures for evacuating areas likely to flood as a result of failure of the dam, and
  - An identification of road closings and reroutings needed to keep traffic and people out of danger areas in the event of flooding due to failure of the dam.
- Dam failure analyses should be completed for those dams for which they are required and have not been done.<sup>28</sup>
  - Hydraulic shadows from dam failure analyses should be added to County and local government geographic information system (GIS) map layers.<sup>29</sup> Local units of government within the County should regulate and zone the hydraulic shadow areas as floodway, unless the shadow area is specifically mapped as floodway and floodplain for the dam hazard designation. For developed areas downstream of compliant high hazard dams, the hydraulic shadow assumes the dam is nonexistent during the one-percent-annual-probability event. For developed areas downstream of compliant significant or low hazard dams, the hydraulic shadow assumes the dam fails during the one-percent-annual-probability event. For undeveloped areas downstream of all compliant dam hazard categories, the hydraulic shadow assumes the dam fails during the one-percent-annual-probability event.

#### *Community Rating System*

The Community Rating System (CRS) is an additional program offered by FEMA as part of its NFIP. The CRS recognizes and encourages community floodplain management activities that go beyond the minimum NFIP standards. The program assigns a ranking to communities that participate based on voluntary floodplain management activities and outreach services that the community provides its residents. A high CRS ranking will offer citizens of that municipality discounts on flood insurance premiums of up to 45 percent. In addition to the benefit of reduced insurance rates, floodplain management and outreach activities associated with CRS aim to further enhance public safety, reduce damages to property and public infrastructure, avoid economic disruption and losses, reduce human suffering, and protect the environment. Participation in the CRS program can provide extra incentive for communities to maintain and improve their floodplain management program. Technical assistance related to design and implementation of some activities associated with the CRS program are available at no charge.

No communities in Washington County currently participate in the CRS program. It is recommended that municipalities consider participation in the CRS program based on the number of NFIP policies currently in effect

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<sup>27</sup> *These can be obtained from the WDNR website at <http://dnr.wi.gov/topic/dams/documentsEAP.html>.*

<sup>28</sup> *Section NR 333.05 of the Wisconsin Administrative Code requires that dam failure analyses be conducted for all dams not owned by the U.S. Government that either 1) have a structural height of more than six feet and a maximum storage capacity of 50 acre-feet or more of water; 2) have a structural height of 25 feet or more and a maximum storage capacity of more than 15 acre-feet of water; or 3) have a structural height of six feet or less and a maximum storage capacity of less than 50 acre-feet of water if the WDNR determines that the dam is likely to endanger life, health, or property if it is not designed, constructed, or reconstructed in accordance with the provisions in Chapter NR 333, "Dam Design and Construction," of the Wisconsin Administrative Code.*

<sup>29</sup> *The hydraulic shadow of a dam is the area of land downstream from a dam that would be inundated by water upon failure of the dam in a regional flood. Section NR 116.08 includes further details on the zoning requirements downstream of dams.*

in their community. All unincorporated communities would be eligible for premium discounts under Washington County’s participation. Incorporated villages and cities are required to participate individually.

## **HAZARD MITIGATION PLAN COMPONENT FOR THUNDERSTORM, HIGH-WIND, HAIL, AND LIGHTNING HAZARDS**

As described in Chapter III, thunderstorm, high winds, hail, and lightning are natural hazard events of significant concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate these types of hazards.

### **Identification of Alternative Mitigation Strategies**

All thunderstorms and related hazard events are potentially dangerous and are the most common type of severe weather event compared to other natural hazards within Washington County as discussed in Chapter III. However, Washington County averages only about 10 days per year in which thunderstorms inflict wind, hail, or lightning damage. Severe thunderstorm fronts can often be tracked, which generally provides ample warning for potentially affected areas to take preventative actions. In addition, when severe thunderstorms and related hazard events occur, they generally last for short periods of time. Severe wind downbursts can exceed hurricane force winds (greater than 74 mph) and can do more damage than an F1 tornado.

While it may not be possible to accurately identify specific areas where there is significant risk from thunderstorm and related hazard events, or the number or severity of the events, measures can be taken to reduce the potential damage caused by thunderstorm and related hazards wherever they may occur in the County. High-wind events associated with thunderstorms are very similar to tornadoes, except they are more common and usually less powerful than tornadoes. Hailstorms tend to occur in conjunction with severe thunderstorms. During a hail storm personal safety is the first priority and persons should seek shelter and stop driving to avoid accidents. Advance warning systems may allow for some actions to reduce hail damage to vehicles and some property, but little can be done to protect structures or crops in the field. Personal protection is paramount for lightning safety—many people incur injuries or are killed due to misinformation and inappropriate behavior during thunderstorms. A few simple precautions can reduce many of the dangers posed by lightning. The individual is ultimately responsible for his/her personal safety and has the right to take appropriate action when threatened by lightning. Through review by the Washington County Hazard Mitigation Plan Local Planning Team, the following measures to reduce vulnerability to thunderstorms, high winds, hail, and lightning have been identified as viable for the County hazard mitigation plan.

### ***Nonstructural***

- Encourage review of local building codes to determine if revisions are needed to improve the ability of structures to withstand greater wind velocities;<sup>30</sup>
- Enforce existing local ordinances requiring adequate anchoring and grounding of newly constructed buildings;
- Encourage local fire suppression departments to obtain and maintain equipment, such as thermal imaging devices, to help detect and mitigate lightning-related fires;

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<sup>30</sup> *The State Uniform Dwelling Code (UDC) is a statewide regulation that sets standards for fire safety; structural strength; energy conservation; erosion control; heating, plumbing, and electrical systems; and general health and safety in dwellings constructed or altered after 1980. The UDC applies uniformly throughout the State, and local governments may not adopt a more or less stringent code. Consequently, should review of local ordinances reveal that a change in the building code would be a viable mitigation measure, the County and municipalities within it would need to pursue a change in the UDC at the State level.*



- Encourage local municipalities to become eligible for and join the National Weather Service’s (NWS) StormReady program.<sup>31</sup> Requirements for this program include:
  - Establishing a 24-hour warning point and emergency operations center,
  - Having multiple ways to receive severe weather warnings and forecasts and alert the public,
  - Creating a system that monitors weather conditions locally,
  - Promoting the importance of public readiness through community seminars, and
  - Developing a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises;
- Provide annual access to NWS or SKYWARN weather spotter training; and
- Encourage agricultural producers to purchase crop insurance.

### ***Structural***

- Maintain, update, and upgrade public early warning systems and networks. Consider expanding such systems as necessary. Desirable characteristics of a robust early warning system include:
  - Employing multiple means of communication to alert people of the imminent threat of severe weather. Examples of such means of communication include providing warnings and/or information through outdoor warning systems, broadcast media, cable and satellite media, electronic mail, SMS messaging, social media, and reverse-911 telephony; and
  - Being capable of reaching vulnerable segments of the population;
- Trim and maintain the health of trees near vulnerable infrastructure, such as utility lines, essential facilities and roads, as well as near homes and businesses;
- Promote planting windbreaks for farm crops;
- Encourage provision of safe rooms in residences, workplaces, and other buildings;
- Work with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers. Priority should be considered for those facilities that are slab-on-grade structures and for those projects that can be completed as part of a newly planned building or building expansion;
- Provide model mobile home park regulations to municipalities for their consideration. Such model regulations call for the provision of community safe rooms (storm shelters) for residents of new and expanding mobile home parks. Based on community and landowner interest, pursue grant funding for installation of community safe rooms in existing mobile home parks;
- Bury and protect power and utility lines;
- Encourage the use of surge protectors on critical electronic equipment;
- Install lightning grade surge protection devices for critical electronic components used by government, public service, and public safety facilities, such as warning systems, control systems, communications, and computers; and
- Promote emergency back-up power at critical facilities.

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<sup>31</sup> *More information on the NWS StormReady program can be found at <http://www.stormready.noaa.gov/>.*

### ***Public Informational and Educational Programming***

- Increase public education and awareness of the potential severity of thunderstorms and distribute emergency preparedness information related to thunderstorm hazards. Such educational efforts should include promoting public awareness of proven lightning safety guidelines to reduce the risk of lightning hazards and of the potential severity of hailstorms;
- Increase the coverage and use of National Oceanic and Atmospheric Administration (NOAA) All Hazard Weather Radios;
- Promote inclusion of safety strategies for severe weather events in driver education classes and materials;
- Encourage residents to develop a Family Emergency Preparedness Plan that would include the preparation of a Disaster Supply Kit (Appendix G); and
- Distribute information on various insurance options for thunderstorms, high winds, lightning, and hail to residents, businesses, and agricultural producers.

### **Current Programs**

#### ***Federal and State Programs***

The NWS issues warnings, watches, and advisories when there is a threat of severe weather conditions. Several categories of warnings, watches, and advisories apply to thunderstorms and associated hazards. The NWS Milwaukee/Sullivan office will issue a severe thunderstorm warning when either a spotter reports a thunderstorm producing winds that equal or exceed 58 miles per hour (mph) or hail of one inch or larger in diameter or a severe thunderstorm is detected by Doppler radar. The NWS Storm Prediction Center in Norman, Oklahoma will issue a severe thunderstorm watch when conditions are favorable for the development of severe thunderstorms in and close to the watch area. The NWS Milwaukee/Sullivan office will issue a high wind warning when sustained winds of 40 mph are expected to occur for an hour or more or wind gusts of 58 mph or more are expected to occur. The NWS Milwaukee/Sullivan office will issue a wind advisory when sustained winds of 30 mph are expected to occur for an hour or more or wind gusts of 45 mph to 57 mph are expected to occur.

Federal and State programs include awareness and education efforts. The NWS also has an extensive public information program to educate people about the dangers of thunderstorms and related hazards and assist in preventing associated deaths and injuries. WEM, in conjunction with the NWS and State and local government agencies, provides both preparedness information and severe weather information to the public. Preparedness information is provided during three severe weather awareness campaigns conducted during the year, each focusing on the prevalent weather hazard at that time. The Wisconsin Department of Health Services has developed a severe thunderstorm and tornado tool kit to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to severe thunderstorms and tornadoes.<sup>32</sup> Similarly, WEM has produced several educational resources regarding thunderstorms and related hazards including prerecorded radio public service announcements, scripts for radio public service announcements, fliers, and educational materials for children.<sup>33</sup> In addition, numerous other organizations, including the American Red Cross, provide public safety information regarding lightning.

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<sup>32</sup> *Wisconsin Department of Health Services, Wisconsin Severe Thunderstorm and Tornadoes Toolkit, Publication P01037, June 2015.*

<sup>33</sup> *These can be accessed at Wisconsin Emergency Management's ReadyWisconsin website located at: [http://ready.wi.gov/Resources/Manager\\_Resources.asp](http://ready.wi.gov/Resources/Manager_Resources.asp).*

### ***Local Programs***

Programs within Washington County include those conducted by the Washington County Emergency Management Office. The Washington County Emergency Management Office has a number of brochures, booklets, and pamphlets available for the public on severe weather safety and other general emergency management-related topics. Washington County Emergency Management participates in State-sponsored severe weather awareness campaigns.

Washington County annually sponsors severe weather spotter training. Depending on availability, training sessions are conducted by the NWS or SKYWARN, a partnership between the NWS and several other organizations. Sessions are targeted toward emergency response personnel and members of the public. In the event of a severe thunderstorm or tornado warning, police and fire department personnel go to designated locations to monitor weather conditions.

Residents of Washington County are able to receive weather warnings through NOAA All Hazard Weather Radio. The locations of transmitters serving the County and the frequencies on which they operate were previously described in the section on flooding. Warnings transmitted via Weather Radio are relayed to other media via the Federal Communication Commission's EAS system. This was also previously described in the section on flooding. Federal, State, and local emergency personnel can also access the EAS system to disseminate nonweather emergency messages through the National Weather Service's HAZCollect system.

As described in Chapter II, Washington County has developed an emergency operations plan and hazard analysis, which sets forth an all-hazards action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs that complement the County plan and that also set forth procedures and actions to deal with a range of situations and events.

Analysis of the vulnerability of humans, infrastructure, and economic production to thunderstorm and related hazard events demonstrates that the provision of advanced warning systems, as well as public informational and educational programming, are the most important mitigation actions to be considered. Washington County owns and operates one outdoor warning and communication siren system which serves the Washington County Fair Park. A total of 45 other outdoor warning and communication siren systems are owned and operated by municipalities in the County, with 15 located within the Village of Germantown, 10 within the City of Hartford, eight within the City of West Bend, four within the Village of Kewaskum, four within the Village of Slinger, two within the Village of Jackson, and one each within the Village of Newburg and the Town of Addison. All of the jurisdictions operating outdoor warning and communication systems use warnings by the NWS to trigger siren activation. In addition, some jurisdictions use other triggering events such as warnings issued by DTN/Meteorlogix—a private weather forecasting service, tornado sightings by weather spotter, and/or triggering at the direction of the jurisdiction's Chief of Police or his designee.

In addition, county emergency management representatives from southeastern Wisconsin have worked with computer science students from the University of Wisconsin-Parkside's "App Factory" to develop the *Ready Badger* app for wireless devices.<sup>34</sup> The app is designed to speed the process of sharing and gathering hazard-related information. This app allows emergency managers to send custom-made alerts for any type of emergency, including severe thunderstorm and high-wind related events. It also provides users with access to emergency preparedness information specific to their county. Users can also use the app to submit digital damage reports to County emergency managers, allowing them to assess damages and respond to disasters more quickly.

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<sup>34</sup> *The Ready Badger app can be downloaded for free in the Apple App Store and Android Google Play Store.*

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Based upon review of the above and the risk analysis given in Chapter III, continuation and refinement of current early warning system programs represents a major component of the planned mitigation action with respect to thunderstorms. In addition, informing the public of the significance of thunderstorm watches and warnings so that they take thunderstorms and related hazards seriously, know where to seek shelter in emergency situations, and are prepared should such a storm cause a disaster is an important component for minimizing the risks associated with these natural hazards.

Feasible structural mitigation actions include installation of community safe rooms to provide protection for people during severe storms. In particular, this should be considered for mobile home parks in the County.

### **Multi-Jurisdictional Considerations**

Thunderstorms and their related hazards can potentially impact all municipalities within the County. In addition, these severe weather events may cause multiple damages to a variety of infrastructure including transmission lines, communication lines, and transportation routes due to flooding from storms, as well as damage to buildings from flooding and/or high winds. Hence, Washington County, municipalities, and relevant businesses should coordinate hazard mitigation activities through a cooperative County and local government partnership in countywide disaster planning and response mechanisms. Such measures are already well underway through the coordinated emergency operations planning program involving the Washington County Emergency Management Office and local community emergency operations programs and should be continued.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk, the following mitigation activities related to thunderstorms, high-wind, hail, and lightning events are included as priority mitigation measures in the Washington County hazard mitigation plan:

- Maintain, update, and upgrade public early warning systems and networks. Continue using multiple means of communication for providing alerts. Consider expanding these systems as necessary. Encourage the use of the NOAA All Hazard Weather Radio by residents. This weather radio continuously broadcasts National Weather Service forecasts, warnings and crucial weather information. NOAA All Hazard Weather Radio also provides direct warning to the public for natural, man-made, and technological hazards, and is the primary trigger for activating the Emergency Alert System on commercial radio, television, and cable systems;
- Encourage the provision of safe rooms, including:
  - Working with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers,
  - Consideration by municipalities of adopting mobile home park regulations which require that community safe rooms be provided for residents of new and expanding mobile home parks, and
  - Based on community and landowner interest, pursue grant funding for installation of community safe rooms in existing mobile home parks;
- Encourage agricultural producers to purchase crop insurance;
- Promote inclusion of safety strategies for severe weather events in driver education classes and materials;
- Encourage residents to develop a Family Emergency Preparedness Plan that would include the preparation of a Disaster Supply Kit (Appendix G); and
- Continue to conduct annual weather spotter training.

## HAZARD MITIGATION PLAN COMPONENT FOR TORNADOES

As described in Chapter III, tornadoes are natural hazard events of concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate these types of hazards.

### Identification of Alternative Mitigation Strategies

All tornadoes are potentially dangerous hazards within Washington County as discussed in Chapter III. However, tornadoes have been shown to impact Washington County about once every three to four years and these are most likely to be an EF1 magnitude or less. In addition, when tornadoes and related hazard events occur, they generally last for short periods of time and impact relatively small areas upon the landscape.

While it may not be possible to accurately identify specific areas where there is significant risk from tornado events, or the number or severity of the events, measures can be taken to reduce the potential damage caused by tornado and related hazards wherever they may occur in the County. Based upon review by the Washington County Hazard Mitigation Plan Local Planning Team, the following measures to reduce vulnerability to tornadoes have been identified as viable for the Washington County hazard mitigation plan.

### *Nonstructural*

- Encourage review of local building codes to determine if revisions are needed to improve the ability of structures to withstand greater wind velocities;<sup>35</sup>
- Upon owner's request conduct inspections of facilities to ensure the quality, quantity, and accessibility of adequate tornado shelters;
- Ensure that mobile and manufactured housing is securely anchored;
- Establish safe and appropriate locations for temporary debris disposal sites;
- Encourage local municipalities to become eligible for and join the NWS StormReady program.<sup>36</sup> Requirements for the program include:
  - Establishing a 24-hour warning point and emergency operations center,
  - Having multiple ways to receive severe weather warnings and forecasts and alert the public,
  - Creating a system that monitors weather conditions locally,
  - Promoting the importance of public readiness through community seminars, and
  - Developing a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises; and
- Provide annual access to NWS or SKYWARN weather spotter training.

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<sup>35</sup> *The State Uniform Dwelling Code (UDC) is a statewide regulation that sets standards for fire safety; structural strength; energy conservation; erosion control; heating, plumbing, and electrical systems; and general health and safety in dwellings constructed or altered after 1980. The UDC applies uniformly throughout the State, and local governments may not adopt a more or less stringent code. Consequently, should review of local ordinances reveal that a change in the building code would be a viable mitigation measure, the County and the municipalities within it would need to pursue a change in the UDC at the State level.*

<sup>36</sup> *More information on the NWS StormReady program can be found at <http://www.stormready.noaa.gov/>.*

## ***Structural***

- Maintain, update, and upgrade public early warning systems and networks. Consider expanding such networks as necessary. Desirable characteristics of a robust early warning system include:
  - Employing multiple means of communication to alert people of the imminent threat of severe weather. Examples of such means of communication include providing warnings and/or information through outdoor warning systems, broadcast media, cable and satellite media, electronic mail, SMS messaging, social media, and reverse-911 telephony; and
  - Being capable of reaching vulnerable segments of the population;
- Encourage provision of safe rooms, especially in structures that do not have basements;
- Retrofit existing or install new structures to ensure adequate shelters from tornadoes for public buildings, major industrial sites, mobile home parks, and other large businesses or complexes such as shopping malls, fairgrounds, and other vulnerable public areas;
- Work with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers. Priority should be considered for those facilities that are located in a slab-on-grade structure and for those projects that can be completed as part of a newly planned building or building expansion;
- Provide model mobile home park regulations to municipalities for their consideration. Such model regulations call for the provision of community safe rooms (storm shelters) for residents of new and expanding mobile home parks. Based on community and landowner interest, pursue grant funding for installation of community safe rooms in existing mobile home parks;
- Trim and maintain the health of trees near vulnerable infrastructure, such as utility lines, essential facilities and roads, as well as near homes and businesses; and
- Bury and protect power and utility lines.

## ***Public Informational and Educational Programming***

- Increase public education and awareness of the potential severity of tornadoes;
- Increase the coverage and use of NOAA All Hazard Weather Radios and Emergency Alert System broadcast awareness;
- Promote inclusion of safety strategies for severe weather events in driver education classes and materials;
- Encourage residents to develop a Family Emergency Preparedness Plan that would include the preparation of a Disaster Supply Kit (Appendix G); and
- Produce and distribute emergency preparedness information related to tornado hazards.

## **Current Programs**

### ***Federal and State Programs***

The National Weather Service issues warnings, watches, and advisories when there is a threat of severe weather conditions. The National Weather Service issues tornado watches when conditions are favorable for the development of thunderstorms that have a strong capability of producing tornadoes and issues tornado warnings when a tornado has been spotted by a trained observer or Doppler radar has indicated a developing tornado.

Federal and State Programs include awareness and education activities. The National Weather Service also has an extensive public information program to educate people about the dangers of tornadoes and related hazards

and assist in preventing associated deaths and injuries. WEM, in conjunction with the National Weather Service and State and local government agencies, provides both preparedness information and severe weather information to the public. Preparedness information is provided during three severe weather awareness campaigns conducted during the year, each focusing on the prevalent weather hazard at that time. The Wisconsin Department of Health Services has developed a severe thunderstorms and tornado tool kit to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to severe thunderstorms and tornadoes.<sup>37</sup> Similarly, WEM has produced several educational resources regarding tornadoes including prerecorded radio public service announcements, scripts for radio public service announcements, fliers, and educational materials for children.<sup>38</sup> In addition, numerous other organizations, including the American Red Cross, provide public safety information regarding tornadoes.

### ***Local Programs***

Programs within Washington County include those conducted by the Washington County Emergency Management Office. The Washington County Emergency Management Office has information available for the public on its webpage regarding tornado safety and other general emergency management-related topics. Washington County Emergency Management participates in all State sponsored severe weather awareness campaigns.

Residents of Washington County are able to receive weather warnings through NOAA All Hazard Weather Radio. The locations of transmitters serving the County and the frequencies on which they operate were previously described in the section on flooding. Warnings transmitted via Weather Radio are relayed to other media via the Federal Communication Commission's EAS system. This was also previously described in the section on flooding. Federal, State, and local emergency personnel can also access the EAS system to disseminate nonweather emergency messages through the National Weather Service's HAZCollect system.

As described in Chapter II, Washington County has developed an emergency operations plan and hazard analysis, which sets forth an all-hazards action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs that complement the County plan and that also set forth procedures and actions to deal with a range of situations and events.

Analysis of the vulnerability of humans, infrastructure, and economic production to tornadoes and related hazard events demonstrates that the provision of advanced warning systems, as well as public informational and educational programming, are the most important mitigation actions to be considered. Washington County owns and operates one outdoor warning and communication siren system which serves the Washington County Fair Park. In addition, local municipalities in the County own and operate 45 other outdoor warning and communication siren systems. The ownership of these systems and how their activation is triggered was previously described in the section on thunderstorms.

In addition, county emergency management representatives from southeastern Wisconsin have worked with computer science students from the University of Wisconsin-Parkside's "App Factory" to develop the *Ready Badger* app for wireless devices.<sup>39</sup> The app is designed to speed the process of sharing and gathering hazard-related information. This app allows emergency managers to send custom-made alerts for any type of emergency, including tornadoes and related events. It also provides users with access to emergency preparedness information specific to their county. Users can also use the app to submit digital damage reports to County emergency managers, allowing them to assess damages and respond to disasters more quickly.

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<sup>37</sup> *Wisconsin Department of Health Services, Wisconsin Severe Thunderstorm and Tornadoes Toolkit, op. cit.*

<sup>38</sup> *These can be accessed at Wisconsin Emergency Management's ReadyWisconsin website located at: [http://ready.wi.gov/Resources/Manager\\_Resources.asp](http://ready.wi.gov/Resources/Manager_Resources.asp).*

<sup>39</sup> *The Ready Badger app can be downloaded for free in the Apple App Store and Android Google Play Store.*

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Based upon review of the above and the risk analysis given in Chapter III, continuation and refinement of current early warning system programs represents a major component of the planned mitigation action with respect to tornadoes. In addition, informing the public of the significance of tornado watches and warnings so that they take these warnings and associated hazards seriously, know where to seek shelter in emergency situations, and are prepared should such an event cause a disaster is an important component for minimizing the risks associated with tornadoes.

In addition, feasible structural mitigation actions include installation of community safe rooms to provide protection for people during tornadoes and severe storms. In particular, this should be considered for mobile home parks in the County.

### **Multi-Jurisdictional Considerations**

Tornadoes and their related hazards can potentially impact all municipalities within the County. In addition, these severe weather events can potentially cause multiple damages to a variety of infrastructure including, transmission lines, communication lines, and transportation routes due to high winds and debris. Hence, Washington County, municipalities, and relevant businesses should coordinate hazard mitigation activities through a cooperative County and local government partnership in countywide disaster planning and response mechanisms. Such measures are already well underway through the coordinated emergency operations planning program involving the Washington County Emergency Management Office and coordinated local community emergency operations programs.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk, the following mitigation activities related to tornado hazard events are included as priority mitigation measures in the Washington County hazard mitigation plan:

- Maintain, update, and upgrade public early warning systems and networks. Continue using multiple means of communication for providing alerts. Consider expanding these systems as necessary. Encourage the use of the NOAA All Hazard Weather Radio by residents. This weather radio continuously broadcasts National Weather Service forecasts, warnings and crucial weather information. NOAA All Hazard Weather Radio also provides direct warning to the public for natural, man-made, and technological hazards, and is the primary trigger for activating the EAS on commercial radio, television, and cable systems;
- Encourage the provision of safe rooms, including:
  - Working with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers,
  - Consideration by municipalities of adopting mobile home park regulations which require that community safe rooms be provided for residents of new and expanding mobile home parks, and
  - Based on community and landowner interest, pursue grant funding for installation of community safe rooms in existing mobile home parks;
- Promotion of educational and informational programming, especially related to the early warning network, including NOAA All Hazard Weather Radio and EAS broadcasts, and to individual actions to protect citizens, property, and businesses. Volunteer groups may be able to provide assistance in these educational efforts;
- Continue to conduct annual weather spotter training;
- Promote inclusion of safety strategies for severe weather events in driver education classes and materials;
- Encourage continued enforcement of building code ordinance requirements; and
- Encourage residents to develop a Family Emergency Preparedness Plan that would include the preparation of a Disaster Supply Kit (Appendix G).



## HAZARD MITIGATION PLAN COMPONENT FOR EXTREME TEMPERATURE

As described in Chapter III, extreme temperatures are natural hazard events of significant concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate these types of hazards.

### **Identification of Alternative Mitigation Strategies**

Extreme heat and cold events combined are potentially deadly natural hazards that Washington County must confront. Temperature extremes should be expected with each summer and winter season, making this a hazard for which plans can be easily prepared. Extreme heat and cold events do not typically occur suddenly and are generally connected to a weather system that can be forecast days in advance. When temperature extreme events do occur, they commonly last for extended periods of time (days or weeks) and impact areas larger than Washington County.

While it may not be possible to accurately identify specific areas where there is significant risk from extreme temperature, extreme heat will have the greatest impact in the urbanized areas of the County. Demographically, the elderly, poor, and debilitated are most vulnerable to excessive heat and cold. Fatalities are usually related to age because excessive heat is stressful and can overwhelm those who are weakened because of age or illness. Measures can be taken to reduce the potential injuries and fatalities caused by temperature extremes wherever they may occur in the County. The following measures to reduce vulnerability to extreme temperature events have been identified as viable for the Washington County hazard mitigation plan.

### ***Nonstructural***

- Organize neighborhood outreach groups who look after vulnerable groups and individuals;
- Provide special arrangements for payment of heating bills;
- Designate sites to be used as public cooling/heating shelters during extreme temperature events. In addition:
  - Conduct an inventory and inspection of these facilities to ensure their quality, quantity, and accessibility for use as heating and/or cooling shelters,
  - Extend hours at these sites during extreme temperature events, and
  - Promote transportation options to assist members of highly vulnerable populations to reach these sites during extreme temperature events;
- Reschedule public events to avoid large outdoor gatherings during periods of extreme heat or cold;
- Extend swimming pool hours during extreme heat events; and
- Establish a donation program to provide used air conditioners to members of vulnerable populations.

### ***Structural***

- Maintain, update, and upgrade public early warning systems and networks. Consider expanding such networks as necessary. Desirable characteristics of a robust early warning system include:
  - Employing multiple means of communication to alert people of the imminent threat of extreme temperatures. Examples of such means of communication include providing warnings and/or information through outdoor warning systems, broadcast media, cable and satellite media, electronic mail, SMS messaging, social media, and reverse-911 telephony; and
  - Being capable of reaching vulnerable segments of the population;

- Take measures to reduce heat island effects in urban areas. Examples of such measures include:
  - Increasing the amount of green space throughout urban areas;
  - Increasing tree plantings around buildings, parking lots, and along public right-of-ways to shade surfaces that contribute to heat island formation; and
  - Encouraging the use of “cool roofing” products made of highly reflective and emissive materials.

### ***Public Informational and Educational Programming***

- Increase public education and awareness of the potential severity of extreme temperature events and distribute emergency preparedness information related to extreme temperature events;
- Increase the coverage and use of NOAA All Hazard Weather Radios and EAS broadcasts;
- Increase outreach to vulnerable populations regarding availability of shelters during extreme heat and cold events; and
- Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves.

### **Current Programs**

#### ***Federal and State Programs***

The NWS issues warnings, watches, and advisories when there is a threat of severe weather conditions. Several categories of warnings, watches, and advisories apply to extreme temperature conditions and associated hazards. The NWS Milwaukee/Sullivan office will issue an excessive heat warning when daytime high temperatures of 105°F or higher and night-time temperatures of 75°F or higher are expected to occur over a 48-hour period or when high temperatures of 100°F or more are expected over four or more consecutive days. The office will issue a heat advisory when daytime high temperatures of 100°F or higher are expected or when daytime high temperatures are expected to be between 95°F and 99°F for four or more consecutive days. The office will issue a wind chill warning when wind chills of -35°F or colder with winds of four or more mph are expected to occur for three or more hours. The office will issue a wind chill advisory when wind chills between -20°F and 34°F with winds of four or more mph are expected to occur for three or more hours.

Heat waves cannot be prevented, therefore, it is important to provide notice of adverse conditions so that the public can anticipate and avoid health-threatening situations. Excessive heat alert thresholds are being tailored at major metropolitan centers based on research results that link unusual amounts of heat-related deaths to city-specific meteorological conditions. The alert procedures are:

- Include Heat Index values in NWS forecast zone and city forecasts.
- Issue Special Weather Statements and/or Public Information Statements presenting a detailed discussion of 1) the extent of the hazard including Heat Index values, 2) who is most at risk, and 3) safety rules for reducing the risk.
- Assist State and local health officials in preparing civil emergency messages for severe heat waves. Meteorological information from Special Weather Statements will be included, as well as medical information, advice, and names and telephone numbers of health officials.
- Release to the media and over the NOAA All Hazard Weather Radio all of the above information.

State programs include awareness and education efforts. WEM, in conjunction with the National Weather Service and State and local government agencies, provides both preparedness information and severe weather information to

the citizens of Wisconsin. Preparedness information is provided during three severe weather awareness campaigns conducted during the year, each focusing on the prevalent weather hazard at that time. The Wisconsin Department of Health Services has developed an extreme heat tool kit to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to extreme heat events.<sup>40</sup> Similarly, the Department has developed a winter weather toolkit to provide information about winter weather, including extreme cold.<sup>41</sup> WEM has also produced several educational resources regarding extreme heat and winter weather, such as extreme cold, including prerecorded radio public service announcements, scripts for radio public service announcements, fliers, and educational materials for children.<sup>42</sup> In addition, numerous other organizations, such as the American Red Cross, provide public safety information.

### ***Local Programs***

Programs within Washington County include those conducted by the Washington County Emergency Management Office. Washington County Emergency Management participates in all State sponsored severe weather awareness campaigns. The Ozaukee-Washington County Health Department has a number of brochures, booklets, and pamphlets available for the public on staying safe in extreme cold weather and other general emergency management-related topics.

The Ozaukee-Washington County Health Department has compiled lists of heat relief and cold relief sites within the County at which people can shelter during heat waves. These lists can be downloaded from the Department's webpage.<sup>43</sup>

As described in Chapter II, Washington County has developed a comprehensive emergency management plan and hazard analysis, which sets forth an all-hazards action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs that complement the County plan and that also set forth procedures and actions to deal with a range of situations and events.

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Based upon review of the above, informational and educational programs represent a major component of the planned mitigation action. Temperature hazards are experienced by Washington County residents annually and the ability to make positive decisions concerning exposure limits will depend on safety awareness. Analysis of the vulnerability of humans, infrastructure, and economic production caused by extreme temperature events demonstrates that the provision of advanced weather forecasting systems; provision of early warning systems to alert the public of extreme temperature situations; availability of adequate shelter from the heat and cold in public buildings, major industrial sites, and other large businesses or complexes such as shopping malls; as well as public informational and educational programming are the most important mitigation actions to be considered. In addition, public service announcements regarding avoiding heat stress and extreme cold help to minimize exposure.

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<sup>40</sup> *Wisconsin Department of Health Services, Wisconsin Extreme Heat Toolkit, Publication P00632, March 2014.*

<sup>41</sup> *Wisconsin Department of Health Services, Wisconsin Winter Weather Toolkit, Publication P00652, April 2014.*

<sup>42</sup> *These can be accessed at Wisconsin Emergency Management's ReadyWisconsin website located at: [http://ready.wi.gov/Resources/Manager\\_Resources.asp](http://ready.wi.gov/Resources/Manager_Resources.asp).*

<sup>43</sup> *The heat relief site list can be found on the Health Department website at: <http://www.co.washington.wi.us/uploads/docs/washington-county-heat-relief-sites-2015.pdf>. The cold relief site list can be found at: [http://www.co.washington.wi.us/uploads/docs/CHN\\_Cold\\_relief\\_shelters.pdf](http://www.co.washington.wi.us/uploads/docs/CHN_Cold_relief_shelters.pdf)*

### **Multi-Jurisdictional Considerations**

Extreme temperature events are primarily a public health concern and affect individuals, typically the elderly, sick, and invalid, who cannot access shelter with decent heat or air conditioning. Because of this, extreme temperature events can potentially impact all municipalities within the County.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk, the following mitigation activities related to extreme temperature events are included as priority mitigation measures in the hazard mitigation plan for Washington County:

- Increase outreach to vulnerable populations regarding the availability of shelters during extreme heat and cold events;
- Designate sites to be used as public cooling/heating shelters during extreme temperature events. In addition:
  - At the request of the sites' owners, conduct inventories and inspections of these facilities to ensure their quality, quantity, and accessibility for use as heating and/or cooling shelters,
  - Encourage the owners of the sites to extend their hours during extreme temperature events, and
  - Promote transportation options to assist members of highly vulnerable populations to reach these sites during extreme temperature events;
- Maintain, update, and upgrade public early warning systems and networks. As part of this, increase coverage and use of NOAA All Hazard Weather Radio and EAS broadcasts;
- Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves; and
- Promote educational and informational programming. Volunteer groups may be able to provide assistance in these educational efforts.

## **HAZARD MITIGATION PLAN COMPONENT FOR WINTER STORMS**

As described in Chapter III, winter storms are natural hazard events of concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate this type of hazard.

### **Identification of Alternative Mitigation Strategies**

As discussed in Chapter III, winter storm events can pose a serious threat to Washington County. Severe winter weather can include heavy snow, blizzards, freezing sleet, and dangerous combinations of temperatures and wind. Winter storms may last for days or weeks completely shutting down businesses and government, while isolating residents in their homes. Extreme cold temperatures often connected to winter storm events are a leading natural hazard cause of deaths in the State. Additionally, fatalities associated with winter storms include heart attacks while shoveling snow and improper use of space heaters. Severe winter storm fronts can often be tracked, which generally provides ample warning for potentially affected areas to take preventative actions.

While it may not be possible to accurately predict the number or severity of winter storm events, measures can be taken to reduce the potential damage caused by winter storms and their related hazards whenever they may occur in the County. High-wind, freezing rain, sleet, ice, and snow may be associated with a winter storm. The following measures to reduce vulnerability to these dangers have been identified as viable for the Washington County hazard mitigation plan.

### ***Nonstructural***

- Encourage review of local building codes to determine if revisions are needed to improve the structures ability to withstand greater wind velocities and snow weight;<sup>44</sup>
- Review the energy efficiency and winter readiness of critical facilities and housing in the community; and
- Ensure that snow removal, anti-icing, and deicing equipment is available and operational.

### ***Structural***

- Maintain, update, and upgrade public early warning systems and networks. Consider expanding such networks as necessary. Desirable characteristics of a robust early warning system include:
  - Employing multiple means of communication to alert people of the imminent threat of severe weather. Examples of such means of communication include providing warnings and/or information through outdoor warning systems, broadcast media, cable and satellite media, electronic mail, SMS messaging, social media, and reverse-911 telephony; and
  - Being capable of reaching vulnerable segments of the population;
- Work with utility companies to assess and improve, as needed, electric service systems reliability;
- Consider burying utilities at critical and vulnerable junctions to avoid power loss due to downed lines;
- Trim and maintain the health of trees near vulnerable infrastructure, such as utility lines, essential facilities and roads, as well as near homes and businesses;
- Promote planting windbreaks and installing snow fences to protect farm crops and highways; and
- Promote the installation of backup power systems at homes and businesses.

### ***Public Informational and Educational Programming***

- Promote winter hazard awareness, including home and travel safety measures, such as avoiding travel during winter storms, and having a shovel, sand, warm clothing, food, and water in the vehicle, if travel cannot be avoided;
- Increase the coverage and use of NOAA All Hazard Weather Radio and Emergency Alert System broadcasts;
- Promote inclusion of safety strategies for severe weather events in driver education classes and materials;
- Promote low-income energy assistance programs;
- Encourage residents to develop a Family Emergency Preparedness Plan including the preparation of a Disaster Supply Kit (Appendix G);

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<sup>44</sup> *The State Uniform Dwelling Code (UDC) is a statewide regulation that sets standards for fire safety; structural strength; energy conservation; erosion control; heating, plumbing, and electrical systems; and general health and safety in dwellings constructed or altered after 1980. The UDC applies uniformly throughout the State, and local governments may not adopt a more or less stringent code. Consequently, should review of local ordinances reveal that a change in the building code would be a viable mitigation measure, the County and the municipalities within the County would need to pursue a change in the UDC at the State level.*

- Produce and distribute emergency preparedness information related to winter storm hazards;
- Maintain and update shelter sites that have back-up emergency power sources; and
- Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fire places, and wood stoves.

## **Current Programs**

### ***Federal and State Programs***

The NWS issues warnings, watches, and advisories when there is a threat of severe weather conditions. Several categories of warnings, watches, and advisories apply to winter weather conditions and associated hazards. The NWS Milwaukee/Sullivan office will issue a winter storm warning when one or more of the following weather events are expected to occur over a period of 12 or fewer hours:

- Snowfall greater than six inches,
- Sleet accumulations of two or more inches,
- Intermittent blowing snow that closes roads or reduces visibility below one-half mile with winds of 25 to 34 mph, or
- Less than one-quarter inch of freezing rain accompanied by another winter event.

NWS forecasters also have discretion to issue winter storm warnings for events that may not officially reach the warning criteria, but are expected to have a significant impact on society. The office will issue a winter weather advisory if one or more of the following weather events are expected to occur over a period of 12 or fewer hours:

- Snowfall of three to six inches,
- Sleet accumulations of less than two inches,
- Intermittent blowing snow that reduces visibility below one-half mile with winds of less than 25 mph, or
- Less than one-quarter inch of freezing rain accompanied by another winter event.

The office will issue a blizzard warning under conditions of sustained winds or frequent gusts of 35 mph or more and falling or blowing snow which reduces visibility to one-quarter mile or less for three or more hours. The office will issue an ice storm warning when ice accumulations of one-quarter inch or more are expected over a period of 12 or fewer hours and an freezing rain advisory when ice accumulations of less than one-quarter inch are expected over a period of 12 or fewer hours.

NWS bulletins are disseminated over a number of telecommunication channels including: the NOAA All Hazard Weather Radio, the NOAA All Hazard Weather Wire, NAWAS, the State law enforcement TIME system, and through an emergency e-mailing network. In addition, these bulletins are relayed to other local media via the Federal Communication Commission's Emergency Alert System (EAS) which rebroadcast the weather bulletins over public and private television and radio stations.

Federal and State programs include awareness and education activities. WEM, in conjunction with the National Weather Service, other State agencies, and local emergency management organizations, provides awareness and preparedness information to the public. This information is provided in three severe weather awareness campaigns conducted annually, each focusing on the prevalent weather hazard at that time. In November each year, Winter Awareness Week focuses on informing and educating people concerning the hazards presented by severe winter weather and information on preparedness for extreme weather conditions during winter. The Wisconsin Department of Health Services has developed a weather tool kit to provide information to local governments, health departments,

and citizens in Wisconsin about preparing for and responding to winter storm events.<sup>45</sup> Similarly, WEM has produced several educational resources regarding winter weather, including prerecorded radio public service announcements, scripts for radio public service announcements, fliers, and educational materials for children.<sup>46</sup>

The Wisconsin Building Code specifies design requirements to minimize vulnerability to winter storms by setting the load capacity of roofs by region based on likely maximum snowfall. The National Weather Service reports that 70 percent of winter storm fatalities occur in automobiles, therefore, listening to weather advisories and avoiding travel during winter storms would help prevent many fatalities.

### **Local Programs**

Community strategies for winter storms in Washington County include conducting snow removal, deicing, and anti-icing activities on roadways; maintaining the health of urban trees to minimize damage from ice storms; and promoting sound levels of home insulation. Older homes can be vulnerable to heat loss and any home is vulnerable to power loss, therefore, possession of an alternative heat and power source is a consideration in protecting against winter storm hazards.

In addition, county emergency management representatives from southeastern Wisconsin have worked with computer science students from the University of Wisconsin-Parkside's "App Factory" to develop the *Ready Badger* app for wireless devices.<sup>47</sup> The app is designed to speed the process of sharing and gathering hazard-related information. This app allows emergency managers to send custom-made alerts for any type of emergency, including severe thunderstorm and high-wind related events. It also provides users with access to emergency preparedness information specific to their county. Users can also use the app to submit digital damage reports to County emergency managers, allowing them to assess damages and respond to disasters more quickly.

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Analysis of the vulnerability of humans, infrastructure, and economic production to winter storms and related hazard events demonstrates that the provision of advanced weather forecasts and warning systems, as well as public informational and educational programming, are the most important mitigation actions to be considered. In addition, informing the public of the significance of winter storm watches and warnings so that they take these events seriously, know where to seek shelter in emergency situations, and are prepared should such a storm cause a disaster are important, ongoing components to minimizing the risks associated with these natural hazards. The 1976 ice storm that affected the County highlights the vulnerability of electrical power systems to winter storms. Thus, assessment and improvement of the electrical power systems by utilities and encouraging the placement of backup power systems at critical facilities are important measures that can be taken to reduce the County's vulnerability to the impacts of severe winter storms.

### **Multi-Jurisdictional Considerations**

Winter storms and their related hazards can potentially impact all municipalities within the County. In addition, these severe events can potentially cause multiple damages to a variety of infrastructure including transmission lines, communication lines, and transportation routes due to whiteout conditions and ice. Washington County, the local units of government, and relevant businesses need to coordinate hazard mitigation activities through local government participation in countywide disaster planning and response mechanisms. Such measures are already

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<sup>45</sup> *Wisconsin Department of Health Services, Wisconsin Winter Weather Toolkit, op. cit.*

<sup>46</sup> *These can be accessed at Wisconsin Emergency Management's ReadyWisconsin website located at: [http://ready.wi.gov/Resources/Manager\\_Resources.asp](http://ready.wi.gov/Resources/Manager_Resources.asp).*

<sup>47</sup> *The Ready Badger app can be downloaded for free in the Apple App Store and Android Google Play Store.*

well underway through the coordinated emergency operations planning program involving the Washington County Emergency Management Office and local community emergency operations programs.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk the following activities related to winter storm events are included as priority mitigation measures in the hazard mitigation plan for Washington County:

- Maintain, update, and upgrade public early warning systems and networks. As part of this, increase coverage and use of NOAA All Hazard Weather Radio and Emergency Alert System broadcasts;
- Promote educational and informational programming for winter storm hazards. Volunteer groups may be able to provide assistance in these educational efforts;
- Promote the inclusion of safety strategies for severe weather events in driver education classes and materials;
- Encourage residents to develop a Family Emergency Preparedness Plan including the preparation of a Disaster Supply Kit (Appendix G);
- Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves;
- Promote the installation of backup power systems at homes and businesses; and
- Work with utilities to assess and improve, as needed, electrical service systems reliability. Such improvements should include consideration of burying utilities at critical and vulnerable junctions to avoid power loss due to downed lines.

## **HAZARD MITIGATION PLAN COMPONENT FOR DROUGHT**

As described in Chapter III, droughts are natural hazard events of concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate this type of hazard.

### **Identification of Alternative Mitigation Strategies**

As discussed in Chapter III, drought events pose a limited threat to Washington County. Stresses on the water resources of Washington County include: a growing population, increased competition for available water, and loss of groundwater recharge areas due to development. Severe droughts result from extended periods of limited or no rainfall, which generally provides ample warning for potentially affected areas to take preventative actions. When drought events do occur, they commonly last for extended periods of time such as weeks or months and impact a relatively large area.

While it may not be possible to accurately predict specific areas where there is significant risk from extreme drought, droughts have the greatest impact on agricultural areas. Washington County has 129,936 acres of agricultural land, and even droughts of limited duration can significantly reduce crop growth and yields, adversely affecting farm income. More substantial events can decimate croplands and result in total loss, negatively impacting the individual producers and the local economy. Although nothing can prevent a drought, measures can be taken to reduce the potential loss caused by droughts wherever they may occur in the County. The following measures to reduce vulnerability to drought events have been identified as viable for the Washington County hazard mitigation plan.

### ***Nonstructural***

- Encourage the WDNR, U.S. Geological Survey, and NWS to continue to operate and monitor stream gauging stations and groundwater monitoring wells;



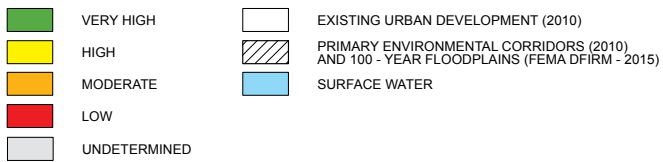
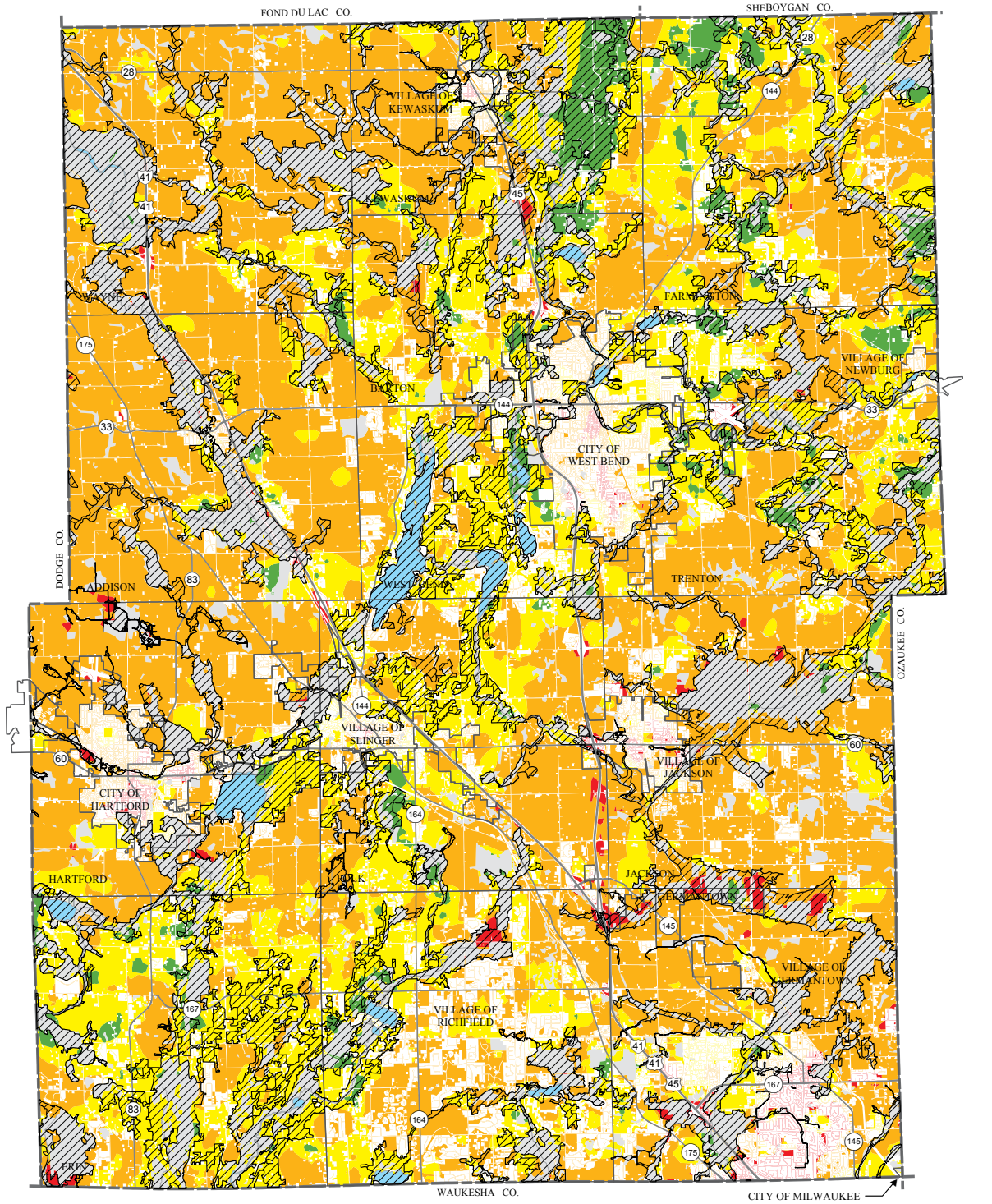
- Encourage the development and maintenance of drought emergency plans for local utilities and local communities. Such plans should include:
  - Development of criteria for triggering drought-related actions, and
  - Specification of water use regulations to be initiated during drought conditions;
- Conduct periodic water audits of local water utility infrastructure to detect and repair leaks throughout the transmission and distribution systems;
- Develop local water conservation programs. Such programs may include provisions such as:
  - Water supply system efficiency actions including water audits, meter testing, leak detection and repair, water main maintenance and replacement, water system audits, and water production system refinement,
  - Public information and education programming, including redesign of water bills, collation and distribution of educational materials, and presentations to schools and civic groups,
  - Outdoor watering reduction measures such as the use of rain barrels or imposition of lawn and landscape plant watering restrictions,
  - Development and use of water conservation rate structures, and
  - Fixture and plumbing system retrofits;
- Protect very high and high recharge potential groundwater recharge areas from inappropriate development (These areas were identified during the development of the regional water supply plan.<sup>48</sup>) Very high and high recharge potential groundwater recharge areas located in Washington County are shown on Map 48;
- Identify areas with potential groundwater level problems and inspect wells in those areas for adequate depth and construction;
- Promote the use green infrastructure practices that allow aquifer recharge, such as rain gardens, permeable pavement, and soil amendments;
- Support agricultural programs that promote soil health, preserve soil moisture, and help to minimize loss of crops and topsoil during drought conditions;
- Promote the use of agricultural methods that reduce evaporation and/or promote infiltration. Such methods may include planting windbreaks for farm crops, planting cover crops, use of no-till or reduced-till methods, and contour plowing;
- Maintain and support the University of Wisconsin-Extension Farmer-to-Farmer Hay, Forage, and Corn List;
- Promote enrollment of agricultural producers into Federal crop insurance programs; and
- Allow and encourage the use of drought-resistant landscaping practices using native plantings.

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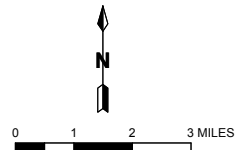
<sup>48</sup> *SEWRPC Technical Report No. 47, Groundwater Recharge in Southeastern Wisconsin Estimated by a GIS-Based Water-Balance Model, July 2008.*

Map 48

GROUNDWATER RECHARGE POTENTIAL IN WASHINGTON COUNTY: 2010



Source: Wisconsin Geological and Natural History Survey and SEWRPC.



## ***Structural***

- Develop interconnections among adjacent water utilities as recommended under the regional water supply plan.<sup>49</sup>

## ***Public Informational and Educational Programming***

- Increase public education and awareness of the potential severity of drought events; and
- Produce and distribute emergency preparedness information related to droughts.

## **Current Programs**

### ***Federal and State Programs***

The continuous monitoring of hydrologic conditions is important to identify and assess drought conditions. The U.S. Geological Survey operates a stream gauging program with local cooperators throughout the State. In Southeastern Wisconsin, this program is coordinated by the Wisconsin Department of Natural Resources and SEWRPC. The Wisconsin Geological and Natural History Survey also monitors a statewide network of groundwater elevation monitoring wells.

The National Drought Mitigation Center (NDMC), based at the University of Nebraska-Lincoln, provides assistance in the development and implementation of measures to reduce societal vulnerability to drought, stressing preparedness and risk management rather than crisis management<sup>50</sup>. Most of the NDMC's services are directed to State, Federal, regional, tribal, and local governments that are involved in drought and water supply planning. The NDMC's activities include maintaining an information clearinghouse and drought portal; drought monitoring, including participation in the preparation of the U.S. Drought Monitor and maintenance of its web site; drought planning and mitigation; drought policy; advising policy makers; collaborative research; K-12 outreach; workshops for Federal, State, and foreign governments and international organizations; organizing and conducting seminars, workshops, and conferences; and providing data to and answering questions for the media and general public.

The U.S. Drought Monitor, a joint effort of the U.S. Department of Agriculture (USDA), the National Oceanic and Atmospheric Administration (NOAA), and the National Drought Mitigation Center, provides monitoring of drought conditions and forecasting of seasonal conditions throughout the United States.<sup>51</sup>

The USDA's Farm Service Agency (FSA) provides information about conservation, commodity programs, crop insurance, and farm loans, along with State and county contacts. It also administers several programs which can provide emergency assistance to agricultural producers in the event of natural disasters such as drought. These programs include the Emergency Conservation Program, the Emergency Forest Restoration Program, the Emergency Loan Program, the Livestock Forage Disaster Program, the Noninsured Crop Disaster Assistance Program, and the

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<sup>49</sup> *SEWRPC Planning Report No. 52, A Regional Water Supply Plan for Southeastern Wisconsin, December 2010. This plan identified three potential opportunities involving water utilities located in Washington County: interconnections between the City of Hartford Water Utilities and the Village of Slinger Water Utilities, the Village of Germantown Water Utility and the Village of Menomonee Falls Water Utility, and the Village of Germantown Water Utility and the City of Mequon. Any such interconnections would require the establishment of necessary agreements and approvals for activating and would need to consider and address issues related to equipment, pumping rates, and demand on water sources. In addition, some interconnections could be prohibited or subject to approvals pursuant to the Great Lakes-St. Lawrence River Basin Water Resources Compact.*

<sup>50</sup> *The National Drought Mitigation Center can be accessed at <http://drought.unl.edu/>.*

<sup>51</sup> *The U.S. Drought Monitor can be accessed at <http://droughtmonitor.unl.edu/>.*

Tree Assistance Program. The FSA's electronic Hay and Grazing Net Ad Service (eHayNet) is an Internet-based service allowing farmers and ranchers to share "Need Hay" ads and "Have Hay" ads online.

Farmers in the County that irrigate can also use the Wisconsin Irrigation Scheduling Program (WISP). This research-based computer program provided by the University of Wisconsin-Extension can assist growers in determining the frequency and amounts of irrigation throughout the growing season. Irrigation scheduling provided by this program can be extremely helpful during a drought.<sup>52</sup>

The Farmer-to-Farmer Hay, Forage and Corn List sponsored by the University of Wisconsin-Extension puts Wisconsin farmers in touch with one another for the purpose of buying and/or selling corn and forage. The farmer to farmer list is free of charge to both buyers and sellers.

Federal and State programs also include awareness and education activities. The Wisconsin Department of Health Services has developed a drought tool kit to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to drought events.<sup>53</sup>

### ***Local Programs***

As described in Chapter II, Washington County has developed a comprehensive emergency management plan, which sets forth an all-hazards action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs that complement the County plan and that also set forth procedures and actions to deal with a range of situations and events, including drought. Many of the local units of government in the County have adopted ordinances that may act to mitigate some effects of drought. These ordinances generally fall into two categories. Several communities have ordinances that restrict or require permits for outdoor burning. Many of these ordinances contain provisions allowing a designated official to withhold or cancel burn permits under dry weather or drought conditions. Some communities also have ordinances that allow a designated official to declare a water emergency and to regulate the use of water from municipal water supplies during drought conditions.

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Drought can have economic, environmental, and social impacts. Drought can impact agriculture by reducing crop yields or destroying crops. Drought can also reduce local water supplies. Based on review of the discussion above, mitigation of the potential impacts of drought should be addressed through a multi-faceted approach. Important elements of such an approach include development of plans for responding to drought conditions for local communities and utilities; protection of local water supply sources; water conservation efforts, both in municipal and agricultural settings; and encouraging agricultural producers to take advantage of Federal crop insurance programs.

### **Multi-Jurisdictional Considerations**

Droughts and their related hazards can potentially impact all municipalities within the County. Washington County, the local units of government, and relevant businesses need to coordinate hazard mitigation activities through the local government participation in countywide disaster planning and response mechanisms.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and, consideration of risk, the following mitigation activities related to drought events are included as priority mitigation measures in the hazard mitigation plan for Washington County:

- Encourage the development and maintenance of drought emergency plans for local utilities and local communities;

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<sup>52</sup> WISP can be accessed at <http://wisp.cals.wisc.edu/wisp/home>.

<sup>53</sup> Wisconsin Department of Health Services, Wisconsin Drought Toolkit, Publication P00884, August 2014.

- Develop local water conservation programs. Such programs should consider including provisions such as water supply efficiency actions, outdoor watering reduction measures, development of water conservation rate structures, fixture and plumbing system retrofits, and public information and education programming;
- Protect very high and high recharge potential groundwater recharge areas from inappropriate development;
- Promote the use of agricultural methods that reduce evaporation and/or promote infiltration;
- Develop interconnections among adjacent utilities as recommended by the regional water supply plan; and
- Encourage farm operators to evaluate the economics of crop insurance programs.

## **HAZARD MITIGATION PLAN COMPONENT FOR TRANSPORTATION ACCIDENTS**

As described in Chapter III, transportation accidents are human-induced hazard events of significant concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate these types of hazards.

### **Identification of Alternative Mitigation Strategies**

As discussed in Chapter III, significant numbers of injuries, deaths, and property damages are associated with crashes on the roadway transportation system in Washington County. Motor vehicle-related accidents within the County are strongly influenced by factors such as road conditions, time of day, weather conditions, traffic conditions, and drug and alcohol use. In addition, railway accidents occasionally occur in the County. These accidents can also result in injuries, loss of life, and damage to property.

#### ***Roadways***

Motor vehicle-related accidents can occur in a variety of areas including local roadways and parking lots. Roadway intersections and highway segments at on- and off-ramp locations are areas where accidents commonly occur. These accidents cause injuries and death to motor vehicle passengers as well as pedestrians and bicycle riders throughout Washington County. The following measures to reduce vulnerability to motor vehicle accidents have been identified as viable for the Washington County hazard mitigation plan.

#### ***Nonstructural***

- Continue to monitor and upgrade the transportation system, when necessary, to reduce accident exposure and provide for increased travel safety and personal security;<sup>54</sup>
- Continue to promote traffic-related law enforcement, including enforcement for traffic violations, weight and travel restrictions, and designated truck routes.
- Continue to promote enforcement of laws prohibiting mobile phone usage and texting while driving;
- Continue to promote enforcement of laws requiring use of safety restraints such as seat belts and infant car seats;
- Develop and maintain local response plans and procedures for use in transportation accidents; and
- Promote preparedness and training for first responder agencies to respond to traffic accidents.

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<sup>54</sup> *SEWRPC Planning Report No. 55, Vision 2050: A Regional Land Use and Transportation System Plan for Southeastern Wisconsin, 2017.*

### *Structural*

- Continue to improve the design, routing, and traffic control at problem roadway areas;
- Consider and implement intersection improvements such as two- or four-way stop control, roundabouts, or signalization at arterial street and highway intersections;
- Expand the use of emergency vehicle preemption at traffic signals; and
- As the existing surface arterial street system is resurfaced and reconstructed and as new surface arterial roads are constructed, consider providing bicycle accommodation through bicycle lanes, paved shoulders, widened outside travel lanes, or enhanced bicycle facilities where feasible.

### *Public Informational and Educational Programming*

- Promote driver safety hazard awareness, especially to drivers within the 16 to 24 age group;
- Promote inclusion of safety strategies for severe weather events in driver education classes and materials;
- Promote the use of intelligent transportation systems (ITS) technology (see Federal and State Programs section below);
- Promote commercial operator training and skill enhancement programs;
- Promote training, planning, and preparedness for mass-casualty incidents involving roadway transportation;
- Develop trained, equipped, and prepared emergency first responders;
- Promote awareness of the influence of drug and alcohol usage on driving safety;
- Provide public education on recent innovations in road design and operation, such as signal preemption and driving in roundabouts;
- Continue public education regarding the dangers of distracted driving such as texting and using mobile phones while driving;
- Promote the use of safety restraints such as seat belts and infant car seats; and
- Promote the use of personal safety equipment such as helmets for operators and passengers of motorcycles and bicycles.

### *Railways*

As indicated in Table 40 in Chapter III, more accidents occur at railway intersections than in other areas of the railway transportation system in Washington County. One reason for this is that trains cannot stop quickly. It can take a freight train moving at 55 miles per hour or an eight-car passenger train moving at 79 miles per hour as much as a mile or more to stop. Railroad-related accidents have and will continue to occur in a variety of areas and derailments can happen anywhere within the railroad system. The following measures to reduce vulnerability to railway related accidents have been identified as viable for the Washington County hazard mitigation plan.

### *Nonstructural*

- Promote railroad inspections and improved designs at problem railway/roadway intersections, particularly at grade crossings, and promote signs and/or signals for rural railroad crossings; and
- Develop and maintain local plans and response procedures for use in railway-related accidents.

## *Structural*

- Improve the design, routing, and traffic control at problem railway areas.

## *Public Informational and Educational Programming*

- Promote awareness and importance of all railroad warning signs and signals;
- Promote awareness that some vehicles such as school buses; large, multi-passenger vans; farm machinery; and emergency response vehicles require special care at crossings;
- Promote awareness of the hazards of trespassing on railroad tracks; and
- Continue emergency operation training, planning, and preparedness for mass-casualty incidents involving railroad transportation.

## **Current Programs**

### ***Federal and State Programs***

The Wisconsin Department of Transportation (WisDOT) is currently involved in a variety of long-range transportation planning activities for airport, bicycle, highway, pedestrian, rail, and roadway systems.<sup>55</sup> Connections 2030, which was adopted in October 2009, is a strategic plan developed by WisDOT that provides a foundation for developing more detailed year 2030 plans. The plan establishes policies to help transportation decision-makers when evaluating programs and projects. The plan is published on the WisDOT website. In addition, planning guidance and tools are available on the WisDOT website to provide local communities with basic transportation planning-related information to help them develop the transportation element of the local community's comprehensive plan.<sup>56</sup> WisDOT programs and services also include incorporation of a broad range of diverse technologies, known collectively as intelligent transportation systems (ITS) to assist in identifying and helping to resolve transportation-related problems. ITS is comprised of a number of information technologies, including information processing, communications, control, and electronic systems integrated together into the transportation systems in order to improve safety and reduce costs. The Wisconsin Department of Transportation, Department of Motor Vehicles also has an extensive public information program to educate people about driver safety and awareness of hazards to help prevent accidents and related deaths and injuries.

The WisDOT's Bureau of Transportation Safety in partnership with the National Highway Traffic Safety Administration sponsors campaigns that mobilize hundreds of law enforcement agencies throughout the State to increase motorists' compliance with traffic safety laws. The high-visibility law enforcement efforts are combined with effective media campaigns to get more motorists to buckle up, slow down, and drive sober. Examples of these campaigns include spring 2016 "Click It or Ticket" campaign to increase the use of safety belts and the summer 2016 "Drive Sober or Get Pulled Over" campaign which sought to discourage drunk driving.

WisDOT conducts several activities to inform motorists of hazards to highway safety along the State's freeway system. WisDOT operates a network of cameras that monitor road and traffic conditions on freeways through much of the State, including six cameras along IH 41/USH 45 in Washington County. WisDOT makes information

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<sup>55</sup> For more information about Wisconsin Department of Transportation Programs and Services, see <http://wisconsindot.gov/> and for specific information on the State Connections 2030 transportation plan see <http://wisconsindot.gov/Pages/projects/multimodal/conn2030.aspx>.

<sup>56</sup> For general local planning guidance and tools, see <http://wisconsindot.gov/Pages/projects/data-plan/plan-res/default.aspx>. For projects specific to the southeastern portion of the State of Wisconsin, including Washington County, see <http://wisconsindot.gov/Pages/projects/by-region/se/default.aspx>

regarding road and weather conditions, travel times, road closures, and traffic incidents available to the public through the internet and a system of message signs located throughout the freeway system.<sup>57</sup>

### ***Local Programs***

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) is designated as the official metropolitan transportation planning organization for Southeastern Wisconsin under State and Federal laws and regulations. SEWRPC has the responsibility of developing and maintaining transportation plans for the Region under these designations. The 2050 regional land use and transportation plan (VISION 2050)<sup>58</sup> was adopted by the Regional Planning Commission in July 2016. VISION 2050 recommends a long-range plan for land use and transportation in the seven-county Southeastern Wisconsin Region. It makes recommendations to local and State governments to shape and guide land use development and transportation improvement including public transit, arterial streets and highways, and bicycle and pedestrian facilities, to the year 2050.

The Washington County Traffic Safety Commission works to enhance the level of safety on public roadways in Washington County. The Commission includes representatives from law enforcement, education, the legal professions, medicine, highway engineering, highway safety, and citizen groups. It meets quarterly to review crashes causing fatalities and injuries and traffic safety issues and to make recommendations to County and local governments regarding traffic safety problems.

As described in Chapter II, Washington County has developed an emergency operations plan and hazard analysis. In addition, many of the local units of government have developed emergency operations plans and/or programs that complement the County's plan and that also set forth procedures and actions to deal with a range of situations and events, including transportation accidents. As described in Chapter II, all of the fire and rescue departments in Washington County participate in formal and informal mutual aid agreements including the Mutual Aid Box Alarm System (MABAS) agreement.

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Based upon review of the above, public informational and educational programming should represent a major component of the planned mitigation action with regard to transportation safety. Additional components should include continuing enforcement of traffic laws and training and preparedness of emergency responders. Given that bicyclists can be particularly vulnerable to traffic accidents, consideration should be given for providing bicycle accommodations when work is done on surface arterial roads.

### **Multi-Jurisdictional Considerations**

Transportation accidents can potentially impact all municipalities within the County. Washington County, the local units of government, and relevant businesses need to coordinate hazard mitigation activities through the local government participation in countywide disaster planning and response mechanisms.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk, the following mitigation activities related to transportation accidents are included as priority mitigation measures in the Washington County hazard mitigation plan:

- As the existing surface arterial street system is resurfaced and reconstructed and as new surface arterial roads are constructed, consider providing bicycle accommodations through bicycle lanes, paved shoulders, widened outside travel lanes, or enhanced bicycle facilities where feasible;

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<sup>57</sup> This information is available through the internet at <http://www.511wi.gov/>

<sup>58</sup> SEWRPC Planning Report No. 55, op. cit.



- Promote driver safety hazard awareness, especially to drivers within the 16 to 24 age group;
- Continue to promote traffic-related law enforcement, including enforcement for traffic violations, weight and travel restrictions, and designated truck routes. Enforcement efforts should include efforts related to enforcement of laws regarding distracted driving and use of safety restraints;
- Continue public education efforts regarding the dangers of distracted driving such as texting and using mobile phones while driving;
- Promote inclusion of safety strategies for severe weather events in driver education classes and materials;
- Promote the use of safety restraints such as seat belts and infant car seats and of personal safety equipment such as helmets for operators and passengers of motorcycles and bicycles; and
- Continue emergency operation training, planning, and preparedness for mass-casualty incidents involving roadway and railroad transportation.

## **HAZARD MITIGATION PLAN COMPONENT FOR CONTAMINATION AND LOSS OF WATER SUPPLY**

As described in Chapter III, contamination and loss of water supply are natural hazard events of concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate these types of hazards.

### **Identification of Alternative Mitigation Strategies**

Washington County is richly endowed with surface and groundwater resources as discussed in Chapter II. However, these sources of freshwater are not unlimited and both surface and groundwater resources are subject to contamination, as well as depletion of supply. Contamination and loss of water supply events generally provide no warning making it difficult for potentially affected areas to take preventative actions. In some cases, industries may be particularly vulnerable to loss of water supply, due to equipment and process needs. In addition, fire protection is an important related issue. When contamination and loss of water supply events do occur, they may last for extended periods of time, such as weeks or months, and likely would impact a specific water source, such as a particular well or utility. In review by the Washington County Hazard Mitigation Plan Local Planning Team, the following measures to reduce vulnerability to water supply contamination events have been identified as viable for the Washington County hazard mitigation plan.

### ***Nonstructural***

- Promote development of a thorough drinking water supply risk and threat assessment that identifies potential vulnerabilities and targets for sabotage and terrorism attack;
- Develop an emergency operation plan for each public water supply system in order to specify procedures for mechanical failures, power outages, unsafe samples, and threats of acts of terrorism;
- Utilize GIS technology and available data to identify important groundwater management areas;
- Promote measures to protect groundwater recharge areas, including promotion of regional activities to protect groundwater recharge areas outside of the County boundaries;
- Develop and implement wellhead protection plans and establish setbacks from wellhead locations to minimize the potential for contamination of groundwater supplies;
- Reduce the potential for groundwater contamination from agricultural fertilizers and chemicals with emphasis on groundwater related water quality management areas;

- Manage livestock, manure, sewage sludge, and agricultural chemicals effectively in areas that are susceptible to groundwater contamination with emphasis on groundwater related water quality management areas;
- Promote proper location, installation, cleaning, monitoring, and maintenance of septic systems and other private onsite sewage disposal systems;
- Identify failing onsite sewage disposal systems for maintenance and remediation;
- Incorporate a groundwater protection element in future land use planning activities;
- Encourage local communities to develop emergency drinking water supply plans, including establishing response partner contacts with whom to discuss procedures;
- Encourage local utilities to identify priority water customers and develop a plan for restoring their service first;
- Identify potential distribution points for emergency water supply; and
- Ensure that utility personnel are trained to shut down and start up utility systems manually.

### ***Structural***

- Maintain municipal water and sewer infrastructure at acceptable operating standards;
- Maintain and consider upgrading water disinfection capabilities, including emergency disinfection equipment;
- Evaluate the condition of water utility electrical equipment to accept generators, and repair or upgrade as necessary;
- Where opportunities exist, develop interconnections between adjacent water utilities to ensure provision of water in the event of an emergency such as a breakdown of utility equipment, a major fire, or a terrorist attack;<sup>59</sup>
- Establish service main and lateral replacement programs for lead mains and laterals;
- Locate and properly abandon old and improperly abandoned wells; and
- Provide backup power for wells, treatment plants, and other vital water utility system components.

### ***Public Informational and Educational Programming***

- Encourage residents to develop a Family Emergency Preparedness Plan including the preparation of a Disaster Supply Kit (Appendix G);

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<sup>59</sup> *This was recommended in the regional water supply plan (SEWRPC Planning Report No. 52, A Regional Water Supply Plan for Southeastern Wisconsin, December 2010). This plan identified three potential opportunities involving water utilities located in Washington County: interconnections between the City of Hartford Water Utilities and the Village of Slinger Water Utilities, the Village of Germantown Water Utility and the Village of Menomonee Falls Water Utility, and the Village of Germantown Water Utility and the City of Mequon. Any such interconnections would require the establishment of necessary agreements and approvals for activating and would need to consider and address issues related to equipment, pumping rates, and demand on water sources. In addition, some interconnections could be prohibited or subject to approvals pursuant to the Great Lakes-St. Lawrence River Basin Water Resources Compact.*

- Continue educational and outreach programs related to backflow prevention;
- Train water utility operators and plant personnel in security awareness and reporting protocols; and
- Conduct outreach on lead laterals and mains.

## **Current Programs**

### ***Federal and State Programs***

There are various governmental and agency programs to help address and fund groundwater contamination-related issues. The U.S. Environmental Protection Agency administers the Superfund program. This program was designed to clean up the worst contamination sites from sources, such as warehouses and landfills. There are no Superfund sites located in Washington County.<sup>60</sup>

The Wisconsin Department of Natural Resources oversees three programs relating to groundwater contamination issues:

- The first is overseen by the Department’s Remediation and Redevelopment Program (RR). This program oversees response actions at spills, hazardous substance release sites, abandoned containers, drycleaners, brownfields (including the Site Assessment Grant Program), “high priority” leaking underground storage tanks, closed wastewater and solid waste facilities, hazardous waste corrective action and generator closures, and sediment cleanup actions. It has primary responsibility for implementing and aiding cleanups under the Spill Law, the Environmental Repair Law, Federal programs (Superfund, Hazardous Waste Corrective Action, Leaking Underground Storage Tanks (LUST), and Brownfields), the Land Recycling Law and State Brownfield Initiatives, the Drycleaner Environmental Response Fund, and at closed landfills. The RR program provides technical assistance, helps to clarify legal liability, provides financial assistance primarily to local governmental units, and provides technical project oversight of cleanup projects.
- The second is the Well Compensation Program, which provides financial assistance through grant monies to remediate or seal contaminated private wells.
- The third is the Source Water Assessment Program which was completed in May 2003, as required by the 1996 reauthorization of the Federal Safe Drinking Water Act (SDWA). The 1996 amendments to the SDWA require States to: 1) delineate assessment area boundaries from which public water systems receive supplies of drinking water, 2) inventory significant potential sources of contamination within those boundaries, 3) determine the susceptibility of the public water systems to those potential sources of contamination, and 4) provide the assessment results to the public. In addition, Chapter NR 811 of the *Wisconsin Administrative Code* requires that wellhead protection plans be developed and submitted to the WDNR for all municipal water supply wells constructed since May 1, 1992. In addition, the WDNR has delineated wellhead protection areas for all other municipal wells and is working with the communities to refine those delineations. The WDNR has also sent letters to all municipal water supply system operators recommending steps to be taken for system security purposes.

### ***Local Programs***

As part of its water supply planning program, the Southeastern Wisconsin Regional Planning Commission has identified groundwater recharge areas with high and very high recharge potential and has made recommendations

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<sup>60</sup> *The Omega Hills North Landfill in the Village of Germantown was removed from the Superfund National Priority List in 1996 because it is being addressed by the WDNR under the authority of the Federal Resource Conservation and Recovery Act.*

regarding groundwater recharge area protection.<sup>61</sup> High and very high recharge potential areas in Washington County are shown on Map 48.

Most of the municipalities in the County that operate water utilities have either enacted wellhead protection ordinances, created wellhead protection or groundwater protection overlay districts as part of their zoning ordinances, or developed wellhead protection plans. While the details of these measures differ among the municipalities, they typically do some or all of the following:

- Specify minimum separation distances from wells and potential sources of contamination such as sewer mains, septic tanks, and fuel storage tanks;
- Define protection zones around municipal wells; and
- Indicate land uses that are permitted, permitted on a conditional basis, and prohibited within these zones.

Section NR 810.15 of the *Wisconsin Administrative Code* requires that the water supplier for every municipal water system develop and implement a comprehensive cross-connection control program. Water utilities within Washington County have developed such programs. While the provisions of these programs differ from utility to utility, they may include such measures as initial and periodic inspections of industrial, commercial, and public authority buildings to detect actual and potential cross-connections; requirements that property owners install protective devices, such as backflow assemblies, where unprotected cross-connections are detected; annual testing of backflow assemblies; and public education measures.

Municipal water utilities also send out informational brochures and newsletters to their customers on water-related issues.

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Based upon review of the above, feasible mitigation actions include development of a thorough water supply risk and threat assessment that identifies potential vulnerabilities and development of response plans, including plans to continue operations in response to particular emergencies and emergency water supply source alternative plans. Where feasible, interconnections between adjacent water utilities could provide some communities with an alternative source of water that could potentially allow service to continue following a loss of water supply event. In addition, ongoing educational efforts related to specific water supply contamination threats should continue.

### **Multi-Jurisdictional Considerations**

The contamination or loss of water supply can potentially impact all municipalities within the County. Both the communities relying on individual private wells and those with public systems are susceptible to problems such as shallow aquifer contamination or drawdown. Communities with public systems are also susceptible to issues such as facility malfunction, main breaks and security-related problems.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk, the following mitigation activities related to contamination or loss of water supply are included as priority mitigation measures in the hazard mitigation plan for Washington County:

- Promote development of a thorough drinking water supply risk and threat assessment that identifies potential vulnerabilities and targets for sabotage and terrorism attacks;

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<sup>61</sup> *SEWRPC Planning Report No. 52, A Regional Water Supply Plan for Southeastern Wisconsin, December 2010; SEWRPC Technical Report No. 47, Groundwater Recharge in Southeastern Wisconsin Estimated by a GIS-Based Water-Balance Model, July 2008.*

- Develop an emergency operation plan for each public water supply system in order to specify procedures for mechanical failures, power outages, unsafe samples, and acts of terrorism;
- Encourage local communities to develop emergency drinking water supply plans, including establishing response partner contacts with whom to discuss procedures;
- Encourage local utilities to identify priority water customers and develop plans for restoring their service first;
- Identify potential distribution points for emergency water supply;
- Evaluate the condition of water utility electrical equipment to accept generators, and repair or upgrade as necessary;
- Where opportunities exist, develop interconnections between adjacent water utilities to ensure provision of water in the event of an emergency such as a breakdown of equipment, a major fire, or a terrorist attack; and
- Continue educational and outreach programs related to backflow prevention.

## **HAZARD MITIGATION PLAN COMPONENT FOR LOSS OF SEWERAGE SYSTEM**

As described in Chapter III, loss of a sewerage system is a hazard event of concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate this type of hazard.

### **Identification of Alternative Mitigation Strategies**

As discussed in Chapter II, several Washington County communities are served by sanitary sewerage systems. Loss or failure of these systems could result in sewer overflows and basement backups. Such loss or failure could threaten public health and could result in damage to the environment. The following measures to reduce vulnerability to the loss of sewerage systems have been identified as viable for the Washington County hazard mitigation plan.

#### ***Nonstructural***

- Ensure that utility personnel are trained to shut down and start up utility systems manually;
- Promote development of a thorough sewerage system risk and threat assessment that identifies potential vulnerabilities and targets for sabotage and terrorism attack; and
- Develop an emergency operation plan for each sanitary sewerage system in order to specify procedures for mechanical failures, power outages, and threats of acts of terrorism;

#### ***Structural***

- Maintain municipal sanitary sewer infrastructure at acceptable operating standards;
- Floodproof and storm proof the wastewater treatment plant, pumping stations, and other vital system components;
- Initiate facility planning for sanitary sewerage systems when average daily flow to the wastewater treatment plant approaches 80 percent of the plant's design capacity;<sup>62</sup>

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<sup>62</sup> *This metric was applied as a guide for when facilities planning should be considered in SEWRPC Planning Report No. 30, A Regional Water Quality Management Plan for Southeastern Wisconsin, Volume One, Inventory Findings, Volume Two, Alternative Plans, and Volume Three, Recommended Plan, July 1979 and SEWRPC Planning Report No. 50, A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds, December 2007, amended May 2013.*

- Provide backup power for the wastewater treatment plant, pumping stations, and other vital system components; and
- Evaluate ability of electrical equipment to accept generators. Repair or upgrade as necessary.

### ***Public Informational and Educational Programming***

- Continue and expand public informational and educational programming related to preventing clogging of sewer laterals and responding to basement backups; and
- Where appropriate, encourage the installation of residential sewage backflow prevention devices.

### **Current Programs**

#### ***Federal and State Programs***

Section NR 210.23 of the *Wisconsin Administrative Code* requires that all owners of sanitary sewage collection systems, including satellite sewage systems, develop and implement a Capacity, Management, Operation and Maintenance Program (CMOM) by August 1, 2016. A CMOM Program assures that a sewage system is properly managed, operated, and maintained at all times; has adequate capacity to convey peak flows; and that all feasible steps are taken to eliminate excessive infiltration and inflow into the system. These programs are intended to significantly reduce, if not eliminate, sanitary sewer overflows (SSOs) and basement back-ups. A CMOM Program must also mitigate the impact of overflows on waters of the State, the environment, and public health. Public notification is required for each SSO.

Chapter NR 208, “Compliance Maintenance,” of the *Wisconsin Administrative Code*, requires that owners of wastewater treatment works annually submit an electronic Compliance Maintenance Annual Report (eCMAR) to the WDNR. The eCMAR is a tool intended to evaluate the wastewater treatment system for problems or deficiencies. As part of completing the eCMAR, treatment plant owners describe management, operation, and maintenance activities and identify proposed actions that are intended to prevent violations of their discharge permits and degradation of water quality. The eCMAR program also encourages actions that promote the owners’ awareness of, and responsibility for, wastewater collection and treatment needs; maximize the useful life of wastewater treatment systems through improved operation and maintenance; and initiate formal planning, design, and construction for system upgrades.

#### ***Local Programs***

Several of the sanitary sewer utilities in the County conduct public information and education activities related to educating residents on the steps that they can take to prevent clogging of their sewer laterals. In addition, some of the utilities also conduct public information and education activities related to what residents should do in response to basement backups.

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Based upon review of the above, feasible mitigation actions include development of a thorough sewerage system risk and threat assessment that identifies potential vulnerabilities and development of response plans, including plans to continue operations in response to particular emergencies. An additional feasible measure is the provision of backup power for vital system components.

### **Multi-Jurisdictional Considerations**

Only those areas within Washington County that are served by sanitary sewerage systems face risks due to loss or failure of these systems. These areas are largely located within the Cities of Hartford and West Bend; the Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; and the unincorporated hamlet of Allenton in the Town of Addison. Because they are not served by sanitary sewerage systems, the other areas within the County are not at risk from this hazard.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk, the following mitigation activities related to loss of sewerage system are included as priority mitigation measures in the hazard mitigation plan for Washington County:

- Promote the development of a thorough sewerage system risk and threat assessment that identifies potential vulnerabilities and targets for sabotage and terrorism attack;
- Develop an emergency operation plan for each sanitary sewerage system in order to specify procedures for mechanical failure, power outages, and threats of acts of terrorism;
- Initiate facility planning for sanitary sewerage systems when average daily flow to the wastewater treatment plant approaches 80 percent of the plant's design capacity; and
- Provide backup power for the wastewater treatment plant, pumping stations, and other vital system components.

## **HAZARD MITIGATION PLAN COMPONENT FOR HAZARDOUS MATERIAL INCIDENTS**

As described in Chapter III, hazardous material incidents are human-induced hazard events of significant concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate these types of hazards.

### **Identification of Alternative Mitigation Strategies**

As described in Chapter II, Washington County contains a significant number of fixed facilities that store hazardous substances, as well as an extensive transportation system to move hazardous materials throughout the County. Nevertheless, there have only been a limited number of minor hazardous material incidents, all of which have been properly handled through local emergency response actions.

Hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other facilities in Washington County. Despite extensive precautions taken to ensure careful handling during manufacture, transport, storage, use, and disposal, accidents and inadvertent releases are bound to occur. In review by the Washington County Hazard Mitigation Plan Local Planning Team, the following measures to reduce vulnerability to hazardous material incidents have been identified as viable for the Washington County hazard mitigation plan.

### ***Nonstructural***

- Continue participation in the Wisconsin Hazardous Materials Response System;
- Maintain the current County-wide, State-designated Type III hazardous materials emergency response team;
- Assess levels of training and refresher training for hazardous material response among first responders, including law enforcement, fire, emergency medical, and public works personnel;
- Promote community and operator compliance with industry safety regulations and standards;
- Document the flow of hazardous cargo along transportation routes through the County;
- Develop local community response plans for hazardous material releases;
- Promote development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, and other appropriate sites that produce, store, or utilize hazardous materials or that are near facilities or transportation routes where hazardous materials are produced, stored, used or transported;

- Inventory, evaluate, and maintain stockpiles of materials, such as firefighting foam, for responding to hazardous material incidents; and
- Consider enacting zoning restrictions for areas adjacent to transportation routes carrying hazardous cargoes.

### ***Structural***

- Promote proper design, construction, maintenance, and inspection of hazardous material storage facilities, pipelines, and other related facilities;
- Promote continued maintenance and upgrading of transportation infrastructure carrying shipments of hazardous cargo;
- Promote control, enforcement, and cleanup of hazardous materials, including proper disposal of chemicals; and
- Continue and consider expansion of the current household hazardous waste management program.

### ***Public Informational and Educational Programming***

- Promote public awareness of hazardous material dangers and personal protection actions for these dangers;
- Educate businesses and those utilizing hazardous materials of their responsibilities;
- Encourage public awareness and widespread use of the “Diggers Hotline” utility damage prevention service;
- Continue to promote training, planning, and preparedness for mass-casualty incidents involving fixed facilities and transportation systems; and
- Continue to develop trained, equipped, and prepared emergency first responders.

### **Current Programs**

#### ***Federal and State Programs***

In 2014, the U.S. Department of Transportation issued an Emergency Order requiring all railroads operating trains containing more than one million gallons of Bakken crude oil, or approximately 35 tank cars, in a particular state to provide the State Emergency Response Commission (SERC) notification regarding the expected transport of such cargo through the counties of that state. The notification must include estimated volumes of Bakken crude oil being transported, frequencies of anticipated train traffic, and the route that the crude oil will be transported. The railroad operators must also provide contact information for a responsible party from the railroad and assist the SERC in sharing the information with the appropriate emergency responders in appropriate communities. In addition, the Pipeline and Hazardous Materials Safety Administration (PHMSA) and Federal Railroad Administration (FRA), in coordination with Canada, issued a rule in 2015 that mandates enhanced standards for new tank cars and a retrofitting schedule for older tank cars carrying crude oil and ethanol. The rule also requires a new braking standard for certain trains and designates new operational protocols for trains transporting large volumes of flammable liquids, including routing requirements, speed restrictions, and information for local government agencies regarding the cargo.

In accordance with the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and Chapter 59 of the *Wisconsin Statutes*, a Local Emergency Planning Committee (LEPC) has been established in Washington County and in other counties in Wisconsin. WEM has been charged with the duties of the State Emergency Response Commission and is the oversight organization for the EPCRA grant program, the emergency response system and establishing training standards for the State and the LEPCs. In Wisconsin, the Federally-mandated local planning districts are counties and the LEPCs develop emergency response plans and prepare for hazardous material emergencies within their individual counties. Each LEPC is required to coordinate its planning activities with local response agencies and local industries that handle extremely hazardous substances above threshold planning quantities (TPQs), and to develop emergency response plans for the transportation of hazardous materials



through their communities. Additionally, facilities are required to make emergency release notifications to the National Response Center, the State EPCRA program, and the LEPC whenever there is a release of an “extremely hazardous substance” or other hazardous substances listed under the Comprehensive Environmental Resources and Conservation Liability Act (CERCLA).

To provide a high level of hazardous materials response capabilities to local communities, WEM contracts and manages 22 Regional Hazardous Materials Response Teams. The teams are divided into four Task Forces: the Northeast Task Force, the Northwest Task Force, the Southeast Task Force, and the Southwest Task Force. These Task Forces are then divided into Type III, Type II, and Type I teams, all with complimentary capabilities and training requirements.

Type III teams are appropriately equipped and trained to handle all known industrial chemical hazards in liquid, aerosol, powder, and solid forms. They are not expected to be fully equipped to intervene in and handle vapor or gas emergencies or incidents involving chemical, biological, radiological, nuclear, and explosive agents (CBRNE). Type II teams are equipped and trained to meet all Type III requirements and are appropriately equipped and trained to handle all unknown industrial chemical hazards in liquid, aerosol, powder, solids, and vapor or gas forms. They are generally not expected to be fully equipped to intervene and handle incidents involving CBRNE. Type I teams meet all Type III and Type II requirements and are also appropriately equipped and trained to handle and can function in all categories for all known and unknown CBRNE agents.

Washington County is part of the Southeast Task Force. The County also has a Type III hazardous materials response team. Other teams that are part of the Southeast Task Force include Type III teams in Fond du Lac and Sheboygan Counties, a Type II team in Racine County, and a Type I team in Milwaukee County.

The Wisconsin Hazardous Materials Response System may be activated for an incident involving a hazardous materials spill, leak, explosion, injury or the potential of immediate threat to life, the environment, or property. The Wisconsin Hazardous Materials Response system responds to the most serious of spills and releases requiring the highest level of skin and respiratory protective gear. This includes all chemical, biological, or radiological emergencies.

Through public educational programs, emergency managers in Wisconsin counties are required to make the public aware of certain hazardous materials located at local facilities. Information about these facilities in Washington County is shared with the public through the Washington County LEPC. The LEPC consists of representatives from a cross-section of individuals throughout Washington County, including, but not limited to, elected officials, members of emergency response agencies, media representatives, community groups, and facility representatives. Types of material, quantities stored, and their inherent dangers are discussed during quarterly LEPC meetings. Facilities having these hazardous materials are required to give this information to the Washington County Office of Emergency Management and to prepare written plans to respond to possible spills.

Federal and State programs also include awareness and education activities. The Wisconsin Department of Health Services has developed a chemical release tool kit to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to hazardous material incidents.<sup>63</sup>

### ***Local Programs***

The Washington County Emergency Management Office and the LEPC have developed a countywide emergency response plan and continue to work on offsite facility plans, as needed, and updates them on a regular basis. The plan also contains information on protective actions such as how to reach the facility coordinator in an emergency, evacuation, and in-place sheltering. Washington County also utilizes a hazardous materials plan. This plan was adopted in 1998 and is reviewed and updated annually. The Washington County Emergency Management Office

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<sup>63</sup> *Wisconsin Department of Health Services, Wisconsin Chemical Release Toolkit, Publication P00734, July 2014.*

and the LEPC are also responsible for receiving and maintaining files. They maintain a countywide emergency response plan, develop and update offsite emergency response plans, and keep the County's hazard analysis for both fixed facilities and chemicals that are transported on highways and railways.

The Washington County Emergency Management Office also has a number of brochures, booklets, and pamphlets available for the public on hazardous chemical safety and other general emergency management-related topics.

As described in Chapter II, Washington County has developed a comprehensive emergency management plan and hazard analysis, which sets forth an all-hazards action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs that complement the County's plan and that also set forth procedures and actions to deal with a range of situations and events, including hazardous materials incidents.

In the event of a hazardous materials incident, Washington County can utilize its county-wide hazardous materials response team, which is also a Type III State-contracted team, or utilize the State-wide hazardous material task force response system. In 1995, the nearby City of Milwaukee Fire Department, which is a Type I State-contracted team, signed a contract with the State of Wisconsin to be the Regional hazardous materials response agency for Southeastern Wisconsin. This department has a certified Hazardous Materials Team, made up of firefighters who have been trained to respond to chemical-related emergencies throughout the Southeastern Wisconsin region, and the Team has specialized equipment and a state-of-the-art hazardous materials response vehicle to assist in responding to regional hazardous materials incidents, including chemical, biological, radiological, and nuclear capabilities.

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Based upon review of the above, the current ongoing hazardous material programs represent a major component of the planned mitigation action with regard to the continued compliance with safety regulation standards, continued training of first responders, enforcement of existing laws and rules, public informational and educational programming systems, and development of, and continued updates to, relevant hazardous materials related plans at the County and local municipality level.

### **Multi-Jurisdictional Considerations**

Hazardous material incidents could potentially impact all municipalities within the County. Increased potential impacts for hazardous material incidents are apparent for those communities in the County that are traversed by major transportation routes such as IH 41, USH 45, and freight railroad lines.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk, the following mitigation activities related to hazardous material incidents are included as priority mitigation measures in the Washington County hazards mitigation plan:

- Continue participation in the Wisconsin Hazardous Materials Response System;
- Develop local community response plans for hazardous material releases;
- Promote development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, and other appropriate sites that produce, store, or utilize hazardous materials or that are near facilities or transportation routes where hazardous materials are produced, used, stored, or transported;
- Promote proper design, construction, maintenance, and inspections of hazardous material storage facilities, pipelines, and other related facilities;
- Promote continued maintenance and upgrading of transportation infrastructure carrying shipments of hazardous cargo;
- Educate businesses and those utilizing hazardous materials of their responsibilities; and

- Continue to promote training, planning, and preparedness for mass-casualty incidents involving fixed facilities and transportations systems.

## **HAZARD MITIGATION PLAN COMPONENT FOR TERRORISM INCIDENTS**

As described in Chapter III, terrorism as a human-induced hazard event is of concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate this type of hazard.

### **Identification of Alternative Mitigation Strategies**

As described in Chapter III, a range of terrorism incidents have the potential to occur in Washington County. The magnitude and scope of such an incident is dependent upon the technological means available to the terrorists, nature of the political issue motivating the act, and the points of weakness of the terrorism target. In review by the Washington County Hazard Mitigation Plan Local Planning Team, the following measures to reduce vulnerability to terrorism incidents have been identified as viable for the Washington County hazard mitigation plan. It should be noted that incidents involving cyberattack are addressed separately in the section on cyberattack on local government in this chapter.

#### ***Nonstructural***

- Promote development of a thorough community risk and threat assessment that identifies potential vulnerabilities and targets for a sabotage, terrorism, and/or weapons of mass destruction (WMD) attack;
- Promote and conduct preparedness activities including planning, training, and exercises for local law enforcement, fire and rescue, and other response personnel for a variety of terrorist, sabotage, and weapons of mass destruction attacks;
- Continue and train Community Emergency Response Teams (CERT) coordinated with County and local emergency operations planning and programs;
- Develop and promote workable population protection plans such as evacuation and in-place sheltering, as appropriate;
- Promote development of site emergency plans that address evacuation and in-place sheltering for schools, factories, office buildings, shopping malls, hospitals, government buildings, and other appropriate sites;
- Promote alertness, awareness, and monitoring of organizations and activities that may threaten the community;
- Establish avenues of reporting (and potential rewards) for information preventing terrorist incidents and sabotage;
- Support and expand the use of Neighborhood Watch and If You See Something, Say Something programs;
- Promote increased security measures at water supply facilities that could include increased security patrols and/or increased monitoring for pathogens and chemical toxins; and
- Encourage development of emergency preparedness plans for critical governmental, utility, and infrastructure systems.

#### ***Structural***

- Heighten security at public gatherings, special events, and critical community facilities and industries.

### ***Public Informational and Educational Programming***

- Promote public awareness of terrorism-related dangers and personal protection actions for these dangers;
- Promote greater awareness of, and provision for, mental health services in schools, workplaces, and institutional settings;
- Increase coverage and use of NOAA All Hazard Weather Radio, which can provide notification to the community during any period of emergency, including a terrorist attack;
- Promote development and testing of internal emergency plans and procedures by businesses, government, and other organizations; and
- Encourage residents to develop a Family Emergency Preparedness Plan that would include the preparation of a Disaster Supply Kit (Appendix G).

### **Current Programs**

#### ***Federal and State Programs***

At the Federal level, initiatives to combat terrorism are coordinated through the Department of Homeland Security (DHS). Since its establishment, DHS has been the lead Federal agency responsible for preparing for and responding to terrorist attacks, in addition to being the lead Federal agency for preparing for, responding to, and recovering from any accidental man-made or natural disasters. DHS also a variety of anti-terrorism resources available to local governments including information resources, training, and funding.

Wisconsin anti-terrorism efforts are coordinated by WEM within the Department of Military Affairs in cooperation with the Wisconsin Office of Justice Assistance and various other Federal, State, and local agencies. A Wisconsin Interagency Working Group on Terrorism, which includes numerous State agencies and advisory members from Federal agencies, was initiated by the Governor in 1997. This group has been working with WEM on Weapons of Mass Destruction and other terrorism-related issues.

Another important State program is the availability of the Wisconsin National Guard civil support team, which can be accessed through the Wisconsin Department of Military Affairs, Division of Emergency Management.

#### ***Local Programs***

As described in Chapter II, there are 13 fire departments; 13 rescue departments; 17 hospitals, major clinics, and health departments that serve communities in Washington County (see Appendices D and E). Six municipalities in the County provide for law enforcement through full-time local police departments. Three other municipalities provide for law enforcement through part-time police departments or town constable with limited hours and the Washington County Sheriff's Department. In the remaining municipalities primary law enforcement is through the County Sheriff's Department. Fire and rescue departments within Washington County participate in the Mutual Aid Box Alarm System (MABAS) agreement. This agreement enables departments to render assistance to each other in the County during the response to fire and rescue emergency incidents and to bring in additional resources from other counties during these incidents.

As described in Chapter II, Washington County has developed a comprehensive emergency management plan and hazard analysis, which sets forth an all-hazards action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs that complement the County's plan and that also set forth procedures and actions to deal with a range of situations and events.

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Based upon review of the above, the current ongoing programs represent a major component of the planned mitigation action with regard to the continued prevention, control, and preparedness for terrorist incidents, and

public informational and educational programming systems. Feasible nonstructural and structural mitigation actions include development of a thorough community risk and threat assessment that identifies potential vulnerabilities, heightening security at special events and critical community facilities, development of site emergency plans, and development of emergency water supply source protection measures that may be applicable at the municipality level.

### **Multi-Jurisdictional Considerations**

Terrorism incidents could potentially impact all municipalities within the County. These events can potentially cause multiple damages to a variety of infrastructure including, transmission lines, utilities, and transportation routes, as well as other critical community facilities in the vicinity of the incident. Hence, Washington County, municipalities, and relevant businesses will need to coordinate hazard mitigation activities through the local government participation in countywide disaster planning and response mechanisms.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk, the following mitigation activities related to terrorism incidents are included as priority mitigation measures in the Washington County hazards mitigation plan:

- Maintain, update, and upgrade public early warning systems and networks. As part of this, increase coverage and use of NOAA All Hazard Weather Radio and Emergency Alert System broadcasts;
- Promote development of a thorough community risk and threat assessment that identifies potential vulnerabilities and targets for sabotage, terrorism, and/or weapons of mass destruction (WMD) attack;
- Promote and conduct preparedness activities including planning, training, and exercises for local law enforcement, fire and rescue, and other response personnel for a variety of terrorist, sabotage, and WMD attacks;
- Promote development of site emergency plans that address evacuation and in-place sheltering for schools, factories, office buildings, shopping malls, hospitals, government buildings, and other appropriate sites;
- Promote increased security measures at water supply facilities that could include increased security patrols and/or increased monitoring for pathogens and chemical toxins;
- Encourage development of emergency preparedness plans for critical governmental, utility, and infrastructure systems; and
- Heighten security at public gatherings, special events, and critical community facilities, utilities, infrastructure, and industries.

## **HAZARD MITIGATION PLAN COMPONENT FOR CYBERATTACK ON LOCAL GOVERNMENT**

As described in Chapter III, cyberattack is a hazard of concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate this hazard.

### **Identification of Alternative Mitigation Strategies**

As described in Chapter III, a range of cyberattack incidents have the potential to affect local government in Washington County. Such attacks may include the disabling of information systems, theft or modification of sensitive or important information, transfer of control of an information system to an unauthorized user, or use of local government resources for unauthorized purposes. The magnitude and scope of a cyberattack incident is also dependent upon the technological means available to the attackers, the goals and motivations of the attackers, and the points of weakness of the local government information system. The Washington County Hazard Mitigation Plan Local Planning Team identified the following measures to reduce vulnerability to cyberattack.

### ***Nonstructural***

- Provision of cybercrime and cyberthreat training to appropriate local government information technology staff and law enforcement personnel;
- Purchase of cyber-insurance by local governments. Such insurance may include first-party coverage against losses such as data destruction, extortion, theft, hacking, and denial of service attacks; liability coverage indemnifying the local government for losses to others caused by actions such as errors and omissions, failure to safeguard data, or defamation; and other benefits such as regular audits of security, investigative expenses, and criminal reward funds;
- Education in basic cybersecurity actions for local government employees. This education should include training on:
  - Identifying sensitive data,
  - Prioritizing which data need more protection,
  - Prioritizing which data need more frequent backing up,
  - Policies regarding access to and use of data,
  - Recognizing suspicious files, emails, and websites,
  - Using strong passwords and changing passwords at regular intervals, and
  - Achieving a balance between operational efficiency and risk;
- Installation, maintenance, and updating of security software, such as firewalls and antiviruses, on local government computers and computer networks;
- Installation of updates for operating systems and application software on local government computers and computer networks as they become available; and
- Disconnection of computers and networks that store highly sensitive information or that control or monitor important equipment or processes from the internet.

### ***Structural***

- Installation of dedicated communication lines for monitoring and/or controlling critical equipment or processes.

### ***Public Informational and Educational Programming***

- Development and implementation of a cybersecurity and data back-up educational initiative for Washington County.

### **Current Programs**

#### ***Federal and State Programs***

Several Federal agencies provide no-cost specialized cybercrime training to state and local law enforcement agencies. The Federal Bureau of Investigation's (FBI) Cyber Investigation Certification Program teaches law enforcement personnel how to secure digital artifacts in crime scenes. The FBI Cyber Shield Alliance provides state and local law enforcement agency partners access, intelligence sharing, federally sponsored training, and fellowships at the National Cyber Investigative Joint Task Force. The National Initiative for Cybersecurity Careers and Studies (NICCS) makes research and training information available through a searchable catalog that allows users to find cyber training programs based on location, preferred delivery method, specialty area, or proficiency level. The

National Computer Forensics Institute offers training courses to state and local law enforcement, prosecutors, and judges through funding from the Federal government. Travel, lodging, equipment for some classes, and course fees are provided at no costs to attendees or their agencies. The Federal Law Enforcement Training Centers' Cyber Division provides introductory to advanced cybercrime training to state and local law enforcement personnel. FEMA's National Training and Education Division provides cybercrime- and cybersecurity-focused courses that address issues such as network assurance, digital forensics, cyber law, white collar crime, and cyber incident analysis and response. The National White Collar Crime Center (NW3C) provides support for law enforcement and regulatory agencies involved in the prevention, investigation, and prosecution of economic and high-tech crime. The NW3C offers courses in cyber investigation, forensics and cybercrime, network intrusions, mobile forensics and wireless network investigations.

The U.S. Department of Homeland Security provides educational materials on cybersecurity and reducing vulnerability to cyberattack.

Through its Ready Wisconsin initiative, WEM provides educational materials on several hazards, including cyberattack. These materials include a monthly cybersecurity newsletter, links to resources, pre-recorded radio public service announcements, and videos.

### ***Local Programs***

Washington County has developed policies regarding the use of open wireless internet access in County buildings and the official use of social media by County Departments. In addition, the County has developed work rules regarding the use of County computers and computer networks by County employees.

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Based upon review of the above, programs to educate and train government employees in basic cybersecurity measures including identifying sensitive data and recognizing cyber-threats represent a major component of the planned mitigation action with regard to the continued prevention, control of, and preparedness for cyberattack incidents. Other feasible mitigation actions include developing cybersecurity initiatives, giving consideration to controlling and/or monitoring critical equipment and processes through the use of dedicated communication lines, and protecting local governments against monetary loss and liability with insurance.

### **Multi-Jurisdictional Considerations**

All municipalities within Washington County could potentially be impacted by cyberattacks.

### **Priority Mitigation Measures**

The recommended priority mitigation measures for cyberattack on local government are:

- Purchase of cyber-insurance by local governments, including both first-party and liability coverage;
- Encourage local governments to provide education in basic cybersecurity to their employees, including training on identifying sensitive data, prioritizing data which need greater protection and/or more frequent backing up, policies regarding data access and use, recognition of cyber-threats, proper procedures for password, and balancing operational efficiency and risk;
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment or processes; and
- Develop and implement a cybersecurity and data back-up initiative.

## **HAZARD MITIGATION PLAN COMPONENTS FOR POWER OUTAGES**

As described in Chapter II, power outages are hazard events of significant concern to be considered in the Washington County hazard mitigation plan. This section describes alternative and selected strategies to mitigate power outages.

### **Identification of Alternative Mitigation Strategies**

As described in Chapter III, long-term power outages can occur throughout Washington County. The severity of such events may range from small, relatively localized incidents to major incidents impacting a substantial portion of the County. Some outages may result in serious social and economic disruptions. The following measures to reduce vulnerability to long-term power outages have been identified as viable for the Washington County Hazard Mitigation Plan.

#### ***Nonstructural***

- Continue to review and implement programs to improve the reliability of the power supply facilities. Such measures may include implementation of maintenance and operational improvements, equipment upgrading, providing redundancy in the supply facilities where appropriate, and in some instances, burying power lines;
- Coordinate activities and communication between power suppliers and the Washington County Emergency Management Office to keep County and municipal officials informed of outage prevention practices and reaction activities during outages;
- Establish and maintain a database of which critical facilities, such as shelters, long-term care facilities, and fueling sites, have and do not have back up power generators;
- Update and maintain listings of available generators in adjacent counties;
- Encourage development of business resumption plans to be put into place following an outage; and
- Develop plans for evacuations and shelter operations in the case of a prolonged outage.

#### ***Structural***

- Encourage the installation of backup power generators at public and private critical facilities.

#### ***Public Informational and Educational Programming***

- Conduct outreach to businesses and facilities to encourage them to develop plans for dealing with long-term power outages. Such outreach should also encourage them to be realistic about the amount and types of assistance that they can expect to receive from local government during an outage;
- Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves.
- Continue and refine public informational and educational programming to include information on safety during outages and preparation for outages. With regard to safety during outages, We Energies<sup>64</sup> offers the following recommendations:
  - Stay at least 25 feet from downed power lines or flooded areas;
  - Use flashlights rather than candles;
  - Unplug or turn off appliances to avoid overloading when power is restored;
  - Do not use extension cords between homes or across yards or streets;

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<sup>64</sup> We Energies, "Power Outage Safety Tips," [http://www.we-energies.com/outages\\_safety/reporting/outage-safety-tips.htm](http://www.we-energies.com/outages_safety/reporting/outage-safety-tips.htm), accessed June 28, 2016.



- Do not use outdoor grills, kerosene heaters, or camping stoves or heaters indoors;
- People whose homes are extremely hot or cold should go to a safe shelter;
- Stay clear of electric company vehicles and equipment;
- Have a supply of safe water;
- Keep refrigerated food safe or dispose of it;
- Leave a light on in your home. When crews do neighborhood spot checks, they’ll know your power is back on if a light is on; and
- Create a family plan on procedures to be used if an outage occurs.

With regard to preparing for a power outage, We Energies recommends<sup>65</sup> creating an emergency plan that includes backup provisions for special electrical medical equipment, sump pump backup systems, telephone provisions, assembly of an emergency kit, protection of electrical equipment, and installation or provision of power generators where appropriate.

## **Current Programs**

### ***Federal and State Programs***

WEM has produced educational resources regarding power outages including prerecorded radio public service announcements and scripts for radio public service announcements.<sup>66</sup> Other informational and educational material related to power outages and mitigative measures are available from organizations such as the American Red Cross.<sup>67</sup>

### ***Local Programs***

As previously noted, the causes of power outages are primarily weather related and, to a lesser extent, equipment failure and other factors. The electric power supply companies—in the case of Washington County, We Energies, Hartford Electric, the Village of Slinger Electric Utility, and American Transmission Company have programs in place to improve the reliability of the electric power delivery system. Equipment and facilities where equipment failures have a history of occurrence are given priority.

These companies also have operational procedures for resolving outage problems once they occur. The power company procedures are prioritized to first deal with any life-threatening situations, then larger outages, and then smaller secondary lines and neighborhood equipment. In some cases homes, utilities, hospitals, and business owners have installed, or have available, backup power generating sources to be used during power outages that temporarily provide for partial or full power during an outage. We Energies has also prepared informational and educational materials related to power outage mitigative measures.

## **Evaluation of Alternatives and Identification of Mitigation Actions**

Based upon the risk assessment given in Chapter III and the discussion given above, three approaches to mitigating the impacts of power outages are considered viable for incorporation into the Washington County hazard mitigation plan. First, efforts should be taken to improve the reliability of the electric power supply system. The responsibility for this lies mainly with the electric utilities. Second, facilities and business should be prepared to deal with power

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<sup>65</sup> Ibid.

<sup>66</sup> These can be accessed at Wisconsin Emergency Management’s ReadyWisconsin website located at: [http://ready.wi.gov/Resources/Manager\\_Resources.asp](http://ready.wi.gov/Resources/Manager_Resources.asp).

<sup>67</sup> American Red Cross, “Be Red Cross Ready: Power Outage Checklist,” 2009.

outages. Such preparation involves both planning activities and installation of backup power generators at critical facilities. Third, since power outages can pose risks to the safety of people affected, mitigation should include educational programming related to safety during power outages.

### **Multi-Jurisdictional Considerations**

All municipalities within Washington County could potentially be impacted by long-term power outages.

### **Priority Mitigation Measures**

The mitigative actions for power outage incidents recommended for the Washington County hazard mitigation plan are as follows:

- Continue to review and implement programs to improve the reliability of the power supply facilities. Consider implementing such measures as maintenance and operational improvements, equipment upgrading, providing redundancy in supply facilities where appropriate, and burying power lines;
- Encourage the installation of backup power generators at public and private critical facilities;
- Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves;
- Conduct outreach to businesses and facilities to encourage them to develop plans for dealing with long-term power outages. Such outreach should also encourage them to be realistic about the amount and types of assistance that they can expect to receive from local government during an outage; and
- Continue and refine public informational and educational programming to include guidance on safety during outages and preparation for outages.

## **HAZARD MITIGATION PLAN COMPONENT FOR COMMUNICABLE DISEASE OUTBREAK**

As described in Chapter III, communicable disease outbreaks are of concern relative to the Washington County hazard mitigation plan. This section describes the alternative and selected strategies to mitigate this hazard.

### **Identification of Alternative Mitigation Strategies**

As described in Chapter III, outbreaks of communicable diseases can occur throughout Washington County. The severity of such events may range from small, relatively localized outbreaks to major pandemics. Some outbreaks may result in serious social and economic disruptions. The following measures to reduce vulnerability to communicable disease outbreaks have been identified as viable for the Washington County Hazard Mitigation Plan.

#### ***Nonstructural***

- Continue maintenance of a community public health system with adequate numbers of medical staff and sufficient disease monitoring and surveillance capabilities to adequately protect the population from small- and large-scale outbreaks and epidemics;
- Promote development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, and other appropriate sites;
- Promote the development of site emergency plans for local units of government;
- Provide community support for clinics and school health services;
- Implement preventive actions directed toward specific medical situations. For example, preventive actions for mosquito-borne diseases could include: mosquito abatement measures, such as catch basin cleaning or

spraying and general spraying; standing water reduction actions; and individual actions, such as covering of skin and use of repellants;

- Develop and maintain plans for mass dispensing clinics for large-scale antibiotic or vaccine dispensing in the event of an infectious disease emergency;
- Promote childhood and adult immunization programs;
- Develop, implement, and support programs targeting the mechanism of transmission for individual diseases. Examples include programs addressing the role of illicit drug usage in the transmission of human immunodeficiency virus and Hepatitis B; and
- Utilize accepted and recommended infection control practices in medical facilities.

### ***Structural***

- Promote demolition and clearance of vacant structures to prevent rodent infestation; and
- Continue to maintain community water supply and sewer infrastructure at high operating standards.

### ***Public Informational and Educational Programming***

- Promote public awareness of the causes, symptoms, and protective actions for disease outbreaks;
- Encourage residents to receive immunizations against communicable diseases, including annual and special-strain influenza inoculations; and
- Promote preventative actions for specific medical situations. For example, preventative actions to be promoted for mosquito-borne diseases involve reducing the public unprotected exposure to mosquitoes.

### **Current Programs**

#### ***Federal and State Programs***

The U.S. Department of Health and Human Services (HHS) is the Federal government's principal agency for protecting the health of all Americans and providing essential human services, especially for those who are least able to help themselves. The Department's 11 operating divisions administer 115 programs, covering a wide spectrum of activities. Relative to communicable disease outbreaks, these activities include:

- Medical and social science research;
- Preventing outbreaks of infectious diseases;
- Immunization services;
- Medicare, which provides health insurance for elderly and disabled Americans;
- Medicaid, which provides health insurance for low-income people;
- Improving maternal and infant health;
- Substance abuse treatment and prevention;
- Comprehensive health services for Native Americans; and
- Medical preparedness for outbreak emergencies.

HHS is the largest grant-making agency in the Federal government. The HHS Medicare program is the nation's largest insurer, handling more than one billion claims per year.

HHS works closely with state, local, and tribal governments, and many HHS-funded services are provided at the local level by state, County, or tribal agencies, or through private sector grantees. The Department's programs are administered by 11 operating divisions, including eight agencies in the U.S. Public Health Service and three human services agencies. In addition to the services they deliver, the HHS programs provide for equitable treatment of beneficiaries nationwide, and they enable the collection of national health and related data.

The Centers for Disease Control and Prevention (CDC) is an agency of the Department of Health and Human Services and recognized as the lead Federal agency for protecting the health and safety of people both at home and abroad. The CDC provides credible information to enhance health decisions, and promotes health through strong partnerships. The CDC serves the national focus for developing and applying disease prevention and control, environmental health, and health promotion and education activities designed to improve the health of the people of the United States.

The CDC's mission is to promote health and quality of life by preventing and controlling disease, injury, and disability. The CDC seeks to accomplish this mission by working with partners throughout the nation and world to monitor health, detect and investigate health problems, conduct research to enhance prevention, develop and advocate sound public health policies, implement prevention strategies, promote health behaviors, foster safe and healthful environments, and provide leadership and training. In addition, the CDC has developed and sustained many vital partnerships with public and private entities that improve service to the American people.

The Wisconsin Department of Health Services (WDHS) works in partnership with local governments, health and human service agencies, private providers, and concerned and affected citizens to protect and promote the health and safety of the people of Wisconsin. WDHS conducts its activities through six divisions. The Division of Public Health (WDPH) provides public health services to the people of Wisconsin that address communicable and chronic diseases; health promotion; environmental, occupational, family, and community health; emergency medical services; and injury prevention. WDPH also collects statistics related to the health of Wisconsin residents. Through its Bureau of Communicable Diseases, WDPH promotes efforts to prevent and control communicable diseases in Wisconsin. Specific responsibilities of the Bureau include:

- Implementing surveillance, control, and prevention measures for communicable diseases;
- Maintaining a State-wide surveillance system;
- Providing vaccines and technical assistance to health care providers conducting immunizations for those communicable diseases for which vaccines are available;
- Operating the Wisconsin Immunization Registry which keeps track of immunization histories for Wisconsin citizens;
- Conducting educational activities to encourage prompt and complete immunization;
- Assisting local health departments, health care providers, and citizens in preventing and controlling the spread of communicable diseases;
- Assisting in the early identification and intervention of communicable diseases;
- Informing the public about ways to prevent and control communicable diseases;
- Monitoring scientific advances in the field of communicable disease prevention and control research; and
- Incorporating appropriate advances into public health practice.

In addition to the programs offered by the WDHS, a number of other organizations conduct programs related to detecting, preventing, and responding to outbreaks of communicable diseases in Wisconsin. These organizations include the Wisconsin Hospital Association, the Wisconsin Association of Local Health Departments and Boards, the Wisconsin Public Health Association, the University of Wisconsin, the Medical College of Wisconsin, the

Wisconsin Laboratory of Hygiene, WEM, the Wisconsin Office of Rural Health, and the Wisconsin Primary Health Care Association.

### ***Local Programs***

As described in Chapter III and Appendix E, there are two hospitals, 14 major clinics, and one health department in Washington County. The County has developed a comprehensive emergency management plan which sets forth responses to a variety of hazards and disasters.<sup>68</sup> In addition, many of the local units of government in the County have developed emergency operation plans and/or programs which complement the County plan and which also set forth procedures and actions to deal with a range of situations and events.

The Washington-Ozaukee Public Health Department conducts active surveillance, investigations, and follow up of incidents of reportable communicable diseases in the County. The Department conducts public education regarding communicable diseases, disease prevention, and immunization. In addition, the department provides immunizations for children not covered by health insurance. The Department also participates in the Tri-County Immunization Coalition with Ozaukee and Waukesha Counties, which focuses on increasing immunization rates and reducing the incidence of vaccine-preventable diseases.

### **Evaluation of Alternatives and Identification of Mitigation Actions**

Based on review of the risk assessment given in Chapter III and the above discussion, three approaches are considered viable for incorporation into the Washington County hazard mitigation plan for addressing the hazards posed by outbreaks of communicable diseases. First, maintaining an adequate level of preparedness through planning activities and maintaining the existing community public health system will ensure that when an outbreak occurs, the capability will be present to address it. Second, public education activities will allow the public to take preventive and protective measures in the event of an outbreak. Finally, encouraging residents to receive immunizations will reduce the portion of the public that is susceptible to such diseases.

### **Multi-Jurisdictional Considerations**

Outbreaks of communicable diseases could potentially impact all municipalities within the County.

### **Priority Mitigation Measures**

Based upon the foregoing evaluation and consideration of risk, the following mitigation measures related to communicable disease outbreaks are included in the Washington County hazards mitigation plan:

- Continue maintenance of a community public health system with adequate numbers of medical staff and sufficient disease monitoring and surveillance capabilities to adequately protect the population from small- and large-scale outbreaks and epidemics;
- Promote development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, and other appropriate sites;
- Develop and maintain plans for mass dispensing clinics for large-scale antibiotic or vaccine dispensing in the event of an infectious disease emergency;
- Promote public awareness of the causes, symptoms, and protective actions for disease outbreaks; and
- Encourage residents to receive immunizations against communicable diseases, including annual and special-strain influenza inoculations.

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<sup>68</sup> *Washington County, Comprehensive Emergency Management Plan (CEMP) for Washington County, Wisconsin, February 2013.*

## HAZARD RISK ANALYSIS AND PRIORITIZATION: 2017

The major natural and other hazards that have been identified as potentially affecting Washington County have been ranked by risk to assist in developing a mitigation plan. Additional description of natural and other hazards as well as the vulnerability assessment of Washington County to these hazards have been identified and summarized in Chapter III of this report. These priority rankings were based upon the number of incidences per year, number of mortalities, number of injuries, property damage, and crop damage inventories set forth in Chapter III. Specifically, this prioritization is based upon the protection of human life and health and protection from property and crop damages throughout the County. Therefore, the major indicators of hazard severity used to rank the natural and other hazards to Washington County are based upon the deaths and injuries versus economic losses resulting from such hazards as summarized in Tables 51 and 52, respectively.

As identified in the vulnerability assessment of natural and other hazards to Washington County in Chapter III, the magnitude and consequent risk of a particular hazard is dependent upon a number of factors that include, but are not limited to, time (e.g., time of year for thunderstorm events and transportation-related hazards, and time in terms of how long an event may last such as drought), size or scale, frequency of occurrence, population size potentially impacted, and amount of urban growth or development potentially impacted. This does not indicate that rural areas are any more or less important than urban areas; however, it does indicate that the more urbanized areas have a greater chance of loss in terms of human death, injury, and property damage per hazard event. It is also important to note, as identified in Chapter III, that many disaster events are compound in nature and not the result of a single event, such as flooding hazards during a severe thunderstorm event. Nonetheless, since the causes of disasters of the past will likely be the best predictor of future disasters, an attempt was made to normalize all of the hazard incidences to an annual average in order to understand the relative potential level of risk each hazard poses to Washington County on an annual basis (see Tables 51 and 52).

### Ranking Severity of Natural Hazards

#### *Death and Injury*

Using the data from the various sources summarized in the vulnerability assessment of Chapter III, the priority natural and human-induced hazards identified in Table III-6 were ranked with respect to their severity in terms of the sum of the number of annual death and injuries they caused and then by frequency of occurrence of each type of hazard event as shown in Table 51.

Six of the 14 identified hazards are associated with mortality and injury, as shown in Table V-3. These hazards in order of appearance include: transportation-related accidents; communicable disease outbreaks; tornadoes; thunderstorms, high-wind, hail, and lightning events; hazardous material incidents; and extreme temperature events. The remaining hazards have never been recorded to be associated with human mortality or injury within Washington County based upon known data.

Transportation-related accidents pose the greatest risk to human life and injury compared to any other hazard within Washington County. As summarized in the vulnerability and community impact assessment in Chapter III, transportation-related accidents are not expected to change significantly in the near future due to their dependence upon a number of factors that include the type of vehicle, density of traffic, type of roadway, type of driver, road conditions, weather conditions, and safety equipment. There were several segments on IH 41 that exceeded the Washington County freeway system average crash rate of 72.5 crashes per 100 million vehicle-miles as shown on Map 37. These are primarily located at on and off ramp locations.

Communicable disease outbreaks represent the second most costly hazard in terms of injuries and lost lives. The frequencies and durations of individual disease outbreaks are difficult to predict, due to differences among disease agents in their infectivity, virulence, and mode of transmission.

Tornadoes and thunderstorms, high wind, hail, and lightning, as a group, represent the third and fourth most costly hazards, respectively, in terms of injuries and lost lives. They pose a significant risk to public health and safety

Table 51

PRIORITY RANKING OF NATURAL AND OTHER HAZARDS AFFECTING WASHINGTON COUNTY BASED UPON MORTALITY AND INJURY

Order Based on Local Planning Team Perception <sup>a</sup>	Natural and Other Hazards	Period of Record	Number of Incidents per Year (average)	Number of Mortalities per Year (average)	Number of Injuries per Year (average)	Sum of Average Mortality and Injury Incidences per Year	Priority Ranking Based on Analysis
1	Transportation Accidents .....	1999-2013 <sup>b</sup>	2,610.7 <sup>b</sup>	14.08 <sup>b</sup>	1,024.88 <sup>b</sup>	1,038.96 <sup>b</sup>	1
12	Communicable Disease Outbreak .....	2005-2013	362.2	0.00	362.22	362.22	2
2	Tornadoes .....	1964-2014	0.3	0.06	1.12	1.18	3
4	Thunderstorms, High Wind, Hail, and Lightning .....	1958-2014	5.9	0.02	0.18	0.20	4
7	Hazardous Material Incidents .....	1969-2014 <sup>c</sup>	1.1 <sup>c</sup>	0.00 <sup>c</sup>	0.12 <sup>c</sup>	0.12 <sup>c</sup>	5
5	Extreme Temperatures .....	1982-2014	1.7	0.03	0.00	0.03	6
3	Winter Storms .....	1960-2014	2.8	0.00	0.00	0.00	7
10	Drought .....	1976-2014	0.7	0.00	0.00	0.00	8
6	Flooding .....	1981-2014	0.5	0.00	0.00	0.00	9
13	Terrorism Incidents .....	1970-2014	0.0	0.00	0.00	0.00	10
8	Power Outages .....	--	-- <sup>d</sup>	-- <sup>d</sup>	-- <sup>d</sup>	-- <sup>d</sup>	11
11	Contamination or Loss of Water Supply .....	--	-- <sup>d</sup>	-- <sup>d</sup>	-- <sup>d</sup>	-- <sup>d</sup>	12
9	Cyberattack on Local Government .....	--	-- <sup>d</sup>	-- <sup>d</sup>	-- <sup>d</sup>	-- <sup>d</sup>	13
14	Loss of Sewerage System .....	--	-- <sup>e</sup>	-- <sup>e</sup>	-- <sup>e</sup>	-- <sup>e</sup>	14

<sup>a</sup>These numbers indicate the ranked order of the hazards assigned by the Washington County Hazards Mitigation Plan Local Planning Team through responses given in the Hazard and Vulnerability Assessment Tool (HVA). Where hazards listed in the HVA have been consolidated for analysis and planning purposes, the order is based upon the highest rank given in the HVA. For more details see Hazard Identification section and Table III-1 in Chapter III in this report.

<sup>b</sup>Data reflect automobile accidents from years 1999 through 2013 and railroad accidents from years 1975-2014.

<sup>c</sup>Based upon pipeline-related incidents from years 1969 through 2014 and transportation-related incidents from years 1971 through 2014.

<sup>d</sup>Incidents have been reported, but no data available to calculate averages.

<sup>e</sup>No data available are available.

Source: National Climatic Data Center; U.S. Department of Transportation, Office of Pipeline Safety; Wisconsin Department of Transportation; Washington County Emergency Management Office; and SEWRPC.

within Washington County. The vulnerability and community impact assessment indicates that the entire county is at risk from these hazards as shown on Maps 34 and 35 in Chapter III of this report. These events are highly unpredictable in terms of exactly where they may occur and how powerful they might be.

Hazardous material incidents are the fifth most costly hazard in terms of injuries and lost lives affecting Washington County. Hazardous material incidents may occur through releases from fixed facilities or pipelines or during transportation of such materials. In Washington County, these incidents cause an average of less than one injury per year.

Temperature extremes are ranked as posing the sixth highest risk of injury or death in Washington County. The vulnerability and community impact assessment in Chapter III identified that this hazard was primarily related to public health concerns, and the individuals at greatest risk are the very young, the very old, and sick persons within the community.

The remaining eight hazards have not been recorded as causing mortality and injury in Washington County, based upon known data. These include the meteorological hazards of winter storms, drought, and flooding and human induced hazards including terrorism incidents, power outages, contamination or loss of water supply, cyberattack on local governments, and loss of sewerage system. It is important to note that although winter storms, flooding, and drought have not been recorded to cause mortality and injury, these hazards rank among the top eight associated with significant property damage costs to Washington County (see Table 52). This illustrates that there are significant differences in the ranking of hazards depending upon whether the ranks are derived by comparing hazards based on their impacts upon human life and injury or by comparing hazards based upon the damages to property and crops that result from hazard incidents (see Property Damage section below).

### ***Property Damage***

Another way to assess the vulnerability of Washington County to natural and other hazards is to examine the resultant property damage. Again, using the data from the various sources summarized in the vulnerability assessment of Chapter III, natural and human-induced hazards in Washington County were ranked with respect to their severity in terms of the annual sum of the property and crop damage caused and then by frequency of occurrence of each type of hazard event as shown in Table 52.

Annual average estimates of property and/or crop damages were determined for eight of the 14 priority hazards. These hazards in order of appearance based upon total annual property damages, include: transportation accidents; tornadoes; winter storms; flooding; thunderstorms, high winds, hail, and lightning; hazardous material incidents; drought; and extreme temperatures.

Among these hazards profiled, transportation-related accidents were identified as resulting in the greatest amount of damage to property and crops in Washington County. As summarized in the vulnerability and community impact assessment in Chapter III, transportation-related accidents are not expected to change significantly in the future due to their dependence upon a number of factors that include the type of vehicle, density of traffic, type of roadway, type of driver, road conditions, weather conditions, and safety conditions.

Tornadoes represent the second most damaging hazard identified as affecting Washington County. While most of the historical damages to property and crops caused by tornadoes resulted from one event, the high rank of this hazard illustrates the impacts that can result from a single catastrophic incident, even when it is restricted to a small portion of the County.

Winter storms were identified as the third most damaging hazard affecting Washington County. While most of the recorded damages to property and crops caused by winter storms resulted from a single event, the high rank of this hazard illustrates the impact that can result from a single severe event that affects a large area, such as the entire County.



Table 52

PRIORITY RANKING OF NATURAL AND OTHER HAZARDS AFFECTING WASHINGTON COUNTY BASED UPON PROPERTY AND CROP DAMAGE

Order Based on Local Planning Team Perception <sup>a</sup>	Natural and Other Hazards	Period of Record	Number of Incidents per Year (average)	Total Property Damage per Year (dollars) <sup>b</sup>	Total Crop Damage per Year (dollars) <sup>b</sup>	Sum of Property and Crop Damage per Year (dollars) <sup>b</sup>	Priority Ranking Based on Analysis
1	Transportation Accidents .....	1999-2013 <sup>c</sup>	2,610.7	22,844,015 <sup>c</sup>	0	22,844,015 <sup>c</sup>	1
2	Tornadoes.....	1964-2014	0.3	1,469,969	3,924	1,473,893	2
3	Winter Storms .....	1960-2014	2.2	1,363,062	3,000	1,366,062	3
6	Flooding .....	1981-2014	0.5	614,408	467,622	1,082,070	4
4	Thunderstorms, High Wind, Hail, and Lightning .....	1958-2014	5.9	482,608	157,505	640,113	5
7	Hazardous Material Incidents .....	1969-2014 <sup>d</sup>	1.1 <sup>d</sup>	537,676 <sup>d</sup>	0 <sup>d</sup>	537,676 <sup>d</sup>	6
10	Drought .....	1976-2014	0.7	0	487,815	487,815	7
5	Extreme Temperatures .....	1982-2014	1.7	2,526	11,033	13,559	8
13	Terrorism Incidents .....	1970-2014	0.0	0	0	0	9
12	Communicable Disease Outbreak .....	2005-2013	364.2	--e	--e	--e	10
8	Power Outages .....	--	--e	--e	--e	--e	11
11	Contamination or Loss of Water Supply .....	--	--e	--e	--e	--e	12
9	Cyberattack on Local Government .....	--	--e	--e	--e	--e	13
14	Loss of Sewerage System.....	--	--f	--f	--f	--f	14

<sup>a</sup>These numbers indicate the ranked order of the hazards assigned by the Washington County Hazards Mitigation Plan Local Planning Team through responses given in the Hazard and Vulnerability Assessment Tool (HVA). Where hazards listed in the HVA have been consolidated for analysis and planning purposes, the order is based upon the highest rank given in the HVA. For more details see Hazard Identification section and Table III-1 in Chapter III in this report.

<sup>b</sup>Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.

<sup>c</sup>Data reflect automobile accidents from years 1999 through 2013 and railroad accidents from years 1975-2014.

<sup>d</sup>Based upon pipeline-related incidents from years 1969 through 2014 and transportation-related incidents from years 1971 through 2014.

<sup>e</sup>Incidents have been reported, but no data are available to calculate damages or averages.

<sup>f</sup>No data available.

Source: National Climatic Data Center; U.S. Department of Agriculture Risk Management Agency; U.S. Department of Transportation, Office of Pipeline Safety; Wisconsin Department of Transportation; Washington County Division of Emergency Management; and SEWRPC.

Flooding was identified as posing the fourth greatest risk to property and crops of the hazards identified as affecting Washington County. As shown on Maps 28 through 31 in Chapter III, the vulnerability and community impact assessment indicates that flooding hazard risks are associated with the major river and lake systems within the County which include waterbodies located in the Menomonee River, Milwaukee River, and Rock River watersheds (see Map 6 in Chapter II of this report). The impact assessment further indicates that, due to the economic importance and extent of agricultural acreage in Washington County, flooding is also the second most costly hazard in terms of potential crop damage.

Severe thunderstorms, high wind, hail, and lightning, as a group rank as the fifth most damaging hazard impacting Washington County. These events are highly unpredictable both in terms of where they may occur and their potential severity. As shown on Map 34 in Chapter III of this report, the vulnerability and community impact assessment indicates that the entire County is at risk from this hazard,

Hazardous material incidents comprise the sixth most costly hazard in Washington County in terms of property and crop damages. While many of these incidents are associated with fixed facilities and pipelines, the fact that many others result during transportation of such materials means that the entire County is at risk from this hazard.

Drought and extreme temperatures ranked as the seventh and eighth most damaging hazards, respectively, affecting Washington County. Both of these hazards have the potential to seriously impact Washington County by causing crop losses, as discussed in the vulnerability assessments in Chapter III.

Based upon known data, two of the remaining six hazards shown in Table 52—terrorism incidents and loss of sewerage system—have not been recorded to have occurred in Washington County. Incidences of four other hazards—communicable disease outbreaks, power outages, contamination or loss of water supply, and cyberattack on local government—have been reported; however, sufficient data regarding these hazards were not available to allow calculation of the average annual damages associated with them.

### **Ranking Summary**

Hazard severity can be assessed and ranked in a variety of ways. The purpose of ranking hazards is to help set priorities and direct more resources to address those hazards of the greatest severity. However, the kinds of mitigation actions that will be needed and warranted in implementing the Washington County Hazard Mitigation Plan depend on the type of vulnerability to be addressed. Some hazards, such as excessive heat and lightning, are unlikely to cause a disaster, but they can be fatal and, therefore, are serious hazards. Vulnerability to such hazards can best be addressed by preventive measures such as public information to encourage hazard awareness and personal protection. Other hazards such as flooding are pervasive and devastating, and may require a variety of tools—mapping, building codes, zoning laws, insurance, elevation or acquisition of floodprone structures, and public awareness—to effectively reduce the risk of disaster. However, flooding might not result in more fatalities than a heat wave. In general, ranking hazards by the number of deaths that they cause shifts the focus away from major disasters which may result in relatively large monetary damages, but generally cause low, or no, loss of life. Weather hazards that have caused past Wisconsin disasters are probably the hazards that will cause future disasters. However, the types of natural and man-made hazards that result in fatalities remain a public health and safety concern, which is why these hazards were incorporated into the hazard mitigation plan by the Washington County Hazards Mitigation Plan Local Planning Team.

## **SUMMARY**

Based upon the foregoing evaluation for each of the natural and other man-made hazards above, the priority mitigation measures identified to be included in the Washington County hazard mitigation plan are summarized in Table 53. Table 53 also includes an evaluation of the mitigation measures identified in each hazard category based upon relative cost, direct benefits, likely indirect benefits, and a list of communities affected.

Table 53

COST-BENEFIT ANALYSIS SUMMARY OF MEASURES INCLUDED IN THE WASHINGTON COUNTY HAZARD MITIGATION PLAN

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Flooding and Related Stormwater Drainage Problems	<p><u>Floodplain and Environmentally Sensitive Land Preservation Element</u></p> <ul style="list-style-type: none"> <li>Floodplain and wetland zoning<sup>e</sup></li> <li>Environmentally sensitive area and open space preservation actions<sup>e</sup></li> </ul>	-.f	-.f	X	--	--	--	X	X	X	5	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger.	
		101,222.7 <sup>g</sup>	-.g	--	--	X	--	--	X	--	--	4	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend; MMSD
		13,770.0	--	--	--	X	--	--	X	--	--	4	Washington County; Villages of Germantown and Richfield; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
Flooding and Related Stormwater Drainage Problems	<p><u>Floodplain Management Plan Element</u></p> <ul style="list-style-type: none"> <li>Removal of four repetitive loss/severe repetitive loss structures<sup>e,j</sup></li> <li>Surveys of up to 983 structures identified as potentially being in the floodplain<sup>e</sup></li> </ul>	1,740.0	--	--	--	X	187.4	X	X	X	5	Washington County, City of Hartford, Village of Richfield	
		1,180.0	--	--	--	X	--	--	X	--	3	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Richfield; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend	
		10,096.0	--	--	--	X	7,630.0	X	X	X	5	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Richfield; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend	

Table 53 (continued)

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected	
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities			
Flooding and Related Stormwater Drainage Problems (continued)	<u>Floodplain Management Plan Element (continued)</u>	212,500.0	--	--	--	X	14,300.0	X	X	X	X	5	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Richfield; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend	
	• Removal of up to 137 mobile homes identified as potentially being in the floodplain <sup>e,j</sup>	6,468.0	--	--	--	X	794.5	X	X	X	X	5	Washington County, Village of Jackson	
	• Removal of up to 137 mobile homes identified as potentially being in the floodplain <sup>e,j</sup>	--	--	--	--	--	--	--	--	--	--	3	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend	
	• National Flood Insurance Program and map updating <sup>e</sup>	--	--	X	--	--	--	--	X	--	--	--	3	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
	• Lending institution and real estate agent policies <sup>e</sup>	--	--	X	--	--	--	--	X	--	--	--	3	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
	• Enforcement of floodplain regulations	--	--	X	--	--	--	X	--	--	--	3	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend	
	• Maintenance of U.S. Geological Survey stream gages	--	58.0 <sup>k</sup>	X	--	--	--	X	--	--	--	1	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend	

Table 53 (continued)

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Flooding and Stormwater Drainage Problems (continued)	<u>Stormwater Management Plan Element</u> <ul style="list-style-type: none"> <li>Stormwater management plans<sup>e</sup></li> </ul>	--,j	--,j	X	--	--	--	X	--	--	--	3	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
	<ul style="list-style-type: none"> <li>Stormwater-related regulations<sup>e</sup></li> </ul>	--,m	--,m	X	--	--	--	X	--	--	--	3	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
	<u>Public Information and Education Element</u> <ul style="list-style-type: none"> <li>Public education activities</li> </ul>	--,n	--,n	X	--	--	--	X	--	--	--	4	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
	<ul style="list-style-type: none"> <li>Public participation activities and coordination with other agencies and units of government</li> </ul>	--,n	--,n	X	--	--	--	X	--	--	--	4	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend

Table 53 (continued)

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Flooding and Related Stormwater Drainage Problems (continued)	<p><u>Secondary Plan Element</u></p> <ul style="list-style-type: none"> <li>Documentation of extent of future floods</li> <li>Stream channel maintenance</li> <li>Stormwater management facilities maintenance</li> <li>Dam Failure Subelement                             <ul style="list-style-type: none"> <li>Regular inspection and maintenance of dams</li> <li>Dam emergency action plans</li> <li>Dam failure analyses</li> <li>Adding hydraulic shadows to GIS layers</li> </ul> </li> </ul>	-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	1	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
		-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	3	Washington County and all local jurisdictions <sup>g</sup>
		-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	3	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
		-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	3	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
		-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	1	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Richfield, and Slinger; Towns of Addison, Farmington, Hartford, Jackson, Polk, Trenton, Wayne, and West Bend
		-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	1	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Richfield, and Slinger; Towns of Addison, Farmington, Hartford, Jackson, Polk, Trenton, Wayne, and West Bend
Thunderstorm, High-Wind, Hail, and Lightning Hazards	<p>Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio</p> <p>Encourage the provision of safe rooms</p> <p>Work with municipalities and businesses to explore installation of safe rooms in community facilities, businesses, and manufacturers</p> <p>Consider adoption of mobile home ordinances requiring provision of safe rooms in new and expanding mobile home parks</p>	-- <sup>o</sup>	-- <sup>o</sup>	--	X	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	X	X	5	Washington County and all cities, villages, and towns
		-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	X	X	5	Washington County and all cities, villages, and towns
		-- <sup>m</sup>	-- <sup>m</sup>	X	--	--	--	X	--	X	X	5	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
		-- <sup>o</sup>	-- <sup>o</sup>	--	X	--	--	--	X	--	--	--	5

Table 53 (continued)

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Thunderstorm, High-Wind, Hail, and Lightning Hazards (continued)	Install safe rooms in existing mobile home parks	3,196.0 <sup>d</sup>	--	--	--	X	--	X	--	X	X	5	Washington County; Villages of Germantown, Jackson, and Slinger; and Towns of Hartford and Trenton
	Encourage agricultural producers to purchase crop insurance	--\$	--\$	X	--	--	--	X	--	--	--	3	Washington County
	Promote inclusion of safety strategies for severe weather events into driver education classes and materials	-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	3.5	Washington County and all cities, villages, and towns
	Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	1.5	Washington County and all cities, villages, and towns
	Continue to conduct annual weather spotter training	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	5	Washington County
Tornadoes	Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	-- <sup>o</sup>	-- <sup>o</sup>	--	X	--	--	X	--	--	--	5	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; and Town of Addison
	Encourage the provision of safe rooms	-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	X	X	5	Washington County and all cities, villages, and towns
	Work with municipalities and businesses to explore installation of safe rooms in community facilities, businesses, and manufacturers	-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	X	X	5	Washington County and all cities, villages, and towns
	Consider adoption of mobile home ordinances requiring provision of safe rooms in new and expanding mobile home parks	-- <sup>m</sup>	-- <sup>m</sup>	X	--	--	--	X	--	X	X	5	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend
	Install safe rooms in existing mobile home parks	3,196.0 <sup>f</sup>	--	--	--	X	--	X	--	X	X	5	Washington County; Villages of Germantown, Jackson, and Slinger; and Towns of Hartford and Trenton
	Promote educational and informational programming, especially related to the early warning network, and to individual actions to protect citizens, property, and businesses	-- <sup>n</sup>	-- <sup>n</sup>	X	--	--	--	X	--	--	--	5	Washington County and cities, villages, and towns
	Continue to conduct annual weather spotter training	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	5	Washington County
	Promote inclusion of safety strategies for severe weather events into driver education classes and materials	-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	3.5	Washington County and all cities, villages, and towns

Table 53 (continued)

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Tornadoes (continued)	Continued enforcement of building code ordinance requirements	--f	--f	X	--	--	--	X	--	--	--	3.5	Washington County and all cities, villages, and towns
	Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit	--f	--f	X	--	--	--	X	--	--	--	1.5	Washington County and all cities, villages, and towns
Extreme Temperature Events	Increase outreach to vulnerable populations regarding the availability of shelters during extreme heat and cold events	--o	--o	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Designate sites to be used as public cooling/heating shelters during extreme temperature events	--f	--f	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	At owner's request, conduct inventories and inspections of these shelters	--o	--o	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Encourage shelter site owners to extend hours during extreme temperature events	--f	--f	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Promote transportation options to assist members of highly vulnerable populations to reach shelter sites during extreme temperature events	--o	--o	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	--o	--o	--	X	--	--	--	X	--	--	5	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; and Town of Addison
Winter Storm Events	Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves	--n	--n	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Promote educational and informational programming	--n	--n	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	--o	--o	--	X	--	--	--	X	--	--	5	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; and Town of Addison
	Promote educational and informational programming	--n	--n	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
Winter Storm Events	Promote inclusion of safety strategies for severe weather events into driver education classes and materials	--o	--o	X	--	--	--	X	--	--	--	3.5	Washington County and all cities, villages, and towns
	Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit	--f	--f	X	--	--	--	X	--	--	--	1.5	Washington County and all cities, villages, and towns



Table 53 (continued)

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Winter Storm Events (continued)	Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves	-- <sup>n</sup>	-- <sup>n</sup>	X	--	--	--	X	--	--	--	3.5	Washington County and all cities, villages, and towns
	Promote the installation of backup power systems at homes and businesses	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Work with utilities to assess and improve electrical service reliability	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Encourage the development and maintenance of drought emergency plans for local utilities and communities	-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	4	Washington County and all cities, villages, and towns
Drought Events	Develop local water conservation programs	-- <sup>o</sup>	98.7 <sup>t</sup>	X	--	--	--	X	--	--	--	4	Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, and Slinger; Town of Addison
	Protect very high and high recharge potential groundwater recharge areas from inappropriate development	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	4	Washington County and all cities, villages, and towns
	Where opportunities exist develop interconnections among adjacent water utilities	-- <sup>q</sup>	-- <sup>q</sup>	--	X	--	--	X	--	--	--	3,4,5	City of Hartford and Villages of Germantown and Slinger
	Encourage farm operators to evaluate the economics of crop insurance programs	-- <sup>s</sup>	-- <sup>s</sup>	X	--	--	--	X	--	--	--	3	Washington County and all cities, villages, and towns
Transportation Accident-Related Events	As existing surface arterial street system is resurfaced and reconstructed and as new arterial roads are constructed, consider adding bicycle accommodations	-- <sup>q</sup>	-- <sup>q</sup>	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Promote driver safety hazard awareness, especially to drivers within the 16 to 24 age group	-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	3.5	Washington County and all cities, villages, and towns
	Continue to promote traffic-related law enforcement	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	X	X	--	5	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; Town of Trenton
	Continue public education efforts regarding the dangers of distracted driving	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	3.5	Washington County and all cities, villages, and towns
Transportation Accident-Related Events	Promote inclusion of safety strategies for severe weather events into driver education classes and materials	-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	3.5	Washington County and all cities, villages, and towns
	Promote the use of safety restraints and personal safety equipment	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Continue emergency operation training, planning, and preparedness for mass-casualty incidents involving railroad transportation	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
			-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	5	Washington County and all cities, villages, and towns

Table 53 (continued)

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Contamination or Loss of Water Supply	Promote development of a thorough drinking water supply risk and threat assessment	--0	--0	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
	Prepare emergency operation plans for each public water supply system	--0	--0	X	--	--	--	X	--	--	--	1	Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, and Slinger; Town of Addison
	Encourage local communities to develop emergency drinking water supply plans	--0	--0	--	X	--	--	X	--	--	--	5	All local jurisdictions
	Encourage local utilities to identify priority water customers and develop plans for restoring their service first	--0	--0	X	--	--	--	X	--	--	--	3.5	Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, and Slinger; Town of Addison
	Identify potential distribution points for emergency water supply	--0	--0	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
Loss of Sewerage System	Evaluate the condition of water utility electrical equipment to accept generators. Repair or upgrade as necessary	--q	--q	--	X	--	--	X	--	--	--	3	Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, and Slinger; Town of Addison
	Where opportunities exist develop interconnections among adjacent water utilities	--q	--q	--	X	--	--	X	--	--	--	3,4,5	City of Hartford and Villages of Germantown and Slinger
	Continue educational and outreach programs related to backflow prevention	--f	--f	X	--	--	--	X	--	--	--	5	Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, and Slinger; Town of Addison
	Promote development of a thorough sewerage system risk and threat assessment	--0	--0	X	--	--	--	X	--	--	--	5	Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; Town of Addison
	Prepare emergency operation plans for each sanitary sewerage system	--0	--0	X	--	--	--	X	--	--	--	4,5	Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; Town of Addison
Loss of Sewerage System	Initiate facility planning for sanitary sewerage systems when average daily flow to the wastewater treatment plant reaches 80 percent of the plant's design capacity	--0	--0	--	X	--	--	X	--	--	--	5	Cities of Hartford and West Bend; Villages of Jackson, Kewaskum, Newburg, and Slinger; Town of Addison
	Provide backup power for wastewater treatment plants, pumping stations, and other vital system components	--q	--q	--	X	--	--	X	--	--	--	3,4,5	Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; Town of Addison

Table 53 (continued)

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Hazardous Material Events	<p>Mitigation Measures</p> <p>Continue participation in the Wisconsin Hazardous Materials Response System</p> <p>Develop local community response plans for hazardous material releases</p> <p>Promote development of site emergency plans for schools, factories, office buildings, shopping malls, and other hazardous materials or that are near facilities or transportation routes where such materials are produced, used, stored, or transported</p> <p>Promote proper design, construction, maintenance, and inspections of hazardous material storage facilities, pipelines, and other related facilities</p> <p>Promote continued maintenance and upgrading of transportation infrastructure carrying shipments of hazardous cargo</p> <p>Educate businesses and those utilizing hazardous materials of their responsibilities</p> <p>Continue to promote training, planning, and preparedness for mass-casualty incidents involving fixed facilities and transportation systems</p>	--	--	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		--	--	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		--	--	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		--	--	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		--	--	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		--	--	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		--	--	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		--	--	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		--	--	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
Terrorism Incidents	<p>Mitigation Measures</p> <p>Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio</p> <p>Promote the development of a thorough community risk and threat assessment</p> <p>Promote and conduct preparedness activities including planning, training, and exercises for local law enforcement, fire and rescue, and other response personnel for a variety of terrorist attacks</p>	--	--	--	X	--	X	--	--	--	5	Washington County; Cities of Hartford and West Bend; Villages of Germantown, Jackson, Kewaskum, Newburg, and Slinger; and Town of Addison	
		--	--	X	--	--	--	X	--	--	--	3.5	Washington County and all cities, villages, and towns
		--	--	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns

Table 53 (continued)

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Terrorism Incidents (continued)	<p>Promote development of site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites</p> <p>Promote increased security measures at water supply facilities</p> <p>Encourage development of emergency preparedness plans for critical government, utility and infrastructure systems</p> <p>Heighten security at public gatherings, special events, and critical community facilities, utilities, infrastructure, and industries</p>	-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	5	Cities of Hearford and West Bend; Villages of Germantown, Jackson, Kewaskum, and Slinger; Town of Addison
		-- <sup>u</sup>	-- <sup>u</sup>	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
Cyberattack on Local Government	<p>Purchase of cyber-insurance by local government</p> <p>Encourage local governments to provide education in basic cybersecurity to their employees</p> <p>Consider installing dedicated communication lines for monitoring and/or controlling critical equipment or processes</p> <p>Develop and implement a cybersecurity and data backup initiative</p>	-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	3	Washington County and all cities, villages, and towns
		-- <sup>o</sup>	-- <sup>o</sup>	X	--	--	--	X	--	--	--	3	Washington County and all cities, villages, and towns
		-- <sup>u</sup>	-- <sup>u</sup>	X	--	--	--	X	--	--	--	3	Washington County and all cities, villages, and towns
		-- <sup>n</sup>	-- <sup>n</sup>	X	--	--	--	X	--	--	--	3	Washington County and all cities, villages, and towns
Power Outages	<p>Continue to review and implement programs to improve reliability of power supply facilities</p> <p>Encourage installation of backup power generators at critical facilities</p> <p>Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves</p> <p>Conduct outreach to businesses and facilities to encourage them to develop plans for dealing with long-term power outages</p> <p>Continue and refine public educational programming on safety during power outages and preparation for power outages</p>	-- <sup>f</sup>	-- <sup>f</sup>	X	--	--	--	X	--	--	--	3	Washington County and all cities, villages, and towns
		-- <sup>q</sup>	-- <sup>q</sup>	--	X	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		-- <sup>n</sup>	-- <sup>n</sup>	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		-- <sup>n</sup>	-- <sup>n</sup>	X	--	--	--	X	--	--	--	3	Washington County and all cities, villages, and towns
		-- <sup>n</sup>	-- <sup>n</sup>	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns

**Table 53 (continued)**

Hazard	Mitigation Measures	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Communicable Disease Outbreak	Continue maintenance of a community public health system with adequate numbers of medical staff and sufficient disease monitoring and surveillance capabilities to adequately protect the population from small- and large-scale outbreaks and epidemics  Promote development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, and other appropriate sites  Develop and maintain plans for mass dispensing clinics for large-scale antibiotic or vaccine dispensing in the event of an infectious disease emergency  Promote public awareness of the causes, symptoms, and protective actions for disease outbreaks  Encourage residents to receive immunizations against communicable diseases, including annual and special strain influenza inoculations	--f	--f	--	X	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		--o	--o	X	--	--	--	X	--	--	--	5	Washington County and all cities, villages, and towns
		--f	--f	X	--	--	--	X	X	X	X	5	Washington County and all cities, villages, and towns
		--f	--f	X	--	--	--	X	--	X	--	5	Washington County and all cities, villages, and towns
		--f	--f	X	--	--	--	X	--	X	X	5	Washington County and all cities, villages, and towns

<sup>a</sup>All costs expressed in 2014 dollars.

<sup>b</sup>Cost of implementation for the County and municipalities is allocated among three categories of low (less than \$100,000), moderate (greater than \$100,000 and less than \$1.0 million), and high (greater than \$1.0 million) costs that are generally defined as:

Low: Educational and informational programming, ongoing enforcement of ordinances, plan development, and continued coordination/mutual aid/interagency agreements.

Moderate: Addition of new staff, additional staff hours budgeted, additional equipment, new ordinance development, and new programs/task force.

High: Major construction, new buildings (infrastructure), and capital programs.

<sup>c</sup>The estimated benefits are based upon the reduction in flood damages during a one-percent-annual-probability flood event. The damage estimates were developed by the Commission staff based upon structure values, flood stage, and depth of flooding as described in Chapter III.

<sup>d</sup>Indirect benefits represent a continuum of potential benefits that may occur as a result of the implementation of specific management actions. For example, implementation of informational programming, while not directly saving lives, may ultimately result in people having the knowledge necessary to save lives and protect property. These intangible benefits cannot be readily quantified and range from increased awareness to reduced loss of life and property, and have been assessed using the following relative cumulative scale:

- 1 = Increased awareness/preparedness
- 2 = Enhanced quality of life/social benefits
- 3 = Reduced property damage
- 4 = Increased environmental and recreational benefits/ecosystems services
- 5 = Reduced loss of life and injury with concomitant benefits for economic productivity

<sup>e</sup>This mitigation measure is related but not essential to continued compliance with the requirements of the National Flood Insurance Program.

<sup>f</sup>Costs covered under ongoing activity.

<sup>g</sup>Costs were developed under the Washington County Park and Open Space Plan. The costs are based on purchasing all recommended land for parks and open spaces. It should be noted that the protection of these areas could also be accomplished through conservation easements, conservation subdivisions, donations, and purchase or transfer of development rights. The acquisition of all land is unlikely to occur before the park and open space plan year 2020 since acquisitions occur only on a willing-seller, willing-buyer basis, and only when funds are available. In the past, major land acquisitions by Washington County have been subsidized by State and Federal grants, which are not always available.

<sup>h</sup>Wetland restoration to be carried out at discretion of property owners.

<sup>i</sup>It is estimated that full implementation of this recommendation would result in an average annual reduction of agricultural damages due to flooding of \$97,000.

<sup>j</sup>Structure floodproofing, elevation, or removal to be evaluated on a site-by-site basis and to be carried out at the discretion of property owners.

Table 53 (continued)

<sup>k</sup>Costs for 2017 are \$11,600 per gage. These costs are covered by the agencies partnering with the U.S. Geological Survey to sponsor the gages. There are currently no active gages in Washington County.

<sup>l</sup>Costs to be determined by each community based upon logical subwatershed area.

<sup>m</sup>Cost of ordinance development is covered under ongoing programs. Cost of implementation is not determined.

<sup>n</sup>Portion of costs included in ongoing programs. Additional cost of the hazard mitigation and educational programs is estimated to be \$10,000 per year.

<sup>o</sup>Costs to be determined. Partially covered under ongoing programs.

<sup>p</sup>Jurisdictions include general purpose units of government—Cities, Towns, and Villages—and special purpose units of government such as School Districts, Sanitary and Utility Districts, Public Inland Lake Protection and Rehabilitation Districts, and Agricultural Drainage Districts.

<sup>q</sup>Costs are site-specific and survey is needed for countywide estimate.

<sup>r</sup>Cost estimate for installing community safe rooms/storm shelters at all six mobile home parks listed in Table II-7 in Chapter II. Depending on the size of the park, estimated costs range between about \$128,000 and \$1,504,000. These estimates are based on average per person capacity cost of \$1,900 from 10 community safe room/storm shelter projects in Wisconsin. Estimate assumes that the required capacity of shelter for a mobile home park is 2.1 persons times the number of lots for mobile homes in the mobile home park.

<sup>s</sup>Private property costs to be expended as needs arise.

<sup>t</sup>Cost estimate based on estimated annual average cost of intermediate-level water conservation programs recommended for existing Washington County water utilities in SEWRPC Planning Report No. 52, A Regional Water Supply Plan for Southeastern Wisconsin, December 2010.

<sup>u</sup>Costs to be determined.

Source: SEWRPC.

There are several potential issues inherent in the development of the recommended ranking of priority mitigation measures. A consideration in establishing priorities for various hazards is whether to place more emphasis on loss of life or monetary damages. For the purposes of this plan, priority or emphasis was placed upon preventing loss of life and injury.

The costs of avoidance of a particular hazard may not be quantifiable, but the cost of occurrence of the hazard often is—for example, most hazards have been quantified by insurance underwriters in the issuance of property and life insurance policies. Conversely, the benefit of any particular mitigation measure may also not be quantifiable or realized. For example, continued coordination of emergency response and operation plans among governmental units and first responders will directly enhance preparedness and protection of the communities involved; however, this action may or may not ultimately result in reduced property damage, injuries, or death if the hazard does not occur. Similarly, flood mitigation actions in upstream areas may result in downstream benefit even though the upstream mitigation actions may not completely address the flood hazard at the location where the mitigation measure was applied.

Another potential issue is whether the hazard ranking reflects public health concerns for which mitigation is possible. For example, the vulnerability to hazards such as extreme heat and lightning are very much a matter of personal exposure. Mitigation in the traditional sense, such as strengthening a structure or moving a structure away from the hazard such as in flood mitigation, is likely to be of little use for these hazards. Reducing the risk of mortality from lightning or temperature extremes largely involves the provision of public health information and promotion of hazard awareness so that individuals take precautions to limit their exposure to the hazard. While hazard awareness and public safety information are important for any type of hazard, it is especially important for hazards such as extreme temperatures, lightning, tornadoes, severe thunderstorms, and communicable disease outbreaks.

### **Ranking of Priority Mitigation Measures**

The mitigation measures identified in each hazard category were further evaluated based upon relative cost, direct benefits, and likely indirect benefits as shown in Table 53. Consideration was given to the likelihood of occurrence of each type of hazard as set forth in the hazard prioritization analysis in the preceding section. Greatest priority is recommended to be given to those mitigation measures that directly or indirectly minimize loss of life or injury.

#### ***Estimated Cost***

Where possible, Table 53 includes a summary of the estimated capital cost and average annual operation and maintenance cost for each mitigation measure. It also gives the benefits for flood-related mitigation measures in the form of the estimated reduction in damages from a one-percent-annual-probability flood that would result from implementation of the mitigation measure. In addition, the table indicates that a number of other benefits that are not readily quantifiable, such as environmental, recreational, and quality of life benefits, are associated with specific mitigation measures. While it may not be possible to directly compare these to the associated costs, they should be taken into account when decisions are made regarding implementation of specific recommendations.

#### ***Cost of Implementation***

An estimated cost of implementation was developed to categorize the relative cost of each of the priority mitigation measures as shown in Table 53. The cost of implementation is allocated among three categories of low (less than \$100,000 dollars), moderate (greater than \$100,000 and less than \$1.0 million), and high (greater than \$1.0 million) costs, which are generally defined as including:

##### *Low*

- Educational and informational programming.
- Ongoing enforcement of ordinances.
- Plan development.

### *Moderate*

- Addition of new staff.
- Additional staff hours budgeted.
- Additional equipment.
- New ordinance development.
- New programs/task force.

### *High*

- Major construction.
- Floodplain structure buyout programs.
- New buildings (infrastructure).
- Capital programs.

This cost categorization allows the mitigation measures to be prioritized with particular regard to cost effectiveness by comparing the estimated low, moderate, and high cost to the number of both direct and indirect benefits identified (see Direct and Indirect Benefits section below).

### ***Direct and Indirect Benefits***

The benefits from implementation of a mitigation measure can be classified as direct, or measurable, and as indirect, or intangible. Direct benefits were defined in terms of enhanced preparedness and protection of individuals or communities, reduced property damage, reduced injuries, and reduced mortalities. Although the exact numbers or amounts of such direct benefits are not known, these would be a direct result of implementing a particular mitigation measure. In contrast, indirect benefits represent a continuum of potential benefits that may occur as a result of the implementation of specific management actions. For example, implementation of informational programming, while not directly saving lives, may ultimately result in people having the knowledge necessary to save lives and protect property. These intangible benefits cannot be readily quantified and range from increased awareness to reduced loss of life and property, and have been assessed using the following relative cumulative scale:

1 = Increased awareness/preparedness.

2 = Enhanced quality of life/social benefits.

3 = Reduced property damage.

4 = Increased environmental and recreational benefits/ecosystems services.

5 = Reduced loss of life and injury with concomitant benefits for economic productivity.

As shown above and in Table 53, the greatest indirect benefit was allocated to those mitigation measures that may ultimately result in minimized loss of life or injury.

### ***Local Units of Government Affected***

Table 53 also provides a list of the local units of government affected for each hazard and corresponding priority mitigation measures.



## Chapter VI

# PLAN ADOPTION, IMPLEMENTATION, MAINTENANCE, AND REVISION

The hazard mitigation plan described in this report is designed to attain, to the maximum extent practicable, the goals and objectives set forth in Chapter IV of this report. In a practical sense, however, the plan is not complete until the steps to convert the plan into action policies and programs have been specified. This chapter presents the plan implementation strategies envisioned and includes information on plan adoption, maintenance, and revision.

### PLAN REFINEMENT, REVIEW, AND ADOPTION

As described in Chapter I, the hazard mitigation planning program was initiated by Washington County in 2015. The plan set forth in this report was begun in 2015 and conducted pursuant to the mitigation planning requirements of 44 *Code of Federal Regulations*, Section 201.6(d) (44 CFR 201.6(d)) which call for local hazard mitigation plans to be reviewed; updated to reflect changes in development, progress in local mitigation efforts, and changes in priorities; and reapproved every five years for local jurisdictions to be able to receive hazard mitigation funding. During 2002, the Federal Emergency Management Agency (FEMA) published rules for hazard mitigation planning in response to the Disaster Mitigation Act of 2000. These rules address State and local mitigation planning and are important for the Washington County hazard mitigation program in the following manner:

- The Wisconsin Department of Military Affairs, Division of Emergency Management (WEM), is directly involved in a partnership role for all-hazard mitigation planning. That agency is responsible for preparing and periodically updating a State all-hazard mitigation plan, provides technical assistance and guidance for local all-hazards planning, and administers planning grant programs for FEMA.
- The rules outline State and local mitigation planning guidelines for accessing hazard mitigation grant funds. For disasters declared after November 1, 2004, local units of government must have a FEMA-approved mitigation plan in order to receive project grants from the Hazard Mitigation Grant Program (HMGP) and the Pre-Disaster Mitigation (PDM) program. This element is important because it requires local adoption of a hazard mitigation plan to remain eligible to receive grants from specific mitigation funds. Communities can formally adopt the County plan, or, alternatively, create and adopt their own plan.
- The rules and related guidance provide more specificity and detail on the hazard mitigation plan content than did the previous rules.

The Washington County hazard mitigation plan has been structured to meet the 2002 guidance.

The Washington County hazard mitigation plan was prepared under the guidance of the Washington County Hazards Mitigation Local Planning Team (LPT) comprised of representatives of all of the communities within the County, as well as County businesses and agency representatives. The LPT met four times during the plan preparation period to provide input on the types of hazards to be considered, the appropriate mitigation strategies, and to review the draft report chapters with the report chapters then being refined to reflect the comments and recommendations of the LPT. The activities of the LPT are documented in Appendix A.

During the drafting of the plan, public informational meetings were held to review the plan with local officials, businesses and industry, and citizens, following completion of the first four chapters and after completion of the plan in draft form. In addition, as draft chapters of the updated plan were completed, copies were placed in downloadable form on the website of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) and a webpage was available on the SEWRPC website on which members of the public could ask questions and submit comments on the draft plan update. Following plan finalization, the plan was presented for consideration and adoption to the Washington County Board of Supervisors on December 12, 2017. A copy of the signed plan adoption resolution is included in Appendix K. Copies of the plan were also sent to each of the local units of government in the County advising them of the need for adoption by the local government in order to retain future eligibility for mitigation funding for the FEMA Hazard Mitigation Grant and the Pre-Disaster Mitigation Programs administered by WEM. Copies of the adopted resolutions approving the plan at the local units of government are included in Appendix K. In addition, County and SEWRPC staff have been made available to meet with communities on an individual basis to review the plan and consider adoption and implementation steps. A status report on plan adoption by the County and local units of government is maintained by the Washington County Office of Emergency Management.

## **PLAN IMPLEMENTATION STRATEGIES**

An important first step in the implementation of the updated hazard mitigation plan for Washington County is its formal adoption by Washington County; the Cities of Hartford and West Bend; the Villages of Germantown, Jackson, Kewaskum, Newburg, Richfield, and Slinger; and the Towns of Addison, Barton, Erin, Farmington, Germantown, Hartford, Jackson, Kewaskum, Polk, Trenton, Wayne, and West Bend. Upon formal adoption, the plan becomes an important guide to hazard mitigation and related management decisions for the County and participating local units of government. Such adoption serves to signify agreement with and official support of the plan recommendations and enables government officials and staff to begin integrating the plan recommendations into the other ongoing County and municipal programs, such as land use control, and public works development planning and programming.

Realization of the plan will require a long-term commitment to the objectives of the plan and a high degree of coordination and cooperation among County officials and staff and various County and community departments and other bodies, including the Hazards Mitigation Local Planning Team; intergovernmental task forces or other committees that may be created in the future to help address common hazard mitigation issues; other concerned units and agencies of government and their respective officials and staffs; area developers and lending institutions; businesses, industry, and institutions; and concerned private citizens in undertaking the substantial investments and series of actions needed to implement the plan. Close cooperation with WEM and FEMA is also essential.

A summary of the plan elements and selected implementation strategy information, including costs, designated management agencies, and schedules are included in Tables 54 and 55. Summaries of recommendations for individual municipalities are given in Appendix H.

It is recommended that the County and local units of government incorporate the analyses performed and mitigation strategies recommended into other local planning efforts, such as those related to stormwater management, stream and river protection, land and water conservation, and comprehensive planning, where appropriate.

Table 54

WASHINGTON COUNTY HAZARD MITIGATION PLAN SUMMARY AND IMPLEMENTATION STRATEGIES

Hazard	Mitigation Measures	Status	Priority	Implementation Timetable and Notes	Potential Funding Programs (see Appendix I)
Flooding and Related Stormwater Drainage Problems	<u>Floodplain and Environmentally Sensitive Land Preservation Element</u>				
	<ul style="list-style-type: none"> <li>Floodplain and wetland zoning</li> <li>Environmentally sensitive area and open space preservation actions<sup>a</sup></li> <li>Wetland restoration to reduce flood-related agricultural and property damages<sup>a</sup></li> </ul>	Implemented	High	In place and ongoing	1,2,5,6,7,9,10,11,12,13,14,16,17,18,19,20,21,22,30,31,37,40,46,47,49,51,52,53,54,55,56,57,59,61,62,64,65,66,68,69,78,79,80,81,84,85
	<ul style="list-style-type: none"> <li>Environmentally sensitive area and open space preservation actions<sup>a</sup></li> <li>Wetland restoration to reduce flood-related agricultural and property damages<sup>a</sup></li> </ul>	Partially Implemented	High	As funding and opportunities become available	
	<ul style="list-style-type: none"> <li>Wetland restoration to reduce flood-related agricultural and property damages<sup>a</sup></li> </ul>	Not Implemented	Medium	As funding and opportunities become available	
	<u>Floodplain Management Plan Element</u>				
	<ul style="list-style-type: none"> <li>Removal of four repetitive loss/severe repetitive loss structures<sup>a</sup></li> <li>Surveys of up to 983 structures identified as potentially being in the floodplain</li> <li>Floodproofing of up to 211 non-residential structures identified as potentially being in the floodplain</li> <li>Removal of up to 635 structures identified as potentially being in the floodplain<sup>a</sup></li> <li>Removal of up to 137 mobile homes identified as potentially being in the floodplain<sup>a</sup></li> <li>National Flood Insurance Program and map updating</li> <li>Lending institution and real estate agent policies</li> <li>Enforcement of floodplain regulations</li> <li>Maintenance of U.S. Geological Survey stream gages</li> </ul>	Not Implemented	High	As funding and opportunities become available	1,2,5,6,9,10,11,12,14,30,31,32,48,49,57,62
	<ul style="list-style-type: none"> <li>Surveys of up to 983 structures identified as potentially being in the floodplain</li> </ul>	Not Implemented	High	Implement following updating of floodplain maps	
	<ul style="list-style-type: none"> <li>Floodproofing of up to 211 non-residential structures identified as potentially being in the floodplain</li> </ul>	Not Implemented	Medium	Implement after updating of floodplain maps and surveys of structures	
	<ul style="list-style-type: none"> <li>Removal of up to 635 structures identified as potentially being in the floodplain<sup>a</sup></li> </ul>	Not Implemented	Medium	Implement after updating of floodplain maps and surveys of structures	
	<ul style="list-style-type: none"> <li>Removal of up to 137 mobile homes identified as potentially being in the floodplain<sup>a</sup></li> </ul>	Not Implemented	Medium	Implement after updating of floodplain maps and surveys of structures	
	<ul style="list-style-type: none"> <li>National Flood Insurance Program and map updating</li> </ul>	Partially Implemented	High	Ongoing, several map updating efforts are underway	
	<ul style="list-style-type: none"> <li>Lending institution and real estate agent policies</li> </ul>	Partially Implemented	High	Ongoing	
	<ul style="list-style-type: none"> <li>Enforcement of floodplain regulations</li> <li>Maintenance of U.S. Geological Survey stream gages</li> </ul>	Implemented	High	In place and ongoing	
	<ul style="list-style-type: none"> <li>Enforcement of floodplain regulations</li> <li>Maintenance of U.S. Geological Survey stream gages</li> </ul>	Implemented	High	Ongoing	
<u>Stormwater Management Plan Element</u>					
<ul style="list-style-type: none"> <li>Stormwater management plans</li> <li>Stormwater-related regulations</li> </ul>	Partially Implemented	High	Ongoing	5,9,10,14,40,52,64	
<ul style="list-style-type: none"> <li>Stormwater-related regulations</li> </ul>	Partially Implemented	High	Ongoing		
<u>Public Information and Education Element</u>					
<ul style="list-style-type: none"> <li>Public education activities</li> <li>Public participation activities and coordination with other agencies and units of government</li> </ul>	Partially Implemented	High	Ongoing	5,39,40,52,59,64,67,86	
<ul style="list-style-type: none"> <li>Public participation activities and coordination with other agencies and units of government</li> </ul>	Partially Implemented	High	Ongoing		

Table 54 (continued)

Hazard	Mitigation Measures	Status	Priority	Implementation Timetable and Notes	Potential Funding Programs (see Appendix I)
Flooding and Related Stormwater Drainage Problems (continued)	<p><b>Secondary Plan Element</b></p> <ul style="list-style-type: none"> <li>Documentation of the extent of future floods</li> <li>Stream channel maintenance</li> <li>Stormwater management facilities maintenance</li> </ul>	<p>Not Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p>	<p>High</p> <p>Medium</p> <p>High</p>	<p>As future flooding occurs</p> <p>Ongoing</p> <p>Ongoing</p>	<p>7,8,9,11,12,64</p>
	<p><b>Secondary Plan Element (continued)</b></p> <ul style="list-style-type: none"> <li>Dam Failure Subelement                             <ul style="list-style-type: none"> <li>Regular inspection and maintenance of dams</li> <li>Dam emergency action plans</li> <li>Dam failure analyses</li> <li>Adding dam failure hydraulic shadows to GIS layers</li> </ul> </li> </ul>	<p>Partially Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p> <p>Not Implemented</p>	<p>High</p> <p>High</p> <p>High</p> <p>Medium</p>	<p>At a minimum, as required by the WDNR<sup>3</sup></p> <p>2022</p> <p>2022</p> <p>As dam failure analyses are completed</p>	<p>30,31,56,78,79,83</p>
Thunderstorm, High-Wind, Hail, and Lightning Hazards	<p>Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio</p> <p>Encourage the provision of safe rooms</p> <p>Work with municipalities and businesses to explore installation of safe rooms in community facilities, businesses, and manufacturers</p> <p>Consider adoption of mobile home ordinances requiring provision of safe rooms in new and expanding mobile home parks</p> <p>Install safe rooms in existing mobile home parks<sup>a</sup></p> <p>Encourage agricultural producers to purchase crop insurance</p> <p>Promote inclusion of safety strategies for severe weather events into driver education classes and materials</p> <p>Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit</p> <p>Continue to conduct annual weather spotter training</p>	<p>Partially Implemented</p> <p>Not Implemented</p> <p>Not Implemented</p> <p>Not Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p> <p>Implemented</p>	<p>High</p> <p>High</p> <p>Medium</p> <p>High</p> <p>Medium</p> <p>Medium</p> <p>Medium</p> <p>Low</p>	<p>Ongoing</p> <p>As needed</p> <p>Ongoing</p> <p>As funding and opportunities become available</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p>	<p>1,5,23,30,39,67,87</p>
	<p>Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio</p> <p>Encourage the provision of safe rooms</p> <p>Work with municipalities and businesses to explore installation of safe rooms in community facilities, businesses, and manufacturers</p> <p>Consider adoption of mobile home ordinances requiring provision of safe rooms in new and expanding mobile home parks</p> <p>Install safe rooms in existing mobile home parks<sup>a</sup></p>	<p>Partially Implemented</p> <p>Not Implemented</p> <p>Not Implemented</p> <p>Not Implemented</p>	<p>High</p> <p>High</p> <p>Medium</p> <p>High</p>	<p>Ongoing</p> <p>As needed</p> <p>Ongoing</p> <p>As funding and opportunities become available</p>	<p>1,5,30,39,67,87</p>
Tomadoes					

Table 54 (continued)

Hazard	Mitigation Measures	Status	Priority	Implementation Timetable and Notes	Potential Funding Programs (see Appendix I)
Tomadoes (continued)	<p>Promote educational and informational programming, especially related to the early warning network, and to individual actions to protect citizens, property, and businesses</p> <p>Continue to conduct annual weather spotter training</p> <p>Promote inclusion of safety strategies for severe weather events into driver education classes and materials</p> <p>Continued enforcement of building code ordinance requirements</p> <p>Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit</p>	<p>Partially Implemented</p> <p>Implemented</p> <p>Partially Implemented</p> <p>Implemented</p> <p>Partially Implemented</p>	<p>Medium</p> <p>Low</p> <p>Medium</p> <p>High</p> <p>Medium</p>	<p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p>	<p>See previous page</p>
Extreme Temperature Events	<p>Increase outreach to vulnerable populations regarding the availability of shelters during extreme heat and cold events</p> <p>Designate sites to be used as public cooling/heating shelters during extreme temperature events</p> <p>At owner's request, conduct inventories and inspections of these facilities</p> <p>Encourage the sites' owners to extend hours during extreme temperature events</p> <p>Promote transportation options to assist members of highly vulnerable populations to reach these sites during extreme temperature events</p> <p>Maintain, update, and upgrade public early warning systems and networks, as part of this increase coverage and use of NOAA All Hazard Weather Radio and EAS broadcasts</p> <p>Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves</p> <p>Promote educational and informational programming</p>	<p>Partially Implemented</p> <p>Implemented</p> <p>Not Implemented</p> <p>Not Implemented</p> <p>Not Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p>	<p>High</p> <p>High</p> <p>Medium</p> <p>Medium</p> <p>Medium</p> <p>High</p> <p>Medium</p> <p>Medium</p>	<p>Ongoing</p> <p>Ongoing</p> <p>Upon request from facility owners</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p>	<p>30,39,67,71,74</p>
Winter Storm Events	<p>Maintain, update, and upgrade public early warning systems and networks, as part of this increase coverage and use of NOAA All Hazard Weather Radio and EAS broadcasts</p> <p>Promote educational and informational programming</p> <p>Promote inclusion of safety strategies for severe weather events into driver education classes and materials</p> <p>Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit</p> <p>Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves</p> <p>Promote the installation of backup power systems at homes and businesses</p> <p>Work with utilities to assess and improve electrical service reliability</p>	<p>Partially Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p> <p>Partially Implemented</p>	<p>High</p> <p>Medium</p> <p>Medium</p> <p>Medium</p> <p>Medium</p> <p>Medium</p> <p>High</p>	<p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p>	<p>1,5,67,74,87</p>

Table 54 (continued)

Hazard	Mitigation Measures	Status	Priority	Implementation Timetable and Notes	Potential Funding Programs (see Appendix I)		
Drought Events	Encourage the development and maintenance of drought emergency plans for local utilities and communities	Partially Implemented	High	Ongoing	15,23,60,77		
	Develop local water conservation programs	Partially Implemented	Medium	2022			
	Protect very high and high recharge potential groundwater recharge areas from inappropriate development	Partially Implemented	High	Incorporated into Regional Land Use Plan, Ongoing			
	Where opportunities exist develop interconnections among adjacent water utilities	Not Implemented	Low	To be determined			
	Encourage farm operators to evaluate the economics of crop insurance programs	Partially Implemented	Medium	Ongoing			
Transportation Accident-Related Events	As existing surface arterial street system is resurface and reconstructed and as new arterial roads are constructed, consider adding bicycle accommodations	Partially Implemented	Medium	As work proceeds on arterial roads	30,34,35,37,38,41,44,45,74,75,76,87		
	Promote driver safety hazard awareness, especially to drivers within the 16 to 24 age group	Partially Implemented	Medium	Ongoing			
	Continue to promote traffic-related law enforcement	Implemented	High	Ongoing			
	Continue public education efforts regarding the dangers of distracted driving	Partially Implemented	Medium	Ongoing			
	Promote inclusion of safety strategies for severe weather events in drivers education classes and materials	Partially Implemented	Medium	Ongoing			
	Promote the use of safety restraints and personal safety equipment	Partially Implemented	Medium	Ongoing			
	Continue emergency operation training, planning, and preparedness for mass-casualty incidents involving railroad transportation	Partially Implemented	High	Ongoing			
	Promote development of a thorough drinking water supply risk and threat assessment	Partially Implemented	High	2022			
	Prepare emergency operation plans for each public water supply system	Partially Implemented	High	2022			
	Encourage local communities to develop emergency drinking water supply plans	Partially Implemented	High	2022			
Contamination or Loss of Water Supply	Encourage local utilities to identify priority water customers and develop plans for restoring their service first	Not Implemented	Medium	2022	15,30,58,60,67,77		
	Identify potential distribution points for emergency water supply	Not Implemented	High	2022			
	Evaluate the condition of water utility electrical equipment to accept generators. Repair or upgrade as necessary	Partially Implemented	Medium	Ongoing			
	Where opportunities exist develop interconnections among adjacent water utilities	Not Implemented	Low	To be determined			
	Continue educational and outreach programs related to backflow prevention	Implemented	Medium	Ongoing			
	Promote development of a thorough sewerage system risk and threat assessment	Partially Implemented	High	2022			
	Prepare emergency operation plans for each sanitary sewerage system	Partially Implemented	High	Ongoing			
	Loss of Sewerage System						1,5,15,30

Table 54 (continued)

Hazard	Mitigation Measures	Status	Priority	Implementation Timetable and Notes	Potential Funding Programs (see Appendix I)		
Loss of Sewerage System (continued)	Initiate facility planning for sanitary sewerage systems when average daily flow to the wastewater treatment plant reaches 80 percent of the plant's design capacity	Partially Implemented	Medium	As needed	See previous page		
	Provide backup power for wastewater treatment plants, pumping stations, and other vital system components	Partially Implemented	Medium	Ongoing			
Hazardous Material Events	Continue participation in the Wisconsin Hazardous Materials Response System	Implemented	High	Ongoing	3, 24, 25, 27, 28, 39, 40, 44, 45, 46, 58, 67, 72, 75, 76, 87		
	Develop local community response plans for hazardous material releases	Partially Implemented	High	2022			
	Promote development of site emergency plans for school, factories, office buildings, shopping malls, and other sites that produce, store, or utilize hazardous materials or that are near facilities or transportation routes where such materials are produced, used, stored, or transported	Partially Implemented	High	Ongoing			
	Promote proper design, construction, maintenance, and inspections of hazardous material storage facilities, pipelines, and other related facilities	Partially Implemented	High	Ongoing			
	Promote continued maintenance and upgrading of transportation infrastructure carrying shipments of hazardous cargo	Partially Implemented	High	Ongoing			
	Educate businesses and those utilizing hazardous materials of their responsibilities	Partially Implemented	Medium	Ongoing			
	Continue to promote training, planning, and preparedness for mass-casualty incidents involving fixed facilities and transportation systems	Partially Implemented	High	Ongoing			
	Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	Partially Implemented	High	Ongoing			
	Promote the development of a thorough community risk and threat assessment	Partially Implemented	High	2022			
	Promote and conduct preparedness activities including planning, training and exercises for local law enforcement, fire and rescue, and other response personnel for a variety of terrorist attacks	Partially Implemented	High	Ongoing			
Terrorism Incidents	Promote development of site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites	Partially Implemented	Medium	Ongoing	3, 4, 26, 27, 28, 29, 33, 34, 35, 36, 42, 43, 44, 45, 50, 67, 71, 72		
	Promote increased security measures at water supply facilities	Partially Implemented	Medium	Ongoing			
	Encourage development of emergency preparedness plans for critical government, utility and infrastructure systems	Partially Implemented	Medium	Ongoing			
	Heighten security at public gatherings, special events, and critical community facilities, utilities, infrastructure, and industries	Partially Implemented	High	Ongoing			
	Purchase of cyber-insurance by local government	Partially Implemented	High	Ongoing			
	Encourage local governments to provide education in basic cybersecurity to their employees	Partially Implemented	High	Ongoing			
	Consider installing dedicated communication lines for monitoring and/or controlling critical equipment or processes	Not Implemented	Medium	To be determined			
	Cyberattack on Local Government						4, 26, 27, 28, 33, 36

Table 54 (continued)

Hazard	Mitigation Measures	Status	Priority	Implementation Timetable and Notes	Potential Funding Programs (see Appendix I)
Cyberattack on Local Government (continued)	Develop and implement a cybersecurity and data backup initiative	Not Implemented	Medium	2022	See previous page
Power Outages	Continue to review and implement programs to improve reliability of power supply facilities Encourage installation of backup power generators at critical facilities Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves Conduct outreach to businesses and facilities to encourage them to develop plans for dealing with long-term power outages Continue and refine public educational programming on safety during power outages and preparation for power outages	Partially Implemented Partially Implemented Partially Implemented Partially Implemented Partially Implemented	High Medium Medium Medium Medium	Ongoing Ongoing Ongoing Ongoing Ongoing	1,5,67,77
Communicable Disease Outbreak	Continue maintenance of a community public health system with adequate numbers of medical staff and sufficient disease monitoring and surveillance capabilities to adequately protect the population from small- and large-scale outbreaks and epidemics Promote development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, and other appropriate sites Develop and maintain plans for mass dispensing clinics for large-scale antibiotic or vaccine dispensing in the event of an infectious disease emergency Promote public awareness of the causes, symptoms, and protective actions for disease outbreaks Encourage residents to receive immunizations against communicable diseases, including annual and special strain influenza inoculations	Partially Implemented Not Implemented Partially Implemented Partially Implemented Partially Implemented	High Low High Medium High	Ongoing Ongoing Ongoing Ongoing Ongoing	5,32,67,71,73

<sup>a</sup> Land acquisition, demolition of structures, and removal of structures to be done on a willing buyer, willing seller basis.

<sup>b</sup> As required in Chapter 31, "Regulation of Dams and Bridges Affecting Navigable Waters," of the Wisconsin Statutes, high hazard dams are required to be inspected every two years; significant hazard dams are required to be inspected every three to four years; and low hazard dams are required to be inspected every 10 years. Owners and operators of dams should inspect their dams both on a regular basis and following high water events.

Source: SEWRPC.



Table 55

SUMMARY OF WASHINGTON COUNTY HAZARD MITIGATION MEASURES AND PRIMARY IMPLEMENTING GOVERNMENTAL UNITS AND AGENCIES

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Flooding	WCB, WCPD	HCC, CHPZ	WBCC, CWBDD	GVB, VGCD	JVB, VJPC	KVB, VKPC	NVB, VNPC	RVB, VRPZ	SVB, VSPZ	ATB, TAZP	BTB, TBPC
Floodplain and wetland zoning	WCPD, WCLC, NRCS	CHPK, CHPZ	CWBPK, CWBDD	VGPK, VGCD, MMSD	JJPK, VJPC	VKPK, VKPC	VNPC	VRPK, VRPC	VSPK, VSPZ	TAPK, TAPC	TBPC
Environmentally sensitive area and open space preservation actions	WCLC, NRCS	--	--	--	--	--	--	--	--	--	--
Wetland restoration to reduce flood-related agricultural and property damages	WCEM	--	--	--	--	--	--	VRPZ	--	--	--
Removal of four repetitive loss/severe repetitive loss structures	WCEM	--	--	--	--	--	--	--	--	--	--
Survey of up to 983 structures identified as potentially being in the floodplain	PO, WCPD	PO, CHPZ	PO, CWBDD	PO, VGCD	PO, VJPC	PO, PKPC	PO, VNPW	PO, VRPZ	--	PO, TAZP	PO, TBPC
Floodproofing of up to 211 structures identified as potentially being in the floodplain	WCEM	PO, CHPZ	PO, CWBDD	PO, VGCD	PO, VJPC	PO, PKPC	PO, VNPW	PO, VRPZ	--	PO, TAZP	PO, TBPC
Removal of up to 635 structures identified as potentially being in the floodplain	WCEM	PO, CHPZ	PO, CWBDD	PO, VGCD	PO, VJPC	PO, PKPC	PO, VNPW	PO, VRPZ	--	PO, TAZP	PO, TBPC
Removal of up to 137 mobile homes identified as potentially being in the floodplain	WCEM	--	--	--	PO, VJPC	--	--	--	--	--	--
National Flood Insurance Program and map updating	FEMA	FEMA	FEMA	FEMA	FEMA	FEMA	FEMA	--	FEMA	--	--
Lending institution and real estate agent policies	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB
Enforcement of floodplain regulations	WCPD	CHPZ	CWBDD	VGCD	VJPC	VKZA	VNPC	VRPZ	VSPZ	TAZP	TBZA
Maintenance of U.S. Geological Survey stream gages	USGS, MMSD, RPC, ACE, WDNR, WKPL	--	--	--	--	--	--	--	--	--	--
Stormwater management plans	WCPD	CHPZ	CWBDD	VGCD	VJPC	VKPC	VNPC	VRPZ	VSPZ	TAZP	TBPC
Stormwater-related regulations	WCPD	CHPZ	CWBDD	VGCD	VJPC	VKZA	VNPC	VRPZ	VSPZ	TAZP	TBZA

NOTE: Agency abbreviations in the table are as follows:

ACE	U.S. Army Corps of Engineers	HCC	Hartford City Council	RPC	Southeastern Wisconsin Regional Planning Commission	USGS	U.S. Geological Survey	VRPZ	Village of Slinger Planning and Zoning
ATB	Addison Town Board	JJPK	Village and Town of Jackson Joint Parks and Recreation	RVB	Richfield Village Board	VGCD	Village of Germantown Community Development Department	WKPL	Waukesha County Department of Parks and Land Use
BTB	Barton Town Board	JVB	Jackson Village Board	SVB	Slinger Village Board	VJPC	Village of Jackson Plan Commission	WBCC	West Bend City Council
CHPZ	City of Hartford Planning, Zoning, & Building Inspection	KVB	Kewaskum Village Board	TAZP	Town of Addison Zoning and Planning	VKPC	Village of Kewaskum Plan Commission	WCB	Washington County Board
CHPK	City of Hartford Parks and Recreation Department	LI	Lending Institutions	NVB	Newburg Village Board	VKZA	Village of Kewaskum Zoning Administrator	WCLC	Washington County Land and Water Conservation Division
CWBDD	City of West Bend Department of Development	MMSD	Milwaukee Metropolitan Sewerage District	OWHD	Ozaukee-Washington County Health Department	VNPC	Village of Newburg Plan Commission	WCEM	Washington County Office of Emergency Management
FEMA	Federal Emergency Management Agency	PO	Property Owners	TBPC	Town of Barton Plan Commission	VNPW	Village of Newburg Public Works Department	WCPD	Washington County Planning and Land Use Department
GVB	Germantown Village Board	RB	Real Estate Brokers	TBZA	Town of Barton Zoning Administrator	VRPZ	Village of Richfield Planning and Zoning	WDNR	Wisconsin Department of Natural Resources

Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Flooding (continued)											
Public education activities	WCEM, RW	CHPW	CWBWPW	SWWT	SWWT	VKWP	SWWT	RVB	VSPW	TAZP	--
Public participation activities and coordination with other agencies and units of government	WCPD, FEMA, WDNR	CHPZ	CWBDD	VGCD	VJPC	VKPC	VNPC	VRPZ	VSPZ	TAZP	TBPC
Documentation of the extent of future floods	WCPD	CHPZ	CWBDD	VGCD	VJPW	VKWP	VNPW	VRPZ	VSPZ	TAZP	BTB
Stream channel maintenance	WCHD	CHPW	CWBWPW	VGPW, JGDD	VJPW, JGDD	VKWP	VNPW	RVB	VSPW	TAHD, HADD	BTB
Stormwater management facility maintenance	WCHD	CHPW	CWBWPW	VGPW	VJPW	VKWP	--	RVB	VSPW	TAHD	--
Dam inspections and maintenance	WCHD	CHPW	CWBWPW, DO	DO	DO	VKWP	--	DO	DO	WDNR	--
Dam emergency action plans	WCHD	CHPW	CWBWPW, DO	DO	DO	VKWP	--	DO	DO	WDNR	--
Dam failure analyses	--	--	--	DO	--	--	--	DO	DO	WDNR	--
Adding hydraulic shadows to GIS layers	WCPD	CHPZ	CWBDD	VGCD	VJPC	VKPC	VNPC	VRPZ	VSPZ	TAZP	TBPC

NOTE: Agency abbreviations in the table are as follows:

BTB	Barton Town Board	FEIMA	Federal Emergency Management Agency	TAHD	Town of Addison Highway Department	VJPW	Village of Jackson Public Works Department	VSPW	Village of Slinger Public Works Department
CWBWPW	City of West Bend Public Works Department	HADD	Hartford-Addison Drainage District	TAZP	Town of Addison Zoning and Planning	VKPC	Village of Kewaskum Plan Commission	VSPZ	Village of Slinger Planning and Zoning
CHPW	City of Hartford Public Works Department	JGDD	Jackson-Germantown Drainage District	TBPC	Town of Barton Plan Commission	VKWP	Village of Kewaskum Public Works Department	WCEM	Washington County Office of Emergency Management
CHPZ	City of Hartford Planning, Zoning, & Building Inspection	PLA	Pike Lake Association	VGCD	Village of Germantown Community Development Department	VNPC	Village of Newburg Plan Commission	WCHD	Washington County Highway Department
CWBDD	City of West Bend Department of Development	RVB	Richfield Village Board	VGPW	Village of Germantown Public Works Department	VNPW	Village of Newburg Public Works Department	WCFD	Washington County Planning and Land Use Department
CWBWPW	City of West Bend Public Works Department	RW	Ready Wisconsin	VJPC	Village of Jackson Plan Commission	VRPZ	Village of Richfield Planning and Zoning	WDNR	Wisconsin Department of Natural Resources
DO	Dam Owner	SWWT	Southeastern Wisconsin Watersheds Trust						

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
Flooding	ETB, TEPC	FTB, TFPC	GTB, TGZA	HTB, THPC	JTB, TJPPC	KTB, TKPC	PTB, TPPC	TTB, TTPC	WTB, TWPC	WBTB, TWBPC
Environmentally sensitive area and open space preservation actions	TEPC	TFPC	GTB	THPC	JJPK, TJPPC	TKPC	TPPC	TTPC	TWPC	TWBPC
Wetland restoration to reduce flood-related agricultural and property damages	--	--	--	--	--	--	--	--	--	--
Removal of four repetitive loss/severe repetitive loss structures	ETB	--	--	--	--	--	--	--	--	--
Survey of up to 983 structures identified as potentially being in the floodplain	PO, TEPC	PO, TFPC	PO, GTB	PO, THPC	PO, TJPPC	PO, TKPC	PO, TPPC	PO, TTPC	PO, TWPC	PO, TWBPC
Floodproofing of up to 211 structures identified as potentially being in the floodplain	PO, TEPC	PO, TFPC	PO, GTB	--	PO, TJPPC	--	PO, TPPC	PO, TTPC	PO, TWPC	--
Removal of up to 635 structures identified as potentially being in the floodplain	PO, TEPC	PO, TFPC	PO, GTB	PO, THPC	PO, TJPPC	PO, TKPC	PO, TPPC	PO, TTPC	PO, TWPC	PO, TWBPC
Removal of up to 137 mobile homes identified as potentially being in the floodplain	--	--	--	--	--	--	--	--	--	--
National Flood Insurance Program and map updating	--	--	--	--	--	--	--	--	--	--
Lending institution and real estate agent policies	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB	LI, RB
Enforcement of floodplain regulations	TEZA	TFZA	TGZA	THZA	TJZA	TKZA	TPZS	TTZA	TWZA	TWBZA
Maintenance of U.S. Geological Survey stream gages	--	--	--	--	--	--	--	--	--	--
Stormwater management plans	TEPC	TFPC	GTB	THPC	TJPPC	TKPC	TPPC	TTPC	TWPC	TWBPC
Stormwater-related regulations	TEZA	TFZA	TGZA	THZA	TJZA	TKZA	TPZS	TTZA	TWZA	TWBZA

NOTE: Agency abbreviations in the table are as follows:

ETB	Erin Town Board	LI	Lending Institutions	TFPC	Town of Farmington Plan Commission	TKPC	Town of Kewaskum Plan Commission	TWPC	Town of Wayne Plan Commission
FTB	Farmington Town Board	PO	Property Owners	TFZA	Town of Farmington Zoning Administrator	TKZA	Town of Kewaskum Zoning Administrator	TWBPC	Town of West Bend Plan Commission
GTB	Germantown Town Board	PTB	Polk Town Board	TGZA	Town of Germantown Zoning Administrator	TPPC	Town of Polk Plan Commission	TWBZA	Town of West Bend Zoning Administrator
HTB	Hartford Town Board	RB	Real Estate Brokers	THPC	Town of Hartford Planning Commission	TPZS	Town of Polk Zoning Secretary	TWZA	Town of Wayne Zoning Administrator
JJPK	Village and Town of Jackson Joint Parks and Recreation	TEPC	Town of Erin Plan Commission	THZA	Town of Hartford Zoning Administrator	TTB	Trenton Town Board	WTB	Wayne Town Board
JTB	Jackson Town Board	TEZA	Town of Erin Zoning Administrator	TJPPC	Town of Jackson Park and Planning Commission	TTPC	Town of Trenton Plan Commission	WBTB	West Bend Town Board
KTB	Kewaskum Town Board	TFPC	Town of Farmington Plan Commission	TJZA	Town of Jackson Zoning Administrator	TTZA	Town of Trenton Zoning Administrator		

Table 55 (continued)

	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
Mitigation Measures										
Flooding (continued)										
Public education activities	--	--	GTB	THPW	--	--	--	--	--	TWBPW, BCLD
Public participation activities and coordination with other agencies and units of government	TEPC	TFPC0	TGZA	THPC	TJPPC	TKPC	TPPC	TTPC	TWPC	TWBPW, BCLD
Documentation of the extent of future floods	ETB	FTB	GTB	THPW	JTB	KTB	PTB	TTPW	WTB	TWBPW
Stream channel maintenance	ETB	FTB	GTB, JGDD	THPW, HADD	JTB, JGDD	KTB	PTB	TTPW	WTB	TWBPW, BCLD
Stormwater management facility maintenance	--	--	GTB	THPW	--	--	--	--	--	TWBPW, BCLD
Dam inspections and maintenance	--	DO	--	PLA	DO, WDNR	--	LCLD, DO	DO	WTB, DO	SLPA, DO
Dam emergency action plans	--	DO	--	PLA	DO, WDNR	--	LCLD, DO	DO	WTB, DO	SLPA, DO
Dam failure analyses	--	DO	--	--	WDNR	--	DO	DO	WTB	DO
Adding hydraulic shadows to GIS layers	TEPC	TFPC	TGZA	THPC	TJPPC	TKPC	TPPC	TTPC	TWPC	TWBPW, BCLD

NOTE: Agency abbreviations in the table are as follows:

BCLD	Big Cedar Lake Protection and Rehabilitation District	JGDD	Jackson-Germantown Drainage District	SLPA	Silver Lake Protection Association	TJPPC	Town of Jackson Park and Planning Commission	TWBPC	Town of West Bend Plan Commission
ETB	Erin Town Board	JTB	Jackson Town Board	TEPC	Town of Erin Plan Commission	TKPC	Town of Kewaskum Plan Commission	TWBPW	Town of West Bend Public Works Department
FTB	Farmington Town Board	LCLD	Little Cedar Lake Protection and Rehabilitation District	TFPC	Town of Farmington Plan Commission	TPPC	Town of Polk Plan Commission	WDNR	Wisconsin Department of Natural Resources
DO	Dam Owner	KTB	Kewaskum Town Board	TGZA	Town of Germantown Zoning Administrator	TTPC	Town of Trenton Plan Commission	WTB	Wayne Town Board
GTB	Germantown Town Board	PTB	Polk Town Board	THPC	Town of Hartford Planning Commission	TTPW	Town of Trenton Public Works Department		
HADD	Hartford-Addison Drainage District	PLA	Pike Lake Association	THPW	Town of Hartford Public Works Department	TWPC	Town of Wayne Plan Commission		

Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Thunderstorm, High-Wind, Hail, and Lightning Hazards Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	WCEM	HCC	WBCC	GVB	JVB	KVB	NVB	RVB	SVB	ATB	--
Encourage the provision of safe rooms	WCEM	--	--	--	--	--	--	--	--	--	--
Work with municipalities and businesses to explore installation of safe rooms in community facilities, businesses, and manufacturers	WCEM	CHPZ	CWBDD	VGCD	VJPC	VKPC	VNPC	VRPZ	VZPZ	TAZP	TBPC
Consider adoption of mobile home ordinances requiring provision of safe rooms in new and expanding mobile home parks	WCB	HCC	WBCC	GVB	JVB	KVB	NVB	RVB	SVB	ATB	BTB
Install safe rooms in existing mobile home parks	WCEM	--	--	MPHO, VGCD	MPHO, VJPC	--	--	--	MPHO, VSPZ	--	--
Encourage agricultural producers to purchase crop insurance	WCLC	--	--	--	--	--	--	--	--	--	--
Promote inclusion of safety strategies for severe weather events into driver education classes and materials	WCEM, WDOT	--	--	--	--	--	--	--	--	--	--
Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit	WCEM, OWHD, RW	--	--	--	--	--	--	--	--	--	--
Continue to conduct annual weather spotter training	WCEM	--	--	--	--	--	--	--	--	--	--

NOTE: Agency abbreviations in the table are as follows:

ATB	Addison Town Board	JVB	Jackson Village Board	RVB	Richfield Village Board	VGCD	Village of Germantown Community Development Department	VSPZ	Village of Slinger Planning and Zoning Department
BTB	Barton Town Board	KVB	Kewaskum Village Board	RW	Ready Wisconsin	VJPC	Village of Jackson Plan Commission	WBCC	West Bend City Council
CHPZ	City of Hartford Planning, Zoning, and Building Inspection	MHPO	Mobile Home Park Owner	SVB	Slinger Village Board	VKPC	Village of Kewaskum Plan Commission	WCB	Washington County Board
CWBDD	City of West Bend Department of Development	NVB	Newburg Village Board	TAZP	Town of Addison Zoning and Planning	VNPC	Village of Newburg Plan Commission	WCEM	Washington County Office of Emergency Management
GVB	Germantown Village Board	OWHD	Ozaukee-Washington County Health Department	TBPC	Town of Barton Plan Commission	VRPZ	Village of Richfield Planning and Zoning	WDOT	Wisconsin Department of Transportation
HCC	Hartford City Council								

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
Thunderstorm, High-Wind, Hail, and Lightning Hazards Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	--	--	--	--	--	--	--	--	--	--
Encourage the provision of safe rooms	--	--	--	--	--	--	--	--	--	--
Work with municipalities and businesses to explore installation of safe rooms in community facilities, businesses, and manufacturers	TEPC	TFPC	GTB	THPC	TJPPC	TKPC	TPPC	TTPC	TWPC	TWBPC
Consider adoption of mobile home ordinances requiring provision of safe rooms in new and expanding mobile home parks	ETB	FTB	GTB	HTB	JTB	KTB	PTB	TTB	WTB	WBTB
Install safe rooms in existing mobile home parks	--	--	--	MHPO, THPC	--	--	--	MHPO, TTPC	--	--
Encourage agricultural producers to purchase crop insurance	--	--	--	--	--	--	--	--	--	--
Promote inclusion of safety strategies for severe weather events into driver education classes and materials	--	--	--	--	--	--	--	--	--	--
Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit	--	--	--	--	--	--	--	--	--	--
Continue to conduct annual weather spotter training	--	--	--	--	--	--	--	--	--	--

NOTE: Agency abbreviations in the table are as follows:

ETB	Erin Town Board	JTB	Jackson Town Board	TEPC	Town of Erin Plan Commission	TKPC	Town of Kewaskum	TWBPC	West Bend Plan Commission
FTB	Farmington Town Board	KTB	Kewaskum Town Board	TFPC	Town of Farmington Plan Commission	TPPC	Town of Polk Plan Commission	TWPC	Town of Wayne Plan Commission
GTB	Germantown Town Board	MHPO	Mobile Home Park Owner	THPC	Town of Hartford Planning Commission	TTB	Trenton Town Board	WTB	Wayne Town Board
HTB	Hartford Town Board	PTB	Polk Town Board	TJPPC	Town of Jackson Park and Planning Commission	TTPC	Town of Trenton Plan Commission		

Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
<b>Tornadoes</b> Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	WCEM	HCC	WBCC	GVB	JVB	KVB	NVB	RVB	SVB	ATB	--
Encourage the provision of safe rooms	WCEM	--	--	--	--	--	--	--	--	--	--
Work with municipalities and businesses to explore installation of safe rooms in community facilities, businesses, and manufacturers	WCEM	CHPZ	CWBDD	VGCD	VJPC	VKPC	VNPC	VRPZ	VZPZ	TAZP	TBPC
Consider adoption of mobile home ordinances requiring provision of safe rooms in new and expanding mobile home parks	WCEM	HCC	WBCC	GVB	JVB	KVB	NVB	RVB	SVB	ATB	BTB
Install safe rooms in existing mobile home parks	WCEM	--	--	MPHO, VGCD	MPHO, VJPC	--	--	--	MPHO, VSPZ	--	--
Encourage agricultural producers to purchase crop insurance	WCLC	--	--	--	--	--	--	--	--	--	--
Promote inclusion of safety strategies for severe weather events into driver education classes and materials	WCEM, WDOT	--	--	--	--	--	--	--	--	--	--
Promote educational and informational programming, especially related to the early warning network, and to individual actions to protect citizens, property, and businesses	WCEM, RW	--	--	--	--	--	--	--	--	--	--
Continue to conduct annual weather spotter training	WCEM	--	--	--	--	--	--	--	--	--	--
Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit	WCEM, OWHD, RW	--	--	--	--	--	--	--	--	--	--
Continued enforcement of building code ordinance requirements	--	CHPZ	CWBBI	VGCD	VJBI	VKBI	VNBI	VRBI	VSBI	TAZP	TBBI

NOTE: Agency abbreviations in the table are as follows:

ATB	Addison Town Board	JVB	Jackson Village Board	SVB	Slinger Village Board	VKBI	Village of Kewaskum Building Inspector	VSBI	Village of Slinger Building Inspector
BTB	Barton Town Board	KVB	Kewaskum Village Board	TAZP	Town of Addison Zoning and Planning	VKPC	Village of Kewaskum Plan Commission	VSPZ	Village of Slinger Planning and Zoning Department
CHPZ	City of Hartford Planning, Zoning, & Building Inspection	MHPO	Mobile Home Park Owners	TBBI	Town of Barton Building Inspector	VNBI	Village of Newburg Building Inspector	WBCC	West Bend City Council
CWBDD	City of West Bend Department of Development	OWHD	Ozaukee-Washington County Health Department	TBPC	Town of Barton Plan Commission	VNPC	Village of Newburg Plan Commission	WCEM	Washington County Office of Emergency Management
CWBBI	City of West Bend Building Inspector	NVB	Newburg Village Board	VGCD	Village of Germantown Community Development Department	VRBI	Village of Richfield Building Inspector	WCLC	Washington County Land and Water Conservation Division
GVB	Germantown Village Board	RVB	Richfield Village Board	VJBI	Village of Jackson Building Inspector	VRPZ	Village of Richfield Planning and Zoning	WDOT	Wisconsin Department of Transportation
HCC	Hartford City Council	RW	Ready Wisconsin	VJPC	Village of Jackson Planning Commission				

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
<b>Tornadoes</b> Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio rooms	--	--	--	--	--	--	--	--	--	--
Work with municipalities and businesses to explore installation of safe rooms in community facilities, businesses, and manufacturers	TEPC	TFPC	GTB	THPC	TJPPC	TKPC	TPPC	TTPC	TWPC	TWBC
Consider adoption of mobile home ordinances requiring provision of safe rooms in new and expanding mobile home parks	EITB	FTB	GTB	HTB	JTB	KTB	PTB	TTB	WTB	WBTB
Install safe rooms in existing mobile home parks	--	--	--	MHPO, THPC	--	--	--	MHPO, TTPC	--	--
Encourage agricultural producers to purchase crop insurance	--	--	--	--	--	--	--	--	--	--
Promote inclusion of safety strategies for severe weather events into driver education classes and materials	--	--	--	--	--	--	--	--	--	--
Promote educational and informational programming, especially related to the early warning network, and to individual actions to protect citizens, property, and businesses	--	--	--	--	--	--	--	--	--	--
Continue to conduct annual weather spotter training	--	--	--	--	--	--	--	--	--	--
Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit	--	--	--	--	--	--	--	--	--	--
Continued enforcement of building code ordinance requirements	TEBI	TFBI	TGBI	THBI	TJBI	TKBI	TPBI	TTBI	TWBI	TWBBI

NOTE: Agency abbreviations in the table are as follows:

ETB	Erin Town Board	MHPO	Mobile Home Park Owner	TGBI	Town of Germantown Building Inspector	TKPC	Town of Kewaskum Plan Commission	TWBBI	Town of West Bend Building Inspector
FTB	Farmington Town Board	PTB	Polk Town Board	THBI	Town of Hartford Building Inspector	TPBI	Town of Polk Building Inspector	TWBI	Town of Wayne Building Inspector
GTB	Germantown Town Board	TEBI	Town of Erin Building Inspector	THPC	Town of Hartford Planning Commission	TPPC	Town of Polk Plan Commission	TWBPC	Town of West Bend Plan Commission
HTB	Hartford Town Board	TEPC	Town of Erin Plan Commission	TJBI	Town of Jackson Building Inspector	TTB	Trenton Town Board	TWPC	Town of Wayne Plan Commission
JTB	Jackson Town Board	TFBI	Town of Farmington Building Inspector	TJPPC	Town of Jackson Park and Planning Commission	TTBI	Town of Trenton Building Inspector	WTB	Wayne Town Board
KTB	Kewaskum Town Board	TFPC	Town of Farmington Plan Commission	TKBI	Town of Kewaskum Building Inspector	TTPC	Town of Trenton Plan Commission	WBTB	West Bend Town Board



Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Extreme Temperature Events Increase outreach to vulnerable populations regarding the availability of shelters during extreme heat and cold events	WCEM, OWHD	--	--	--	--	--	--	--	--	--	--
Designate sites to be used as public cooling/heating shelters during extreme temperature events	WCEM, OWHD	--	--	--	--	--	--	--	--	--	--
At owner's request, conduct inventories and inspections of shelter facilities	WCEM	--	--	--	--	--	--	--	--	--	--
Encourage shelter site owners to extend hours during extreme temperature events	WCEM	--	--	--	--	--	--	--	--	--	--
Promote transportation options to assist members of highly vulnerable populations to reach shelter sites during extreme temperature events	WCEM, WDOT	--	--	--	--	--	--	--	--	--	--
Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	WCEM	HCC	WBCC	GVB	JVB	KVB	NVB	RVB	SVB	ATB	--
Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves	WCEM, WDHS, RW	--	--	--	--	--	--	--	--	--	--
Promote educational and informational programming	WCEM, OWHD, RW	--	--	--	--	--	--	--	--	--	--

NOTE: Agency abbreviations in the table are as follows:

ATB	Addison Town Board	JVB	Jackson Village Board	NVB	Newburg Village Board	SVB	Slinger Village Board	WDHS	Wisconsin Department of Health Services
GVB	Germantown Village Board	KVB	Kewaskum Village Board	RVB	Richfield Village Board	WBCC	West Bend City Council	WDOT	Wisconsin Department of Transportation
HCC	Hartford City Council	OWHD	Ozaukee-Washington County Health Department	RW	Ready Wisconsin	WCEM	Washington County Office of Emergency Management		

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
Extreme Temperature Events Increase outreach to vulnerable populations regarding the availability of shelters during extreme heat and cold events	--	--	--	--	--	--	--	--	--	--
Designate sites to be used as public cooling/heating shelters during extreme temperature events	--	--	--	--	--	--	--	--	--	--
At owner's request, conduct inventories and inspections of shelter facilities	--	--	--	--	--	--	--	--	--	--
Encourage shelter site owners to extend hours during extreme temperature events	--	--	--	--	--	--	--	--	--	--
Promote transportation options to assist members of highly vulnerable populations to reach shelter sites during extreme temperature events	--	--	--	--	--	--	--	--	--	--
Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	--	--	--	--	--	--	--	--	--	--
Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves	--	--	--	--	--	--	--	--	--	--
Promote educational and informational programming	--	--	--	--	--	--	--	--	--	--

NOTE: Agency abbreviations in the table are as follows:

Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Winter Storm Events Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	WCEM	HCC	WBCC	GVB	JVB	KVB	NVB	RVB	SVB	ATB	--
Promote educational and informational programming	WCEM, RW	--	--	--	--	--	--	--	--	--	--
Promote inclusion of safety strategies for severe weather events into driver education classes and materials	WCEM, WDOT	--	--	--	--	--	--	--	--	--	--
Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit	WCEM, OWHD, RW	--	--	--	--	--	--	--	--	--	--
Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves	WCEM, WDHS, RW	--	--	--	--	--	--	--	--	--	--
Promote the installation of backup power systems at homes and businesses	WCEM	--	--	--	--	--	--	--	--	--	--
Work with utilities to assess and improve electrical service reliability	WCEM, WE	HEU	--	--	--	--	--	--	SEU	--	--

NOTE: Agency abbreviations in the table are as follows:

ATB	Addison Town Board	JVB	Jackson Village Board	RVB	Richfield Village Board	SVB	Slinger Village Board	WDHS	Wisconsin Department of Health Services
GVB	Germantown Village Board	KVB	Kewaskum Village Board	RW	Ready Wisconsin	WBCC	West Bend City Council	WDOT	Wisconsin Department of Transportation
HCC	Hartford City Council	NVB	Newburg Village Board	SEU	Slinger Electric Utility	WCEM	Washington County Office of Emergency Management	WE	We Energies
HEU	Hartford Electric Utility	OWHD	Ozaukee-Washington County Health Department						

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
<p><u>Winter Storm Events</u>                      Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio</p>	--	--	--	--	--	--	--	--	--	--
Promote educational and informational programming	--	--	--	--	--	--	--	--	--	--
Promote inclusion of safety strategies for severe weather events into driver education classes and materials	--	--	--	--	--	--	--	--	--	--
Encourage residents to develop a Family Emergency Preparedness Plan including preparation of a Disaster Supply Kit	--	--	--	--	--	--	--	--	--	--
Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves	--	--	--	--	--	--	--	--	--	--
Promote the installation of backup power systems at homes and businesses	--	--	--	--	--	--	--	--	--	--
Work with utilities to assess and improve electrical service reliability	--	--	--	--	--	--	--	--	--	--

NOTE: Agency abbreviations in the table are as follows:

Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Drought Events Encourage the development and maintenance of drought emergency plans for local utilities and communities	--	CHMU	CWBWU	VGWU	VJWU	VKWU	VNPC	VRPZ	VSWU	ASD, TAZP	TBPC
Develop local water conservation programs	--	CHMU	CWBWU	VGWU	VJWU	VKWU	--	--	VSWU	ASD	--
Protect very high and high recharge potential groundwater recharge areas from inappropriate development	WCPD	CHPZ	CWBDD	VGCD	VJPC	VKPC	VNPC	VRPZ	VSPZ	TAZP	TBPC
Where opportunities exist, develop interconnections among adjacent water utilities	--	CHMU	--	VGWU	--	--	--	--	VSWU	--	--
Encourage farm operators to evaluate the economics of crop insurance programs	WCLC, UWEX	--	--	--	--	--	--	--	--	--	--

NOTE: Agency abbreviations in the table are as follows:

- ASD Allenton Sanitary District
- CHPZ City of Hartford Planning, Zoning, & Building Inspection
- CHMU City of Hartford Water Utility
- CWBDD City of West Bend Department of Development
- CWBWU City of West Bend Water Utility
- CGCD Town of Addison Zoning and Planning
- VJPC Town of Barton Plan Commission
- VJWU University of Wisconsin-Extension
- VGCD Village of Germantown Community Development Department
- VJPC Village of Jackson Plan Commission
- VJWU Village of Jackson Water Utility
- VGCD Village of Germantown Water Utility
- VGWU Village of Kewaskum Plan Commission
- VGWU Village of Richfield Planning and Zoning
- VKPC Village of Kewaskum Water Utility
- VNPC Village of Newburg Plan Commission
- VNPC Village of Richfield Planning and Zoning
- VKPC Village of Germantown Water Utility
- VKPC Village of Kewaskum Plan Commission
- VNPC Village of Newburg Plan Commission
- VNPC Village of Richfield Planning and Zoning
- VSWU Village of Slinger Water Utility
- VSPZ Village of Slinger Planning and Zoning
- WCLC Washington County Land and Water Conservation Division
- WCPD Washington County Planning and Parks Department

**Table 55 (continued)**

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
<u>Drought Events</u> Encourage the development and maintenance of drought emergency plans for local utilities and communities	TEPC	TFPC	GTB	THPC	TJPPC	TKPC	TPPC	TTPC	TWPC	TWBPC
Develop local water conservation programs	--	--	--	--	--	--	--	--	--	--
Protect very high and high recharge potential groundwater recharge areas from inappropriate development	TEPC	TFPC	GTB	THPC	TJPPC	TKPC	TPPC	TTPC	TWPC	TWBPC
Where opportunities exist, develop interconnections among adjacent water utilities	--	--	--	--	--	--	--	--	--	--
Encourage farm operators to evaluate the economics of crop insurance programs	--	--	--	--	--	--	--	--	--	--

NOTE: Agency abbreviations in the table are as follows:

GTB    Germantown Town Board    TFPC    Town of Farmington Plan Commission    TJPPC    Town of Jackson Park and Planning Commission    TKPC    Town of Kewaskum Plan Commission    TTPC    Town of Trenton Plan Commission    TWPC    Town of Wayne Plan Commission    TWBPC    Town of West Bend Plan Commission

Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Transportation Accident-Related Events As existing surface arterial street system is resurfaced and reconstructed and as new arterial roads are constructed, consider adding bicycle accommodations	WDOT, WCHD	CHPW	CWBWPW	VGPD	VJPW	VKPW	VNPW	VRHD	VSPW	TAHD	TBPC
Promote driver safety hazard awareness, especially to drivers within the 16 to 24 age group	WCEM, WDOT	--	--	--	--	--	--	--	--	--	--
Continue to promote traffic-related law enforcement	WCSD, WSP	CHPD	CWBPD	VGPD	VJPD	VKPD	VNPD	--	VSPD	--	--
Continue public education efforts regarding the dangers of distracted driving	WCEM, WDOT	--	--	--	--	--	--	--	--	--	--
Promote inclusion of safety strategies for severe weather events in drivers education classes and materials	WCEM, WDOT	--	--	--	--	--	--	--	--	--	--
Promote the use of safety restraints and personal safety equipment	WCEM, OWHD, WDOT	--	--	--	--	--	--	--	--	--	--
Continue emergency operation training, planning, and preparedness for mass-casualty incidents involving railroad transportation	WCEM, WCSD	CHPD, CHFR	CWBFD, CWBPD	VGFD, VGPD	JFD, VJPD	VKFD, VKPD	NBFD, VNPD	RVFC	VSFD, VSPD	AVFD, SLFC	KFD

NOTE: Agency abbreviations in the table are as follows:

AVFD	Allenton Volunteer Fire Department	JFD	Jackson Fire Department	VGFD	Village of Germantown Fire Department	VKPW	Village of Kewaskum Public Works Department	VSPW	Village of Slinger Public Works Department
CHPD	City of Hartford Police Department	KFD	Kohlsville Fire Department	VGPD	Village of Germantown Police Department	VNFD	Village of Newburg Fire Department	WCEM	Washington County Office of Emergency Management Department
CHFR	City of Hartford Fire and Rescue Department	OWHD	Ozaukee-Washington County Health Department	VGPD	Village of Germantown Public Works Department	VNPD	Village of Newburg Police Department	WCHD	Washington County Highway Department
CHPW	City of Hartford Public Works Department	RVFC	Richfield Volunteer Fire Company	VJPD	Village of Jackson Police Department	VNPW	Village of Newburg Public Works Department	WCSD	Washington County Sheriff's Department
CWBFD	City of West Bend Fire Department	SLFC	St. Lawrence Fire Company	VJPW	Village of Jackson Public Works Department	VRHD	Village of Richfield Highway Department	WDOT	Wisconsin Department of Transportation
CWBPD	City of West Bend Police Department	TAHD	Town of Addison Highway Department	VKFD	Village of Kewaskum Fire Department	VSFD	Village of Slinger Fire Department	WSP	Wisconsin State Patrol
CWBWPW	City of West Bend Public Works Department	TBPC	Town of Barton Plan Commission	VKPD	Village of Kewaskum Police Department	VSPD	Village of Slinger Police Department		

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
Transportation Accident-Related Events As existing surface arterial street system is resurfaced and reconstructed and as new arterial roads are constructed, consider adding bicycle accommodations	TEPC	TFPC	GTB	THPW	TJPPC	TKPC	TPHD	TTPW	TWPC	TWBPW
Promote driver safety hazard awareness, especially to drivers within the 16 to 24 age group	--	--	--	--	--	--	--	--	--	--
Continue to promote traffic-related law enforcement	--	--	--	THPD	--	--	--	TTPD	--	--
Continue public education efforts regarding the dangers of distracted driving	--	--	--	--	--	--	--	--	--	--
Promote inclusion of safety strategies for severe weather events in drivers education classes and materials	--	--	--	--	--	--	--	--	--	--
Promote the use of safety restraints and personal safety equipment	--	--	--	--	--	--	--	--	--	--
Continue emergency operation training, planning, and preparedness for mass-casualty incidents involving railroad transportation	APFD, CHFR, RVFC	BFD, FFD	RVFC	CHFR, THPD	JFD	VKFD	JFD, RVFC, VSFD	VNFD, TTPD	AVFD, KFD	AVFD, CWBFD, VSFD

NOTE: Agency abbreviations in the table are as follows:

APFD	Ashippun Volunteer Fire Department	FFD	Fillmore Fire Department	TEPC	Town of Erin Planning Commission	TKPC	Town of Kewaskum Plan Commission	TWBPW	Town of West Bend Public Works Department
AVFD	Allenton Volunteer Fire Department	GTB	Germantown Town Board	TFPC	Town of Farmington Plan Commission	TPHD	Town of Polk Highway Department	VKFD	Village of Kewaskum Fire Department
BFD	Boltonville Fire Department	JFD	Jackson Fire Department	THPD	Town of Hartford Police Department	TTPD	Town of Trenton Police Department	VNFD	Village of Newburg Fire Department
CHFR	Hartford Fire and Rescue	KFD	Kohlsville Fire Department	THPW	Town of Hartford Public Works Department	TTPC	Town of Trenton Public Works Department	VSFD	Village of Slinger Fire Department
CWBFD	City of West Bend Fire Department	RVFC	Richfield Volunteer Fire Company	TJPPC	Town of Jackson Park and Planning Commission	TWPC	Town of Wayne Plan Commission		



Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Contamination of Loss of Water Supply	WCEM	CHWU	CWBWU	VGWU	VJWU	VKWU	VNPC	VRPZ	VSWU	ASD, TAZP	TBPC
Promote development of a thorough drinking water supply risk and threat assessment	--	CHWU	CWBWU	VGWU	VJWU	VKWU	--	--	VSWU	ASD	--
Prepare emergency operation plans for each public water supply system	WCEM	CHWU	CWBWU	VGWU	VJWU	VKWU	VNPC	VRPZ	VSWU	ASD, TAZP	TBPC
Encourage local communities to develop emergency drinking water supply plans	--	CHWU	CWBWU	VGWU	VJWU	VKWU	--	--	VSWU	ASD	--
Encourage local utilities to identify priority water customers and develop plans for restoring their service first.	WCEM, OWHD	CHWU	CWBWU	VGWU	VJWU	VKWU	VNPC	VRPZ	VSWU	ASD, TAZP	TBPC
Identify potential distribution points for emergency water supply	--	CHWU	CWBWU	VGWU	VJWU	VKWU	--	--	VSWU	ASD	--
Evaluate the condition of water utility electrical equipment to accept generators. Repair or upgrade as necessary	--	CHWU	--	VGWU	--	--	--	--	VSWU	--	--
Where opportunities exist develop interconnections among adjacent water utilities	--	CHWU	CWBWU	VGWU	VJWU	VKWU	--	--	VSWU	ASD	--
Continue educational and outreach programs related to backflow prevention	--	CHWU	CWBWU	VGWU	VJWU	VKWU	--	--	VSWU	ASD	--

NOTE: Agency abbreviations in the table are as follows:

- ASD Allenton Sanitary District
- OWHD Ozaukee-Washington County Health Department
- CHWU City of Hartford Water Utility
- TAZP Town of Addison Zoning and Planning
- CWBWU City of West Bend Water Utility
- TBPC Town of Barton Plan Commission
- VGWU Village of Germantown Water Utility
- VJWU Village of Jackson Water Utility
- VNPC Village of Newburg Plan Commission
- VKWU Village of Kewaskum Water Utility
- VRPZ Village of Richfield Planning and Zoning
- VSWU Village of Slinger Water Utility
- WCEM Washington County Office of Emergency Management

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
Contamination of Loss of Water Supply	TEPC	TFPC	GTB	THPC	TJPPC	TKPC	TPPC	TTPC	TWPC	TWBPC
Promote development of a thorough drinking water supply risk and threat assessment	--	--	--	--	--	--	--	--	--	--
Prepare emergency operation plans for each public water supply system	TEPC	TFPC	GTB	THPC	TJPPC	TKPC	TPPC	TTPC	TWPC	TWBPC
Encourage local communities to develop emergency drinking water supply plans	--	--	--	--	--	--	--	--	--	--
Encourage local utilities to identify priority water customers and develop plans for restoring their service first	TEPC	TFPC	GTB	THPC	TJPPC	TKPC	TPPC	TTPC	TWPC	TWBPC
Identify potential distribution points for emergency water supply	--	--	--	--	--	--	--	--	--	--
Evaluate the condition of water utility electrical equipment to accept generators. Repair or upgrade as necessary	--	--	--	--	--	--	--	--	--	--
Where opportunities exist develop interconnections among adjacent water utilities	--	--	--	--	--	--	--	--	--	--
Continue educational and outreach programs related to backflow prevention	--	--	--	--	--	--	--	--	--	--

NOTE: Agency abbreviations in the table are as follows:

TEPC    Town of Erin Plan Commission    GTB    Germantown Town Board    TJPPC    Town of Jackson Park and Planning Commission    TPPC    Town of Polk Plan Commission    TWPC    Town of Wayne Plan Commission  
TFPC    Town of Farmington Plan Commission    THPC    Town of Hartford Planning Commission    TKPC    Town of Kewaskum Plan Commission    TTPC    Town of Trenton Plan Commission    TWBPC    Town of West Bend Plan Commission

**Table 55 (continued)**

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Loss of Sewerage System Promote development of a thorough sewerage system risk and threat assessment	--	CHSU	CWBSU	VGFW, MMSD	VJPW	VKWW	VNPW	--	VSSU	ASD	WLSU
Prepare emergency operation plans for each sanitary sewerage system	--	CHSU	CWBSU	VGFW, MMSD	VJPW	VKWW	VNPW	--	VSSU	ASD	WLSU
Initiate facility planning for sanitary sewerage systems when average daily flow to the wastewater treatment plant reaches 80 percent of the plant's design capacity	--	CHSU	CWBSU	VGFW, MMSD	VJPW	VKWW	VNPW	--	VSSU	ASD	--
Provide backup power for wastewater treatment plants, pumping stations, and other vital system components	--	CHSU	CWBSU	VGFW, MMSD	VJPW	VKWW	VNPW	--	VSSU	ASD	WLSU

NOTE: Agency abbreviations in the table are as follows:

- ASD Allenton Sanitary District
- CHSU City of Hartford Sewer Utility
- CWBSU City of West Bend Sewer Utility
- MMSD Milwaukee Metropolitan Sewerage District
- VGFW Village of Germantown Public Works Department
- VJPW Village of Jackson Public Works Department
- VKWW Village of Kewaskum Wastewater Utility
- VNPW Village of Newburg Public Works Department
- VSSU Village of Slinger Sewer Utility
- WLSU Wallace Lake Sanitary District

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
Loss of Sewerage System Promote development of a thorough sewerage system risk and threat assessment	--	--	--	HSD, PLUD, TRSD	--	--	--	WLSD	--	SLSD
Prepare emergency operation plans for each sanitary sewerage system	--	--	--	HSD, PLUD, TRSD	--	--	--	WLSD	--	SLSD
Initiate facility planning for sanitary sewerage systems when average daily flow to the wastewater treatment plant reaches 80 percent of the plant's design capacity	--	--	--	--	--	--	--	--	--	--
Provide backup power for wastewater treatment plants, pumping stations, and other vital system components	--	--	--	HSD, PLUD, TRSD	--	--	--	WLSD	--	SLSD

NOTE: Agency abbreviations in the table are as follows:

HSD Hilldale Sanitary District      PLUD Pike Lake Utility District      SLSL Silver Lake Sanitary District      TRSD Town of Rubicon Sanitary District      WLSD Wallace Lake Sanitary District

Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Hazardous Material Events Continue participation in the Wisconsin Hazardous Materials Response System	--	CHFR	CWBFD	--	JFD	--	--	RVFC	VSFD	--	Town of Barton
Develop local community response plans for hazardous material releases	LEPC, WCEM	CHFR	CWBFD	VGFD	JFD	VKFD	VNFD	RVFC	VSFD	AVFD	KFD
Promote development of site emergency plans for schools, factories, office buildings, shopping malls, and other sites that produce, store, or utilize hazardous materials or that are near facilities or transportation routes where such materials are produced, used, stored, or transported	LEPC, WCEM	--	--	--	--	--	--	--	--	--	--
Promote proper design, construction, maintenance, and inspections of hazardous material storage facilities, pipelines, and other related facilities	WCEM	--	--	--	--	--	--	--	--	--	--
Promote continued maintenance and upgrading of transportation infrastructure carrying shipments of hazardous cargo	WDOT, WCHD	CHIPW	CWBWPW	VGPD	VJPW	VKPW	VNPW	VRHD	VSPW	TAHD	TBPC
Educate businesses and those utilizing hazardous materials of their responsibilities	WCEM, RW	--	--	--	--	--	--	--	--	--	--
Continue to promote training, planning, and preparedness for mass-casualty incidents involving fixed facilities and transportation systems	WCEM, WCSD	CHPD, CHFR	CWBFD, CWBPD	VGFD, VGPD	JFD, VJPD	VKFD, VKPD	VNFD, VNPD	RVFC	VSFD, VSPD	AVFD, SLFC	KFD

NOTE: Agency abbreviations in the table are as follows:

AVFD	Allenton Volunteer Fire Department	JFD	Jackson Fire Department	VGPD	Village of Germantown Police Department	VNFD	Village of Newburg Fire Department	VSPD	Village of Slinger Police Department
CHFR	City of Hartford Fire and Rescue	KFD	Kohlsville Fire Department	VGPD	Village of Germantown Public Works Department	VNPD	Village of Newburg Police Department	VSPW	Village of Slinger Public Works Department
CHPD	City of Hartford Police Department	LEPC	Washington County Local Emergency Planning Committee	VJPD	Village of Jackson Police Department	TAHD	Town of Addison Highway Department	WCEM	Washington County Office of Emergency Management
CHPW	City of Hartford Public Works Department	RVFC	Richfield Volunteer Fire Company	VJPW	Village of Jackson Public Works Department	TBPC	Town of Barton Plan Commission	WCHD	Washington County Highway Department
CWBFD	City of West Bend Fire Department	RW	Ready Wisconsin	VKFD	Village of Kewaskum Fire Department	VNPW	Village of Newburg Public Works Department	WCSD	Washington County Sheriffs Department
CWBPD	City of West Bend Police Department	SLFC	St. Lawrence Fire Company	VKPD	Village of Kewaskum Police Department	VRHD	Village of Richfield Highway Department	WDOT	Wisconsin Department of Transportation
CWBWPW	City of West Bend Public Works Department	VGFD	Village of Germantown Fire Department	VKPW	Village of Kewaskum Public Works Department	VSFD	Village of Slinger Fire Department		

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
<b>Hazardous Material Events</b> Continue participation in the Wisconsin Hazardous Materials Response System	--	BFD	--	--	--	--	--	--	--	--
Develop local community response plans for hazardous material releases	APFD, CHFR, RVFC	BFD, FFD	RVFC	CHFR	JFD	VKFD	JFD, RVFC, VSFD	VNFD	AVFD, KFD	AVFD, CWBFD, VSFD
Promote development of site emergency plans for schools, factories, office buildings, shopping malls, and other sites that produce, store, or utilize hazardous materials or that are near facilities or transportation routes where such materials are produced, used, stored, or transported	--	--	--	--	--	--	--	--	--	--
Promote proper design, construction, maintenance, and inspections of hazardous material storage facilities, pipelines, and other related facilities	--	--	--	--	--	--	--	--	--	--
Promote continued maintenance and upgrading of transportation infrastructure carrying shipments of hazardous cargo	TEPC	TFPC	GTB	THPW	TJPPC	TKPC	TPHD	TTPW	TWPC	TWBPW
Educate businesses and those utilizing hazardous materials of their responsibilities	--	--	--	--	--	--	--	--	--	--
Continue to promote training, planning, and preparedness for mass-casualty incidents involving fixed facilities and transportation systems	APFD, CHFR, RVFC	BFD, FFD	RVFC	CHFR, THPD	JFD	VKFD	JFD, RVFC, VSFD	VNFD, TTPD	AVFD, KFD	AVFD, CWBFD, VSFD

NOTE: Agency abbreviations in the table are as follows:

- APFD Ashippun Volunteer Fire Department
- FFD Fillmore Fire Department
- AVFD Allenton Volunteer Fire Department
- GTB Germantown Town Board
- BFD Boltonville Fire Department
- JFD Jackson Fire Department
- CHFR Hartford Fire and Rescue
- KFD Kohlsville Fire Department
- CWBFD City of West Bend Fire Department
- RVFC Richfield Volunteer Fire Company
- TEPC Town of Erin Plan Commission
- TFPC Town of Farmington Plan Commission
- THPD Town of Hartford Police Department
- THPW Town of Hartford Police Department
- TJPPC Town of Jackson Park and Planning Commission
- TKPC Town of Kewaskum Plan Commission
- TPHD Town of Polk Highway Department
- TTPD Town of Trenton Police Department
- TPW Town of Trenton Public Works Department
- TWPC Town of Wayne Plan Commission
- TWBPW Town of West Bend Public Works Department
- VNFD Village of Newburg Fire Department
- VKFD Village of Kewaskum Fire Department
- VSFD Village of Slinger Fire Department

Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
<b>Terrorism Incidents</b> Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	WCEM	HCC	WBCC	GVB	JVB	KVB	NVB	RVB	SVB	ATB	--
Promote the development of a thorough community risk and threat assessment	WCEM, WCPD	CHPZ	CWBEM	VGCD	VJPC	VKEM	VNPC	VRPZ	VSPZ	TAZP	TBPC
Promote and conduct preparedness activities including planning, training, and exercises for local law enforcement, fire and rescue, and other response personnel for a variety of terrorist attacks	WCEM, WCSD	CHPD, CHFR	CWBFD, CWBPD	VGFD, VGPD	JFD, VJPD	VKFD, VKPD	VNFD, VNPD	RVFC	VSFD, VSPD	AVFD, SLFC	KFD
Promote development of site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites	WCEM, WCPD	CHPZ	CWBEM	VGCD	VJPC	VKEM	VNPC	VRPZ	VSPZ	TAZP	TBPC
Promote increased security measures at water supply facilities	--	CHWU	CWBWU	VGWU	VJWU	VKWU	--	--	VSWU	ASD	--
Encourage development of emergency preparedness plans for critical government, utility and infrastructure systems	WCEM, WCHD	CHPW	CWBPW	VGPW	VJPW	VKPW	VNPW	VRHD	VSPW	TAHD	TBPC
Heighten security at public gatherings, special events, and critical community facilities, utilities, infrastructure, and industries	WCSD	CHPD	CWBPD	VGPD	VJPD	VKPD	VNPD	--	VSPD	--	--

NOTE: Agency abbreviations in the table are as follows:

ASD	Allenton Sanitary District	CWBW U	City of West Bend Water Utility	TAHD	Town of Addison Highway Department	VJWU	Village of Jackson Water Utility	VRPZ	Village of Richfield Planning and Zoning
ATB	Addison Town Board	GVB	Germantown Village Board	TAZP	Town of Addison Zoning and Planning	VKEM	Village of Kewaskum Emergency Government Director	VSFD	Village of Slinger Fire Department
AVFD	Allenton Volunteer Fire Department	HCC	Hartford City Council	TBPC	Town of Barton Plan Commission	VKFD	Village of Kewaskum Fire Department	VSPD	Village of Slinger Police Department
CHFR	Hartford Fire and Rescue	JVB	Jackson Village Board	VGCD	Village of Germantown Community Development Department	VKPC	Village of Kewaskum Plan Commission	VSPW	Village of Slinger Public Works Department
CHPD	City of Hartford Police Department	JFD	Jackson Fire Department	VGFD	Village of Germantown Fire Department	VKPD	Village of Kewaskum Police Department	VSPZ	Village of Slinger Planning and Zoning Department
CHPW	City of Hartford Public Works Department	KFD	Kohlsville Fire Department	VGPD	Village of Germantown Police Department	VKWU	Village of Kewaskum Water Utility	VSWU	Village of Slinger Water Utility
CHPZ	City of Hartford Planning, Zoning, & Building Inspection	KVB	Kewaskum Village Board	VGPW	Village of Germantown Public Works Department	VNFD	Village of Newburg Fire Department	WBCC	West Bend City Council
CHWU	City of Hartford Water Utility	NVB	Newburg Village Board	VGWU	Village of Germantown Water Utility	VNPC	Village of Newburg Plan Commission	WCEM	Washington County Office of Emergency Management
CWBEM	City of West Bend Division of Emergency Management	RVB	Richfield Village Board	VJPC	Village of Jackson Plan Commission	VNPD	Village of Newburg Police Department	WCHD	Washington County Highway Department
CWBFD	City of West Bend Fire Department	RVFC	Richfield Volunteer Fire Company	VJPD	Village of Jackson Police Department	VNPW	Village of Newburg Public Works Department	WCPD	Washington County Planning and Parks Department
CWBPD	City of West Bend Police Department	SLFC	St. Lawrence Fire Company	VJPW	Village of Jackson Public Works Department	VRHD	Village of Richfield Highway Department	WCSD	Washington County Sheriff's Department
CWBPW	City of West Bend Public Works Department	SVB	Slinger Village Board						

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
<b>Terrorism Incidents</b> Maintain, update, and upgrade public early warning systems. Consider expanding these systems, as necessary. Encourage the use of NOAA All Hazard Weather Radio	--	--	--	--	--	--	--	--	--	--
Promote the development of a thorough community risk and threat assessment	TEEM	TFPC	GTB	THPC	T,JPPC	TKPC	TPPC	TTPC	TWPC	TWBPC
Promote and conduct preparedness activities including planning, training, and exercises for local law enforcement, fire and rescue, and other response personnel for a variety of terrorist attacks	APFD, CHFR, RVFC	BFD, FFD	RVFC	CHFR, THPD	JFD	VKFD	JFD, RVFC, VSFD	VNFD, TTPD	AVFD, KFD	AVFD, CWBFD, VSFD
Promote development of site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites	TEEM	TFPC	GTB	THPC	T,JPPC	TKPC	TPPC	TTPC	TWPC	TWBPC
Promote increased security measures at water supply facilities	--	--	--	--	--	--	--	--	--	--
Encourage development of emergency preparedness plans for critical government, utility and infrastructure systems	TEPC	TFPC	GTB	THPW	T,JPPC	TKPC	TPHD	TTPW	TWPC	TWBPW
Heighten security at public gatherings, special events, and critical community facilities, utilities, infrastructure, and industries	--	--	--	THPD	--	--	--	TTPD	--	--

NOTE: Agency abbreviations in the table are as follows:

- APFD Ashippun Volunteer Fire Department
- AVFD Allenton Volunteer Fire Department
- BFD Boltonville Fire Department
- CHFR Hartford Fire and Rescue
- CWBFD City of West Bend Fire Department
- FFD Fillmore Fire Department
- GTB Germantown Town Board
- JFD Jackson Fire Department
- KFD Kohlsville Fire Department
- RVFC Richfield Volunteer Fire Company
- TEEM Town of Erin Emergency Management Director
- TEPC Town of Erin Plan Commission
- TFPC Town of Farmington Plan Commission
- THPC Town of Hartford Planning Commission
- THPD Town of Hartford Police Department
- THPW Town of Hartford Public Works Department
- TJPPC Town of Jackson Park and Planning Commission
- TKPC Town of Kewaskum Plan Commission
- TTPC Town of Trenton Police Department
- TTPD Town of Trenton Police Department
- TTPW Town of Trenton Public Works Department
- TWPC Town of West Bend Public Works Department
- TWBPW Town of West Bend Public Works Department
- VKFD Village of Kewaskum Fire Department
- VNFD Village of Newburg Fire Department
- VSFD Village of Slinger Fire Department



Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
Cyberattack on Local Government Purchase of cyber-insurance by local government	WCIS	CHTC	CWBIT	VGAD	JVA	KVA	NVB	RVA	SVA	ATB	BTB
Encourage local governments to provide education in basic cybersecurity to their employees	WCEM, RW	--	--	--	--	--	--	--	--	--	--
Consider installing dedicated communication lines for monitoring and/or controlling critical equipment or processes	WE	CHPW, CHSU, CHWU, HEU	CWBPW, CWBSU, CWBWU	VGPW, VGWU	VJPW, VJMU	VKPW, VKWU, VKWW	VNPW	--	VSPW, VSSU, VSWU, SEU	ASD	WLSL
Develop and implement a cybersecurity and data backup initiative	WCIS	CHTC	CWBIT	VGAD	JVA	KVA	NVB	RVA	SVA	ATB	BTB

NOTE: Agency abbreviations in the table are as follows:

ASD	Allenton Sanitary District	CWBIT	City of West Bend Information Technology Department	NVB	Newburg Village Board	VGWU	Village of Germantown Water Utility	VSPW	Village of Slinger Public Works Department
ATB	Addison Town Board	CWBPW	City of West Bend Public Works Department	RVA	Richfield Village Administrator	VJPW	Village of Jackson Public Works Department	VSSU	Village of Slinger Sewer Utility
BTB	Barton Town Board	CWBSU	City of West Bend Sewer Utility	RW	Ready Wisconsin	VJWU	Village of Jackson Water Utility	VSWU	Village of Slinger Water Utility
CHTC	City of Hartford Technology Coordinator	CWBIT	City of West Bend Water Utility	SEU	Slinger Electric Utility	VKPW	Village of Kewaskum Public Works Department	WCIS	Washington County Information Services Division
CHPW	City of Hartford Public Works Department	HEU	Hartford Electric Utility	SVA	Slinger Village Administrator	VKWU	Village of Kewaskum Water Utility	WE	We Energies
CHSU	City of Hartford Sewer Utility	JVA	Jackson Village Administrator	VGAD	Village of Germantown Administration Department	VKWW	Village of Kewaskum Wastewater Utility	WLSL	Wallace Lake Sanitary District
CHWU	City of Hartford Water Utility	KVA	Kewaskum Village Administrator	VGFW	Village of Germantown Public Works Department	VNPW	Village of Newburg Public Works Department		

**Table 55 (continued)**

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
Cyberattack on Local Government Purchase of cyber-insurance by local government	ETB	FTB	GTB	HTB	JTB	KTB	PTB	TTB	WTB	WBTB
Encourage local governments to provide education in basic cybersecurity to their employees	--	--	--	--	--	--	--	--	--	--
Consider installing dedicated communication lines for monitoring and/or controlling critical equipment or processes	--	--	--	HSD, PLUD, TRSD	--	--	--	WLSD	--	SLSD
Develop and implement a cybersecurity and data backup initiative	ETB	FTB	GTB	HTB	JTB	KTB	PTB	TTB	WTB	WBTB

NOTE: Agency abbreviations in the table are as follows:

- ETB Erin Town Board
- FTB Farmington Town Board
- GTB Germantown Town Board
- HSD Hilldale Sanitary District
- HTB Hartford Town Board
- JTB Jackson Town Board
- KTB Kewaskum Town Board
- PLUD Pike Lake Utility District
- P/B Polk Town Board
- PTB Polk Sanitary District
- PTB Town of Rubicon Sanitary District
- PTB Trenton Town Board
- SLSD Silver Lake Sanitary District
- TRSD Town of Rubicon Sanitary District
- TTB Trenton Town Board
- TTB Wallace Lake Sanitary District
- WTB Wayne Town Board
- WBTB West Bend Town Board
- WLSD Wallace Lake Sanitary District

Table 55 (continued)

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
<b>Power Outages</b> Continue to review and implement programs to improve reliability of power supply facilities	WE	HEU	--	--	--	--	--	--	SEU	--	--
Encourage installation of backup power generators at critical facilities	WCCEM	--	--	--	--	--	--	--	--	--	--
Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves	WCCEM, WDHS	--	--	--	--	--	--	--	--	--	--
Conduct outreach to businesses and facilities to encourage them to develop plans for dealing with long-term power outages	WCCEM	--	--	--	--	--	--	--	--	--	--
Continue and refine public educational programming on safety during power outages and preparation for power outages	WCCEM, WE	HEU	--	--	--	--	--	--	SEU	--	--

NOTE: Agency abbreviations in the table are as follows:

HEU Hartford Electric Utility      Slinger Electric Utility      WCCEM Washington County Office of Emergency Management      WE Energies

SEU      WE Energies

WDHS      Wisconsin Department of Health Services

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
<b>Power Outages</b> Continue to review and implement programs to improve reliability of power supply facilities	--	--	--	--	--	--	--	--	--	--
Encourage installation of backup power generators at critical facilities	--	--	--	--	--	--	--	--	--	--
Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves	--	--	--	--	--	--	--	--	--	--
Conduct outreach to businesses and facilities to encourage them to develop plans for dealing with long-term power outages	--	--	--	--	--	--	--	--	--	--
Continue and refine public educational programming on safety during power outages and preparation for power outages	--	--	--	--	--	--	--	--	--	--

NOTE: Agency abbreviations in the table are as follows:

**Table 55 (continued)**

Mitigation Measures	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kewaskum	Village of Newburg	Village of Richfield	Village of Slinger	Town of Addison	Town of Barton
<b>Communicable Disease Outbreak</b> Continue maintenance of a community public health system with adequate numbers of medical staff and sufficient disease monitoring and surveillance capabilities to adequately protect the population from small- and large-scale outbreaks and epidemics	OWHD, HCP	--	--	--	--	--	--	--	--	--	--
Promote development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, and other appropriate sites	WCEM, OWHD	--	--	--	--	--	--	--	--	--	--
Develop and maintain plans for mass dispensing clinics for large-scale antibiotic or vaccine dispensing in the event of an infectious disease emergency	OWHD	--	--	--	--	--	--	--	--	--	--
Promote public awareness of the causes, symptoms, and protective actions for disease outbreaks	WDHS, RW, OWHD, HCP	--	--	--	--	--	--	--	--	--	--
Encourage residents to receive immunizations against communicable diseases, including annual and special strain influenza inoculations	OWHD, WDHS, HCP										

NOTE: Agency abbreviations in the table are as follows:

HCP Health Care Providers      OWHD Ozaukee-Washington County Health Department      RW Ready Wisconsin      WCEM Washington County Office of Emergency Management      WDHS Wisconsin Department of Health Services

Table 55 (continued)

Mitigation Measures	Town of Erin	Town of Farmington	Town of Germantown	Town of Hartford	Town of Jackson	Town of Kewaskum	Town of Polk	Town of Trenton	Town of Wayne	Town of West Bend
<p><b>Communicable Disease Outbreak</b>            Continue maintenance of a community public health system with adequate numbers of medical staff and sufficient disease monitoring and surveillance capabilities to adequately protect the population from small- and large-scale outbreaks and epidemics</p>	--	--	--	--	--	--	--	--	--	--
<p>Promote development of site emergency plans for schools, factories, office buildings, shopping malls, hospitals, and other appropriate sites</p>	--	--	--	--	--	--	--	--	--	--
<p>Develop and maintain plans for mass dispensing clinics for large-scale antibiotic or vaccine dispensing in the event of an infectious disease emergency</p>	--	--	--	--	--	--	--	--	--	--
<p>Promote public awareness of the causes, symptoms, and protective actions for disease outbreaks</p>	--	--	--	--	--	--	--	--	--	--
<p>Encourage residents to receive immunizations against communicable diseases, including annual and special strain influenza inoculations</p>	--	--	--	--	--	--	--	--	--	--

NOTE: Agency abbreviations in the table are as follows:

Source: SEWRPC.

## HAZARD MITIGATION FUNDING SOURCES

Financing of the construction, operation, and maintenance of hazard mitigation measures may be accomplished through a number of means, including: the establishment of a stormwater utility; tax incremental financing (TIF) districts; local property taxes; reserve funds; general obligation bonds; private-developer contributions, including fees applied to construction of regional stormwater management facilities in lieu of providing onsite facilities; State grants or loans; and certain Federal and State programs.

The identification of potential funding sources, including sources other than solely local-level sources, is an integral part of the implementation of a successful mitigation plan. The following description of funding sources includes those that appear to be applicable for the County and local units of government as of 2017. However, because funding programs and opportunities are constantly changing, the involved staff of County and local units of government will need to monitor the potential funding sources and programs. Some of the programs described in this chapter may not be available under all envisioned conditions in the County or to its residents and/or property owners for a variety of reasons, including, for example, eligibility requirements or lack of funds at a given time in Federal and/or State budgets. Nonetheless, the list of sources and programs set forth in this chapter should provide a starting point for identifying possible funding for implementing the hazard mitigation plan recommended in this report (see also Appendices I and J).

### **Federal Emergency Management Agency Programs**

The Federal Emergency Management Agency (FEMA) funds several programs that in the State of Wisconsin are administered through WEM. These programs include the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, the Pre-Disaster Mitigation Program, and the Public Assistance Program. These programs are described below.<sup>1</sup> Examples of types of projects that can be eligible for funding under the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the Pre-Disaster Mitigation Program are given in Table 56.

#### ***Hazard Mitigation Grant Program***

The Hazard Mitigation Grant Program (HMGP) can provide up to 75 percent of the costs attendant to certain natural hazard mitigation programs. In the case of flood mitigation, projects can include the floodproofing or acquisition and relocation of floodprone properties, the elevation of structures in compliance with National Flood Insurance Program (NFIP) standards, and other flood control measures, including structural projects, where identified as cost-effective. To be eligible for mitigation activities with FEMA funding, structures must be insured under the NFIP. Under the HMGP, the balance of the costs is shared by the State of Wisconsin (12.5 percent) and the grantee (12.5 percent). Communities in Wisconsin can apply through the State for HMGP funds only after a Presidential disaster declaration is issued. HMGP funds must be applied for within 60 days of the declaration. The State, as HMGP grantee, is responsible for identifying and prioritizing projects. Eligible projects must be included as part of the grantee's all-hazard mitigation plan and must meet cost-benefit criteria established by FEMA. Although State and local units of government are eligible applicants, HMGP funds can be used on private property for eligible projects. The HMGP gives priority to properties identified by FEMA as repetitive-loss properties.

#### ***Flood Mitigation Assistance Program***

The Flood Mitigation Assistance (FMA) program can provide up to 75 percent of the costs attendant to the acquisition, relocation, elevation, and floodproofing of structures in compliance with NFIP standards. Properties included in a project subapplication for FMA funding must be NFIP-insured at the time of the application submittal and prior to the period of availability or application start date. Flood insurance must be maintained through completion of

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<sup>1</sup> *Additional information on eligibility requirements and eligible projects under the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the Pre-Disaster Mitigation Program can be found in Federal Emergency Management Agency, Hazard Mitigation Assistance Guidance: Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, and Flood Mitigation Assistance Program, February 27, 2015.*

Table 56

**ELIGIBLE ACTIVITIES UNDER FEDERAL HAZARD MITIGATION GRANT PROGRAMS**

Eligible Activity	Hazard Mitigation Grant Program	Flood Mitigation Assistance Program	Pre-Disaster Mitigation Programs
Mitigation Projects	Y	Y	Y
Property Acquisition and Structure Demolition	Y	Y	Y
Property Acquisition and Structure Relocation	Y	Y	Y
Structure Elevation	Y	Y	Y
Mitigation Reconstruction	Y	Y	Y
Dry Floodproofing of Historic Residential Structures	Y	Y	Y
Dry Floodproofing of Non-residential Structures	Y	Y	Y
Generators	Y	--	Y
Localized Flood Risk Reduction Projects	Y	Y	Y
Non-localized Flood Risk Reduction Projects	Y	--	Y
Structural Retrofitting of Existing Buildings and Facilities	Y	Y	Y
Non-structural Retrofitting of Existing Buildings and Facilities	Y	Y	Y
Safe Room Construction	Y	--	Y
Wind Retrofit for One- and Two Family Residences	Y	--	Y
Infrastructure Retrofit	Y	Y	Y
Soil Stabilization	Y	Y	Y
Wildfire Mitigation	Y	--	Y
Post-Disaster Code Enforcement	Y	--	--
Advance Assistance	Y	--	--
5 Percent Initiative Projects	Y	--	--
Miscellaneous/Other <sup>a</sup>	Y	Y	Y
Hazard Mitigation Planning	Y	Y	Y
Planning Related Activities	Y	--	--
Technical Assistance	--	Y	--
Management Cost	Y	Y	Y

<sup>a</sup>Miscellaneous/Other indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects may be approved provided funding is available.

Source: Federal Emergency Management Agency.

the mitigation activity and for the life of the structure. In addition to participating in the NFIP, eligible program applicants must meet cost-benefit criteria established by FEMA. Mitigation of repetitive-loss properties is given a high priority under this program. Increased cost of compliance (ICC) coverage under the NFIP may provide a funding source for bringing noncompliant structures into compliance after a flood loss.

***Pre-Disaster Mitigation Program***

FEMA's Pre-Disaster Mitigation Program (PDM) can potentially provide up to 75 percent of the costs attendant to pre-disaster mitigation planning and the implementation of cost-effective mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing



reliance on funding from actual disaster declarations. Examples of eligible projects include property acquisition, structure acquisition and demolition or relocation, structure elevation, safe room construction, dry floodproofing of nonresidential structures and historic residential structures, and minor localized flood reduction projects.

### ***Public Assistance Program***

FEMA's Public Assistance Program (PA) can provide some limited assistance with respect to structure elevation and relocation. For example, if entire portions of a community were to be relocated outside of a floodplain, this program can assist in rebuilding the necessary infrastructure in the new location. Funding under this program is provided for repair of infrastructure damaged during a flood that results in a Presidential disaster declaration. In making repairs to the infrastructure, cost-effective mitigation activities may be included. If a community determines that a badly damaged facility is not to be repaired, the estimated damage amount may be used to fund an alternate project. Funding provided under the PA may pay for cost-effective hazard mitigation measures for facilities damaged by the incident. In addition, funding from the PA may be combined with funding from the HMGP, FMA, and/or PDM programs to implement mitigation measures on the same facility; however, they cannot be combined to pay for the same work.

### **U.S. Department of Housing and Urban Development Community Development Block Grant Program**

Community Development Block Grant (CDBG) programs, funded by the U.S. Department of Housing and Urban Development, are administered by the Wisconsin Department of Administration.

The Community Development Block Grant Emergency Assistance Program is a special program that the Wisconsin Department of Administration, Division of Energy, Housing and Community Resources activates to assist local units of government that have recently experienced a natural or man-made disaster. The program provides funds to address housing needs that occur as a direct result of natural or man-made disasters, with preference given to those households with incomes at or below 80 percent of the county median household income. A local unit of government that has recently experienced a natural or man-made disaster may apply for assistance in addressing the housing problems caused by the disaster. Generally, cities, towns, counties, and villages with populations less than 50,000 and all counties, except Milwaukee, Waukesha, and Dane, are eligible to apply. The program also makes funds available for the repair of public infrastructure affected by natural disaster. Eligible activities dependent upon the nature of the disaster may include: repair of damage to the dwelling unit; acquisition and demolition of dwellings unable to be repaired; costs for new housing units to replace those lost in the disaster; and repairs to publically owned utility systems, streets, and sidewalks.

The Community Development Block Grant for Public Facilities Program is a versatile financing tool for general-purpose local units of government in need of funds to undertake needed infrastructure and public building projects. This program is designed to enhance the vitality of a community by undertaking public investment that contributes to its overall community and economic development. Eligible applicants are local units of government that are not HUD entitlement communities.<sup>2</sup> Projects must meet one of three national objectives for the program. These are: 1) the project principally benefits low and moderate income persons; 2) the project eliminates slum and blight; and 3) the proposed activity meets an urgent local need, typically a catastrophic event. Eligible activities include utilities and streets, fire stations and emergency vehicles, community/senior centers and shelters, and municipal telecommunications. Grant funds are available on a continual basis. The maximum grant for any single applicant is \$500,000, and applicants can receive only one grant per 12-month period.

### **U.S. Small Business Administration Programs**

The U.S. Small Business Administration (SBA) provides disaster loans to homeowners and businesses to repair or replace property damaged in a declared disaster. SBA loans are granted only for uninsured losses. Loans may be

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<sup>2</sup> HUD entitlement communities include principal cities of Metropolitan Statistical Areas, other metropolitan cities with populations of at least 50,000, and urban counties with populations of at least 200,000 (excluding the population of entitlement cities). There are no entitlement communities in Washington County.

used to meet required building codes, such as the NFIP requirements. SBA may also provide loans for relocation out of special flood hazard areas when such locations are required by local officials. While SBA's enabling legislation generally prohibits the agency from making disaster loans for voluntary relocations, there are exceptions that can be made, including relocations of homeowners, renters, and business owners out of special flood hazard areas when the community is participating in a buyout program. These loans would be limited to the amount necessary to repair or replace the damage at the disaster site. SBA loans may also be used to refinance existing mortgages. Up to 20 percent of the disaster loan can be used for mitigation measures.

### **U.S. Army Corps of Engineers**

The Army Corps of Engineers programs are potential sources of funding for implementing the floodland management recommendations of this plan. In order to be eligible for funding, the plan components must meet specific Corps economic feasibility and other criteria. The programs that may be applicable include the following:

- Section 22—Water resources planning assistance (50 percent Federal, 50 percent local cost share).
- Section 103—Hurricane and Storm Damage Reduction Program. Maximum \$5.0 million per project (65 percent Federal, 35 percent local cost share).
- Section 205—Flood damage reduction projects. Maximum Federal cost for planning, design, and construction is \$10.0 million per project (65 percent Federal, 35 percent local cost share).
- Section 208—Clearing debris and sediment from channels for flood prevention. Maximum \$500,000 per project (65 percent Federal, 35 percent local cost share).
- Section 14—Emergency streambank and shoreline protection. Maximum \$1.5 million per project (65 percent Federal, 35 percent local cost share).

### **U.S. Department of Agriculture Farm Service Agency**

The U.S. Department of Agricultural Farm Service Agency (USDA-FSA) oversees several voluntary conservation-related programs that provide direct and indirect hazard mitigation benefits. These programs work to address a large number of farming- and ranching-related issues including drinking water protection, reducing soil erosion, preserving wildlife habitat, preserving and restoring forest and wetlands, and aiding farmers whose farms have been damaged by natural disasters. Several of these programs are described below (also see Appendices I and J).

#### ***Conservation Reserve Program***

The Conservation Reserve Program (CRP) is a voluntary program for agricultural landowners that provides annual rental payments and up to 50 percent cost-share assistance to establish long-term, resource-conserving covers on eligible farmland. The CRP goal is to reduce soil erosion, protect the nation's ability to produce food, reduce sedimentation in streams and lakes, improve water quality, establish wildlife habitat, and enhance forest and wetland resources. Implementation of the program can also have hazard mitigation benefits, including reduction of crop losses and property damages due to flooding. Through the program, farmers are encouraged to convert highly erodible cropland or other environmentally sensitive areas to vegetative cover such as prairie-compatible, noninvasive forage mix, wildlife plantings, trees, filter strips, or riparian buffers. The rental payment that the land owner receives is based on the agricultural rental value of the land.

### **U.S. Department of Agriculture Natural Resources Conservation Service**

The U.S. Department of Agricultural Natural Resources Conservation Service (USDA-NRCS) provides farmers and ranchers with financial and technical assistance to voluntarily install conservation measures to concurrently help the environment and agricultural operations. Many of these programs may serve as potential funding sources for flood mitigation efforts by the County and local communities (see Appendices I and J).

## **Wisconsin Department of Natural Resources**

The Wisconsin Department of Natural Resources (WDNR) operates programs that may serve as potential funding sources for flood mitigation efforts by the County and local communities (see also Appendices I and J). These programs are described below.

### ***Municipal Flood Control Grants***

Under Chapter NR 199, “Municipal Flood Control Grants” of the *Wisconsin Administrative Code* municipalities including cities, towns, and villages, as well as metropolitan sewerage districts, are eligible for cost-sharing grants from the State for projects such as acquisition and removal of structures; floodproofing and elevation of structures; riparian restoration projects; acquisition of vacant land or purchase of easements to provide additional flood storage or to facilitate natural or more efficient flood flows; construction of facilities for the collection, detention, retention, storage, and transmission of stormwater and groundwater for flood control and riparian restoration projects; and preparation of flood mapping projects. Municipalities and metropolitan sewerage districts are eligible for up to 70 percent State cost-share funding for eligible projects, and would have to provide at least a 30 percent local match. Applications are due on March 15 of even-numbered years.

### ***Knowles-Nelson Stewardship Local Grant Assistance Programs***

Local units of government are eligible to apply for funding through four stewardship grant programs and two related federal programs administered by the WDNR. The WDNR programs include the Aids for the Acquisition and Development of Local Parks, the Urban Green Space, the Urban Rivers, and the Acquisition of Development Rights programs. The WDNR also administers the Federal Land and Water Conservation Fund and Recreational Trails Act programs. These programs provide 50 percent matching grants to cities, villages, towns, counties, public inland lake protection and rehabilitation districts, and qualified nonprofit conservation organizations. Eligible activities include acquisition of land; development and renovation projects for nature-based outdoor recreation; development, maintenance, and restoration of trails; river habitat restoration projects that serve public recreation or resource conservation purposes; and purchase of land for noncommercial gardening in urban areas. The annual application deadline is May 1.

### ***Stormwater Management Program***

The WDNR administers a Targeted Runoff Management (TRM) grant program provided for under Section 281.65(4c) of the *Wisconsin Statutes*. Local governmental units may be reimbursed up to 70 percent of eligible costs associated with installing Best Management Practices (BMPs) to limit or end nonpoint water pollution. Grant awards for small-scale agricultural and urban projects cannot exceed \$150,000. Grants provided under this program may be used for projects to control nonpoint source pollution and may be available to partially support dual-purpose (water quality and water quantity) detention ponds, streambank protection projects, or other stormwater management facilities.

The WDNR also administers an Urban Nonpoint Source and Stormwater Grant Program provided for under Section 281.66 of the *Wisconsin Statutes*. Cities, towns, villages, and counties are eligible for grants under this program to improve urban water quality by limiting or ending sources of urban nonpoint source pollution. Funded projects are site-specific and targeted to address high priority problems in urban project areas. Two types of grants are available under this program: planning grants and construction grants. Construction grants are made for construction projects designed to control stormwater runoff rates, volumes, and discharge quality from nonpoint sources within existing urban development. Eligible project sponsors can be reimbursed up to 50 percent of project costs to construct BMPs. A project must be located in an urban area to be eligible for BMP cost sharing. Eligible activities include construction of structural urban BMPs such as detention basins, wet basins, infiltration trenches, infiltration basins, or wetland basins; engineering design and construction services for BMP installation; land acquisition and easement purchase; storm sewers; and streambank and shoreland stabilization projects. Projects are selected for funding based on a competitive process.

### ***Municipal Dam Grant Program***

The 2015-2017 biennial budget provides approximately \$3.5 million to fund eligible engineering and construction costs associated with the maintenance, repair, modification, or abandonment and removal of municipally-owned dams. The program will cover 50 percent of the first \$400,000 of eligible project costs and 25 percent of the next \$800,000 of dam repair, reconstruction, or modification project costs. The program will cover 100 percent of the first \$400,000 for dam abandonment and removal projects. Cities, towns, villages, counties, tribes, and public inland lake protection and rehabilitation districts may apply for funds through this program.

### ***Dam Removal Grant Program***

The 2015-2017 Biennial Budget provides approximately \$500,000 to fund dam removal projects for any owner who wishes to remove their dam. This program provides reimbursement for 100 percent of eligible costs up to a maximum of \$50,000 to remove a dam. Counties, cities, villages, towns, tribes, public inland lake protection and rehabilitation districts, and private dam owners may apply for grant funds through this program.

### **Wisconsin Department of Transportation**

The Wisconsin Department of Transportation (WisDOT) has numerous programs that provide financial assistance to local government and other public and private entities to make a variety of improvements to local roads, highways, bridges, airports, harbors, rail, bicycle, and pedestrian facilities.

### ***Bureau of Transportation Safety Grants***

The WisDOT Bureau of Transportation Safety provides traffic safety grants to organizations and partners that provide services that minimize the number of traffic fatalities and injuries each year. Partners include health centers, law enforcement, fire departments, emergency medical services, and other agencies. One such program provides funding for health care centers and departments to purchase child passenger safety seats to distribute to families who are unable to afford them.

### ***Highway Safety Improvement Program***

The Highway Safety Improvement Program (HSIP) provides funding for highway safety projects at sites that have a high crash history. The objective of the program is to develop and implement stand-alone safety projects designed to reduce the number and severity of crashes on all streets and highways (both State and local). The emphasis for this program is on low-cost measures that can be implemented quickly to increase road safety. The program is typically 90 percent Federally funded and requires a 10 percent match of State and/or local funds.

### **Other Potential Funding Sources**

A variety of other potential funding sources exist which may provide funds for implementation of elements of the recommended hazard mitigation plan. These are listed in Appendices I and J.

## **PLAN MONITORING AND REEVALUATION STRATEGIES**

For a hazard mitigation plan to be successful it must not only be implemented; it must be monitored. Plan monitoring is best accomplished through a formal, periodic process designed to measure and assess progress in implementation, changes in outside circumstances that may affect the plan and efforts to implement it, and changes to the plan or the implementation process. The plan should also be reviewed following each hazard event to assess its continued viability and the need for revisions.

### **Plan Monitoring**

#### ***Review***

Toward ensuring successful monitoring of the hazard mitigation plan, it is recommended that the Washington County All Hazards Mitigation Plan Local Planning Team meet periodically to review the plan and the status of its implementation with a view toward enhancing and improving response to natural and other hazard events. Plan review meetings will be held following any disasters that affect the County and at the discretion of the Director of the

County Office of Emergency Management. These meetings will provide the opportunity to develop and recommend any necessary revisions of the plan to the Washington County Board of Supervisors, as well as to the local units of government involved. The revisions would be proposed, considered, and adopted in the form of formal amendments to the hazard mitigation plan. This review process will be coordinated and conducted by the County Office of Emergency Management, with input from, coordination with, and participation by all concerned County officials and staff, all units and agencies of government involved in plan implementation, and concerned private parties.

The Local Planning Team, in its review process, will periodically examine the plan and the efforts to implement it with respect to: 1) whether any hazards affecting the County and local units of government have changed, and, if so, how they have changed; 2) whether any hazard mitigation goals and objectives have changed, or need to be changed; 3) the degree and extent of progress made in implementing previously identified hazard mitigation actions; 4) whether the plan elements and their priorities should remain unchanged or need modification; 5) whether any new plan elements are needed; and 6) whether applicable funding programs and levels have changed. As an integral part of its review process, the County Office of Emergency Management, with review and guidance of the Local Planning Team, will submit an annual written report to the Local Emergency Planning Committee and the County Board that sets forth the status of plan implementation efforts, details plan implementation actions taken over the past year, prioritizes mitigation goals and activities for the next year, and sets forth any recommended revisions to the plan. It is also recommended that the County Office of Emergency Management oversee the development and maintenance of a tracking and archiving system for all future detailed hazard mitigation studies undertaken by or for the County or the local units of government concerned. Such studies should be evaluated using policies established either by the Local Planning Team or the County Board.

The meetings of the Local Planning Team will continue to be publicly noticed and salient decisions recorded in County Office of Emergency Management files and, where appropriate, on the County website and in press releases among others. Meetings of the Local Planning Team are considered public meetings under Wisconsin Law and are open to all interested parties.

County Office of Emergency Management staff will also continue to organize community level events to increase public awareness, participation, and preparedness. The staff will ensure that appropriate notices, agendas, and other documentation are provided to interested persons and LPT members in a timely manner. The venue and timing of these events shall be varied to ensure the widest possible participation and geographic spread across the County. Through these community level events, staff will gain an understanding of issues of concern, encourage public involvement, and maintain hazard awareness and preparedness at a high level.

County Office of Emergency Management will be responsible on a day-to-day basis for creating and implementing a common monitoring system. This will require close cooperation and coordination with other units of government and agencies involved. This review will form part of the agenda for the aforementioned annual meeting of the Local Planning Team.

### ***Post-Disaster Review***

The plan monitoring and refinement strategy will include a post-disaster component whereby the plan is reviewed and evaluated after any future major hazard event. Based upon this review, the hazard mitigation plan will be updated or revised as needed based upon the experiences with and circumstances and consequences of the hazard. In this regard, the post-disaster review effort will be coordinated with the emergency operations program administered by County Office of Emergency Management in partnership with the local units of government. The experiences of the emergency operations may indicate a need for refined mitigation actions that would then be incorporated into the plan. Any plan updating found to be needed will be incorporated into the annual plan update noted above.

### **Reevaluation Strategy**

As a condition of eligibility for receiving project grant funding from its mitigation grant programs, FEMA requires that hazard mitigation plans be reviewed, revised, and resubmitted for approval every five years. The updated plan

should document changes that have occurred since the development of the plan, such as the implementation of recommended mitigation measures, changes in development, occurrences of hazard events, and changes in local priorities. In addition, it should update the risk analysis. This should include both determining whether the risks posed by specific hazards have changed and re-evaluating the identified hazards to determine whether any changes need to be made in the set of hazards addressed by the plan. Finally, the updated plan should evaluate the relevance of the plan's goals, objectives, and recommended strategies and update them as appropriate.

To meet these requirements, it is recommended that the hazard mitigation plan be updated at a minimum of five-year intervals. Updating efforts should be led by the Director of the Washington County Office of Emergency Management in partnership with other appropriate County Departments. Reevaluation, updating, and revision of this plan should be initiated approximately 24 months prior to expiration of this plan. As part of the updating process, the Director will reconstitute the Hazard Mitigation Local Planning Team to oversee development of the updated plan. The team should include representatives of all of the municipalities that are covered under the plan. The meetings of the Local Planning Team will be publicly noticed. In addition, at appropriate times during the updating process, members of the public and adjacent communities will be provided with opportunities to review and submit questions and comment on the plan update. Plan updating will be conducted according to relevant guidance available from FEMA and WEM. Following completion of the updated plan in draft form, it will be submitted to WEM and FEMA for review and approval. Following approval by FEMA, the updated plan will need to be adopted by the Washington County Board and by the governing bodies of the incorporated municipalities in the County.

#### **Incorporating Existing Planning Mechanisms**

The Hazard Mitigation Local Planning Team will meet on an annual basis to provide a mechanism for ensuring that the actions identified in the Plan are incorporated into ongoing County planning activities.

Washington County currently utilizes comprehensive land use planning, land use regulations, neighborhood planning, and building codes to guide and control development in the County. These existing mechanisms will have hazard mitigation strategies integrated into them where applicable.

In addition, the County will require that participating local municipalities address hazards in their comprehensive plans and land use regulations. Specifically, one of the goals in the Plan promotes the spatial distribution of land uses to minimize hazards and dangers to the health, welfare, and safety of County residents from natural and manmade hazards. The County Planning and Parks Department will conduct periodic reviews of the County's comprehensive plans and land use policies, analyze any plan amendments, and provide technical assistance to other local municipalities in implementing these requirements.

## APPENDICES

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**Appendix A**

**WASHINGTON COUNTY HAZARD MITIGATION  
LOCAL PLANNING TEAM MEETING AGENDAS AND  
MEETING SUMMARY NOTES, AND INFORMATION ON  
PUBLIC MEETINGS**

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**Figure A-1**

**MEMBERS OF THE WASHINGTON COUNTY  
HAZARD MITIGATION LOCAL PLANNING TEAM**

Rob Schmid, Chair .....	Emergency Management Coordinator, Washington County
Joseph E. Boxhorn, Secretary .....	Senior Planner, Southeastern Wisconsin Regional Planning Commission
Jessi Balcom .....	Village of Slinger Administrator
Kate Barret .....	Public Health Nurse, Washington County Health Department
Brad Bautz .....	Director of Emergency Management, Town of Erin
Ryan Betancur .....	Emergency Preparedness Coordinator, Washington County Health Department
Bob Bingen .....	Chairman, Town of Addison
Tom Bishop .....	Chief of Police, Village of Kewaskum
Eric Damkon .....	Geographic Information Systems Manager, Washington County
Jed Dolnick .....	Chief of Police, Village of Jackson
Richard Engel .....	Chairman, Washington County Volunteer Organizations Active in Disasters and Assistant Emergency Coordinator, Amateur Radio Emergency Service
Ron Eickstedt .....	Highway Supervisor, Town of Jackson
Phil Gaudet .....	Land Resources Manager, Washington County Land Use Division
Joe Gonnering .....	Chairman, Town of Trenton
Shawn Graff .....	Executive Director, Ozaukee-Washington Land Trust
Roxanne Gray .....	Mitigation Section Supervisor, Wisconsin Division of Emergency Management
Mark Groeschel .....	Fire Chief, Kewaskum Fire Department
Jim Healy .....	Village of Richfield Administrator
Raymond Heidtke .....	Chair, Town of Jackson
Mike Heili .....	President, Village of Newburg
Matt Heiser .....	Village of Kewaskum Administrator
Laura K. Herrick .....	Chief Environmental Engineer, Southeastern Wisconsin Regional Planning Commission
Peter Hoell .....	Chief of Police, Village of Germantown
Donald Kriefall .....	Washington County Supervisor
Gerald W. Kudek .....	Fire Chief, City of West Bend
Jamie Ludovic .....	Assistant to the Washington County Administrator
Chris Marks .....	Emergency Management Director, Village of Richfield
Michael R. Miller .....	Washington County Supervisor
Aaron Owens .....	Planner, Southeastern Wisconsin Regional Planning Commission
John C. Peters .....	Emergency Government Coordinator, Town of Kewaskum
Jeff Puetz .....	Director of ERM, West Bend Mutual Insurance
Mark Piotrowicz .....	City Planner, City of West Bend
William R. Sackett .....	President, Village of Newburg
Scott Schmidt .....	County Engineer/Highway Commissioner, Washington County
Albert Schulteis .....	Chair, Town of Polk
Deb Sielski .....	Deputy Administrator, Washington County Planning and Parks Department
Katie Sommers .....	State Hazard Mitigation Officer, Wisconsin Division of Emergency Management
G. Fritz Statz .....	GIS Project Lead, Wisconsin Department of Natural Resources
Judy Steinert .....	Administrative Assistant, Washington County Office of Emergency Management
Paul Stephans .....	Fire Chief/Emergency Management Director, City of Hartford
Maurice Strupp .....	Chair, Town of Hartford

**Figure A-2**

**ACTIVITIES OF THE WASHINGTON COUNTY  
HAZARD MITIGATION LOCAL PLANNING TEAM**

Washington County Emergency Management Office  
Southeastern Wisconsin Regional Planning Commission

**Notice of Meeting and Agenda**

**WASHINGTON COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM**

DATE: April 16, 2015  
TIME: 2:00 to 5:00 p.m.  
PLACE: Washington County Sheriff's Department  
EOC/Training Room (Room 3011)  
500 N. Schmidt Road  
West Bend, Wisconsin

AGENDA:

1. Welcome
2. Introductions
3. Overview of hazard mitigation and hazard mitigation planning process: Katie Sommers, Wisconsin Division of Emergency Management, State Hazard Mitigation Officer and Roxanne Gray, Wisconsin Division of Emergency Management, Hazard Mitigation Supervisor
4. Background on development of the Hazard Mitigation Plan: Joseph E. Boxhorn, SEWRPC Senior Planner
  - a. Main Plan Components
  - b. Schedule for plan development (Attachment 1)
  - c. Local Planning Team role
5. Hazard and vulnerability assessment exercise (Attachment 2): Joe Boxhorn
6. Adjourn

Joseph E. Boxhorn  
Secretary

Individual County Board Supervisors may attend the above meeting. It is possible that such attendance may constitute a meeting of the county board or any of its committees pursuant to State ex rel. Badke v. Greendale Village Board, 173 Wis. 2d 553, 494 N.W. 2d 408 (1993). This notice does not authorize attendance at either the above meeting or the Badke meeting, but is given solely to comply with the notice requirements of the open meeting law.

**AFFIDAVIT OF POSTING**

This agenda was posted in the office of the County Clerk on this 9th day of April 2015. Notice was sent to the West Bend News, Express News, WBKV/WBWI Radio, WTKM Radio, My Community NOW, Hartford Times Press, Kewaskum Statesman, Milwaukee Journal-Sentinel. Individuals with disabilities requiring special accommodations for attendance at the meeting should contact the County Clerk at (262) 335-4301 at least 48 hours prior to the meeting.

Enclosures

**Attachment 1**

**PROPOSED TENTATIVE WORK SCHEDULE FOR  
DEVELOPING THE WASHINGTON COUNTY HAZARD MITIGATION PLAN**

Task	Estimated Completion Date
Submit First Quarterly Report to Wisconsin Division of Emergency Management	January 15, 2015
Develop Planning Team	April 2, 2015
Submit Second Quarterly Report to Wisconsin Division of Emergency Management	April 15, 2015
Kickoff Planning Team Meeting	April 16, 2015
Public Participation	April 2, 2015 through August 15, 2016
Develop Community Profiles and Inventories	June 15, 2015
Planning Team Meeting (Review Chapters 1 and 2)	Early July 2015
Identify and Describe Hazards	July 31, 2015
Submit Third Quarterly Report to Wisconsin Division of Emergency Management	July 15, 2015
Submit Fourth Quarterly Report to Wisconsin Division of Emergency Management	October 15, 2015
Develop Risk and Vulnerability Assessments	November 30, 2015
Planning Team Meeting (Review Chapters 3 and 4)	Mid December 2015
First Public Meeting	Mid January 2016
Submit Fifth Quarterly Report to Wisconsin Division of Emergency Management	January 15, 2016
Develop Mitigation Actions	March 31, 2016
Submit Sixth Quarterly Report to Wisconsin Division of Emergency Management	April 15, 2016
Apply to Wisconsin Division of Emergency Management for Extension of Grant Deadline	June 15, 2016
Develop Plan Maintenance Process	June 30, 2016
Planning Team Meeting (Review Chapters 5 and 6)	Mid July 2016
Submit Seventh Quarterly Report to Wisconsin Division of Emergency Management	July 15, 2016
Second Public Meeting	Early August 2016
Submit Draft Plan to WEM for Review	August 31, 2016
Submit Eighth Quarterly Report to Wisconsin Division of Emergency Management	October 15, 2016
Revise Plan Based on State Review	October 31, 2016
Submit Final Plan to the Federal Emergency Management Agency for Approval Pending Adoption	November 15, 2016
Submit Ninth Quarterly Report to Wisconsin Division of Emergency Management	January 15, 2017
Formal Adoption by Washington County Board	February 15, 2017

## ATTACHMENT 2

### INSTRUCTIONS FOR COMPLETING HAZARD VULNERABILITY AND ASSESSMENT TOOL

The purpose of this Hazard Vulnerability and Assessment Tool is to evaluate the potential that specific hazards may occur, the likely severity of impacts resulting from these hazards, and the extent to which these impacts may be mitigated by current levels of preparedness. The tool uses estimates of probability of occurrence, likely severity of impacts, and level of preparedness to estimate the risk posed by each hazard.

Please address all of the potential threats that are listed. Instructions for completing entries in each column are given below.

#### **Probability**

For each of the listed hazards, please indicate the likelihood that it will occur, with 1 indicating a low probability of occurrence, 2 indicating a moderate probability of occurrence, and 3 indicating a high probability of occurrence. Issues to consider for probability include, but are not limited to:

- Known risk,
- Historical data and experience, and
- Local government or agency experience.

#### **Human Impacts**

For each of the listed hazards, please indicate what you consider to be the likely level of impacts to human life if the hazard occurs, with 1 indicating a low level of impacts, 2 indicating a moderate level of impacts, and 3 indicating a high level of impacts. Issues to consider for human impacts include, but are not limited to:

- Potential of the hazard to cause death, and
- Potential of the hazard to cause injury requiring medical treatment.

#### **Property Impacts**

For each of the listed hazards, please indicate the likely level of physical losses and damages to property if the hazard occurs, with 1 indicating a low level of losses and damages, 2 indicating a moderate level of losses and damages, and 3 indicating a high level of losses and damages. Issues to consider for property impacts include, but are not limited to:

- The potential of the hazard to cause damage to property or crops,
- The cost to replace damaged property,
- The cost to set up a temporary replacement for damaged property,
- The cost to repair damaged property, and
- The time to recover from the property damage.

#### **Business and Government Agency Impacts**

For each of the listed hazards, please indicate what the likely level of impacts to the operations of businesses and government agencies is if the hazard occurs, with 1 indicating a low level of impacts, 2 indicating a moderate level of impacts, and 3 indicating a high level of impacts. Issues to consider for business impacts include, but are not limited to:

- Business or agency interruption,
- Employees unable to report to work,
- Customers or clients unable to reach facility,
- Company or agency in violation of contractual agreements,
- Imposition of fines and penalties or legal costs,
- Interruption of access to critical supplies,
- Interruption of product or service distribution,
- Financial impact or burden, and
- Interruption of critical care and emergency services.

## **Preparedness**

For each of the listed hazards, please indicate the current level of preparedness for dealing with the hazard and its impacts, with 1 indicating a high level of preparedness, 2 indicating a moderate level of preparedness, and three indicating a low level of preparedness or no preparedness. Issues to consider for preparedness include, but are not limited to:

- The status of current plans that address the hazard,
- The frequency of drills that address the hazard,
- The status of training related to the hazard and its impacts,
- Insurance,
- The availability of back-up systems, and
- The availability of community resources.

This survey will be compiled and the results will be reported during the hazard identification phase of developing or updating the hazard mitigation plan.

#224805  
500-1110  
JEB/pk  
04/08/15



**HAZARD AND VULNERABILITY ASSESSMENT TOOL  
WASHINGTON COUNTY HAZARD MITIGATION PLAN**

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)				RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS AND AGENCY IMPACT	PREPAREDNESS	
		<i>Likelihood This Will Occur</i>	<i>Possibility of Death or Injury</i>	<i>Physical Losses and Damages</i>	<i>Interruption of Services</i>	
SCORE	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 - 100%
A1. Riverine flooding						0%
A2. Stormwater flooding						0%
A3. Lake flooding						0%
A4. Tornado						0%
A5. Earthquake						0%
A6. Thunderstorm						0%
A7. High straight-line wind						0%
A8. Lightning						0%
A9. Hail						0%
A10. Heavy snow storm						0%
A11. Blizzard						0%
A12. Ice storm						0%
A13. Extreme cold						0%
A14. Extreme heat						0%
A15. Drought						0%
A16. Fog						0%
A17. Dust storm						0%
B1. Contamination or loss of water supply system						0%
B2. Loss of sewerage system						0%
B3. Loss of telecommunication						0%
B4. Electrical system outage						0%
B5. Computer system incident/cyber attack						0%
C1. Hazardous materials railroad incidents						0%
C2. Hazardous materials roadway incidents						0%
C3. Hazardous materials pipeline incidents						0%
C4. Hazardous materials fixed facility incidents (industries, bulk fuel storage sites, grain elevators, agricultural chemical storage, and explosives, including fireworks storage)						0%
D1. Railroad transportation accidents						0%
D2. Roadway transportation accidents						0%
D3. Aviation accidents						0%
D4. Fuel shortage						0%
E1. Correctional center incidents						0%
E2. Civil unrest						0%
E3. Terrorism incidents (bomb threats, hostage situations, biological incidents)						0%
E4. Workplace violence						0%
E5. School violence						0%
F1. Communicable disease outbreak or epidemic						0%
F2. Large-scale food contamination						0%
G1. Wildfire						0%
G2. Large structure fires						0%
G3. Explosions						0%
G4. Mass casualty incidents						0%
G5. Building collapse or cave-in						0%
H1. Dam failure						0%
H2. Landslide						0%
H3. Land subsidence						0%
<b>AVERAGE SCORE</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0%</b>

\*Threat increases with percentage.

Source: Kaiser Permanente and SEWRPC.

<b>RISK = PROBABILITY * SEVERITY</b>		
0.00	0.00	0.00

# SUMMARY NOTES OF THE APRIL 16, 2015 MEETING OF THE WASHINGTON COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM

## INTRODUCTION

The April 16, 2015, meeting of the Washington County Hazard Mitigation Plan Local Planning Team was convened at the Washington County Sheriff's Department at 2:02 p.m. The meeting was called to order by Rob Schmid, Washington County Emergency Management Coordinator. Attendance was taken by circulating a sign-in sheet.

In attendance at the meeting were the following individuals:

### Local Planning Team Members

Rob Schmid, Chair	Emergency Management Coordinator, Washington County
Joseph E. Boxhorn, Secretary	Senior Planner, Southeastern Wisconsin Regional Planning Commission
Jessi Balcom	Village of Slinger Administrator
Kate Barret	Public Health Nurse, Washington County Health Department
Brad Bautz	Director of Emergency Management, Town of Erin
Bob Bingen	Chairman, Town of Addison
Eric Damkot	Geographic Information Systems Manager, Washington County
Jed Dolnick	Chief of Police, Village of Jackson
Richard Engel	Chairman, Washington County Volunteer Organizations Active in Disasters/Assistant Emergency Coordinator Amateur Radio Emergency Service
Ron Eickstedt	Highway Supervisor, Town of Jackson
Phil Gaudet	Land Resources Manager, Washington County Land Use Division
Shawn Graff	Executive Director, Ozaukee-Washington Land Trust
Roxanne Gray	Mitigation Section Supervisor, Wisconsin Division of Emergency Management
Mark Groescholz	Fire Chief, Kewaskum Fire Department
Jim Healy	Village of Richfield Administrator
Raymond Heidtke	Chair, Town of Jackson
Matt Heiser	Village of Kewaskum Administrator
Peter Hoell	Chief of Police, Village of Germantown
T.J. Justice	City Administrator and Director of Development, City of West Bend
Laura L. Kletti	Chief Environmental Engineer, Southeastern Wisconsin Regional Planning Commission
Gerald W. Kudek	Fire Chief, City of West Bend
Jamie Ludovic	Assistant to the Washington County Administrator
Chris Marks	Emergency Management Director, Village of Richfield
Michael R. Miller	Washington County Supervisor
Aaron W. Owens	Planner, Southeastern Wisconsin Regional Planning Commission
John C. Peters	Emergency Government Coordinator, Town of Kewaskum
Jeff Puetz	Director of ERM, West Bend Mutual Insurance
Mark Piotrowicz	City Planner, City of West Bend
William R. Sackett	President, Village of Newburg
Albert Schulteis	Chair, Town of Polk
Deb Sielski	Deputy Administrator, Washington County Planning and Parks Department
Katie Sommers	State Hazard Mitigation Officer, Wisconsin Division of Emergency Management

G. Fritz Statz  
Judy Steinert

GIS Project Lead, Wisconsin Department of Natural Resources  
Administrative Assistant, Washington County Office of  
Emergency Management

Paul Stephans  
Maurice Strupp

Fire Chief/Emergency Management Director, City of Hartford  
Chair, Town of Hartford

Mr. Schmid welcomed the attendees to the meeting and thanked them for their participation.

## **OVERVIEW OF HAZARD MITIGATION AND HAZARD MITIGATION PLANNING PROCESS**

Mr. Schmid introduced Katie Sommers, State Hazard Mitigation Officer Wisconsin Division of Emergency Management. At Mr. Schmid's request, Ms. Sommers presented an overview of hazard mitigation and the hazard mitigation planning process.

[Secretary's Note: A copy of Ms. Sommers' presentation is attached herein as Exhibit A.]

Mr. Graff noted that flooding is an issue that crosses political boundaries. He asked whether neighboring counties have been through the hazard mitigation planning process. Ms. Sommers replied that all of the counties adjacent to Washington County have developed hazard mitigation plans. She added that Ozaukee County is currently updating its plan. Ms. Gray suggested sharing the draft plan with neighboring counties, examining their plans, and inviting neighboring jurisdictions to Local Planning Team meetings to get input on their experiences with hazard mitigation. Ms. Sommers noted that the Federal Emergency Management Agency requires that the planning process include an opportunity for neighboring jurisdictions to comment on the plan during the drafting stage.

## **BACKGROUND ON DEVELOPMENT OF THE HAZARD MITIGATION PLAN**

Mr. Schmid introduced Joseph E. Boxhorn of the SEWRPC staff. At Mr. Schmid's request, Mr. Boxhorn presented background information on the initial hazard mitigation plan, the main plan components to be developed, and a schedule for the plan update. In addition, Mr. Boxhorn explained the role of the Local Planning Team in the plan development process.

[Secretary's Note: Mr. Boxhorn's presentation is attached herein as Exhibit B.]

## **HAZARD AND VULNERABILITY ASSESSMENT EXERCISE**

Mr. Boxhorn stated that as part of the hazard and vulnerability analysis for the plan, it will be necessary to decide which hazards will be addressed by the plan. He noted that a hazard and vulnerability assessment tool and instructions for completing the tool were included with the agenda for this meeting. He explained that the tool is a modified version of a tool developed by Kaiser Permanente for assessing the risks faced by healthcare facilities.

[Secretary's Note: A copy of the hazard and vulnerability assessment tool and the instructions for completing the tool are attached herein as Exhibit C.]

Mr. Boxhorn asked the members of the Local Planning Team to complete the hazard and vulnerability assessment tool. He explained that the results of this exercise would be one of the factors used to determine which hazards are addressed by the hazard mitigation plan.

A Team member asked whether participants should include which community they are from on the tool. Mr. Boxhorn replied that this would not be necessary, noting that the location of hazard occurrence would be addressed during a later stage of the risk analysis.

Mr. Schmid asked what was meant by the term “land subsidence.” Mr. Boxhorn explained that this refers to large-scale settling of land. He noted that a sink hole is an example of land subsidence.

## **ADJOURNMENT**

There being no further business, the meeting was adjourned by unanimous consent at 3:30 p.m.

WASHINGTON CO HMP SUMMARY NOTES 04/16/2015 MTG (00225176).DOC  
500-1110  
JEB/pk  
04/22/15

Exhibit A



## Hazard Mitigation Planning

Katie Sommers  
State Hazard Mitigation Officer  
Roxanne Gray  
Mitigation Section Supervisor



## What is Mitigation?

According to the Federal Emergency Management Agency (FEMA):

**"Mitigation is any sustained action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards"**



Photo from Kosciusko County



Photo from Soldiers Grove, WI



The complex block, titled "Why Do We Mitigate?", contains two images and a list of reasons. The top image shows a boat on a river with people. The bottom image shows a residential area with significant damage to buildings and infrastructure. The list of reasons is as follows:

- Disasters cost society too much
- State and federal aid insufficient
- Can prevent future damages
- Less impact and speed response and recovery process
- Mitigation happens at the local level

The Washington County Hazard Mitigation Planning logo is in the top left corner.

 **Why Do We Mitigate?**

### Nationwide Trends

- \$80 Billion 2004-2011 (GAO) responding to disasters
- \$6 Billion per year in flood damages
- Costs continue to rise
- People continue to build and live in high-risk areas



 **Why Do We Mitigate?**

### In Wisconsin

- \$3 billion in disaster-related damages last 3 decades
- 12 Federal Disaster Declarations in the 90's compared to 6 in the 80's
- 2000, 2001, two in 2002, 2004, 2007, 2008, two in 2010, 2011, 2012, 2013
- 2 snow emergencies (2000 and 2008)





**Value of Mitigation**

For every **\$1 spent** on mitigation, **\$4 is saved** in future damages.  
(Per the National Institute of Building Sciences -2005)

The graphic features a blue border and a circular logo in the top left corner with a map of Wisconsin and the letters 'W E M'. It contains two side-by-side photographs: the left one shows a flooded residential area with murky brown water, and the right one shows a well-maintained green lawn with trees. Below the photos is a white box with blue and red text.



**Examples of Mitigation**

The graphic features a circular logo in the top left corner with a map of Wisconsin and the letters 'W E M'. It contains three photographs: the top one shows a house with a white picket fence and a sign that says 'WELCOME TO OUR NIGHTMARE'; the bottom left one shows a flooded yard with a mailbox; the bottom right one shows a flooded residential street with houses partially submerged in brown water.





## Acquisition/Demolition



**Communities acquire land, demolish structures, and keep the land in open space.**

**Images from Darlington, WI**



## Elevation



**Elevation raises a structure out of the floodplain. Wisconsin has specific regulations to follow with elevation projects. See DNR for more information.**

**Images from Soldiers Grove, WI**



**Floodwall**

Floodwalls can prevent water from inundating structures that cannot be elevated, relocated, or demolished.

Image from Darlington, WI

The image shows a residential street with a concrete floodwall in the foreground. Behind the wall are several houses, including a large two-story grey house and a white house with a red roof. The sky is overcast.



**Community Safe Room**

Community safe rooms built to FEMA-361 standards can withstand winds up to 250 MPH.

Image from Town of Dunn, WI

The image shows a large, single-story, grey metal building with a brown door. A sign on the wall reads "TORNADO SHELTER" with a map of Wisconsin above it. An orange and white traffic cone is in the foreground. The sky is blue with some clouds.



**Stormwater Detention**

Detention ponds can store stormwater runoff, decreasing flash flooding in urban areas.  
Image from MMSD Stormwater Detention Project (Wauwatosa, WI)

This slide features a circular logo in the top left corner with the letters 'WEM' and the text 'WASHINGTON COUNTY HAZARD MITIGATION PLANNING'. The main image shows a large, calm pond in a rural setting with trees and a bright sun in the sky. The text is overlaid on a blue background at the top and bottom of the image.



**Stormwater**

Stream restoration allows watersheds to better manage flooding.  
Image from Theinsville, WI

This slide features the same circular logo in the top left corner. The main image shows a stream restoration project with a wooden fence, a concrete channel, and trees in a residential area. The text is overlaid on a blue background at the top and bottom of the image.



**River Warning Systems**

River warning systems installed on conservation dams to warn county officials about expected dam breaching.

Images from Vernon County



**Other Projects**

- Raise appliances and utilities
- Install back-flow valves
- Retrofit for wind resistance
- Education and public awareness
- Insurance (flood and sewer backup)
- Land use planning

NOAA Weather Radios

Mobile Home Tie-Downs

Wind Retrofit Guide for Residential Buildings

Proper Landscaping



## Benefits of Mitigation

- Enhance recreation and tourism
  - Parks
  - Trails
- Increase community pride & improve quality of life
- Save tax dollars



Darlington, WI



Chaseburg, WI



## Mitigation Planning



 **Benefits of Pre-Disaster Planning**

- Use skills, experience, and expertise of wide range of groups
- Address broad range of hazards
- Involve and educate citizens
- Identify the best mitigation projects
- Gain public and political support



Soldiers Grove, WI

 **Benefits of Pre-Disaster Planning**

- Mitigation can support other goals of the community
- Capitalize on mitigation opportunities after a disaster
- Identify sources of technical and financial assistance
- Fewer constraints on time and resources vs. post-disaster



Darlington, WI

 **Disaster Mitigation Act of 2000**

- Public Law 106-390 signed into law 10/30/00
- Establishes a national disaster hazard mitigation program
  - Section 203: Pre-Disaster Mitigation Program
  - Section 322: Mitigation Planning Requirement



 **Vision of DMA 2000**

- To reduce disaster losses thru pre-disaster mitigation planning by pre-identifying, cost-effective mitigation
- Mitigation planning would then streamline and speed up the recovery process





## Mitigation Planning

- Describe actions to mitigate hazards, risks, and vulnerabilities
- Establish strategy to implement those actions
- Pre-identify projects to ensure comprehensive, integrated approach to hazard reduction



## Local/Tribal Mitigation Plan Criteria



- Local Planning – 44 CFR Part 201.6
- Tribal Planning – 44 CFR Part 201.7
- Components
  - Planning Process
  - Risk Assessment
  - Mitigation Strategy
  - Plan Maintenance Process
  - Plan Adoption
  - Plan Review





## Comprehensive Planning

- Issues and Opportunities
- Housing
- Transportation
- Utilities and Community Facilities
- Agricultural, Natural, and Cultural Resources
- Economic Development
- Intergovernmental Cooperation
- Land Use
- Implementation



## Planning Deadlines

- Must have an approved All-Hazards Mitigation Plan to receive PDM, HMGP, FMA
- Local plans have to be reviewed, updated, and re-approved every 5 years



**Plan Updates**

- Should allow one year to 18 months for update
- Plan expires 5 years from approval date



Vernon County, WI



The slide features a blue background. At the top left is the Wisconsin Emergency Management (WEM) logo. The title 'Plan Updates' is in white text on a blue banner. Below the title are two bullet points in white text. A central photograph shows a calm pond with a utility pole in the foreground and a line of trees in the background. The text 'Vernon County, WI' is centered below the photo.



**Planning Process**





The slide features a blue background. At the top left is the Wisconsin Emergency Management (WEM) logo. The title 'Planning Process' is in white text on a blue banner. Below the title is a collage of three images: a flooded residential area with a boat in the water, a house with a 'WELCOME TO OUR NIGHTMARE' sign, and a flooded street with buildings.



## Planning Process

1. Determine the planning area and resources
2. Form and organize the team
3. First steps
4. Engage the public
5. Document the process





## 3. First Steps

- Establish responsibilities
- Confirm the purpose of the plan
- Review the current mitigation plan
- Refine the plan scope and schedule
- Develop an outreach strategy





### 3. First Steps

- **Review Existing Plans, Studies, and Laws**
  - Stormwater studies
  - Engineering reports
  - Floodplain ordinances
  - State Hazard Mitigation Plan
  - Comprehensive plans
  - Local hazard analysis
  - Land use plans
  - Building codes





### 4. Engage the Public

- **Tell your story. Educate the public about the progress and the results of the planning process.**
- **Publish progress in a newspaper.**
- **Publish newsletters or brochures.**
- **Host public-input workshops and/or focus groups.**
- **Open planning meetings to the public.**




## 4. Engage the Public

- Consider outreach activities at local festivals, fairs, or other public events.
- Post progress and results on the internet. Allow electronic feedback submissions.
- Have the draft plan available for review at county and municipal buildings, libraries, etc. Display the final plan once it's approved.
- Be creative!!



## 5. Document the Process

- Documentation of the planning process is a requirement!
- Plan adoption is a requirement!
- Document time and expenses for local match for FEMA grants.



## 5. Document the Process


Include copies of...

- Meeting agendas, sign-in sheets, minutes
- Public notices
- Media articles
- Public comments or input
- Surveys
- Correspondence



## Risk Assessment






## Risk Assessment: What is it?


- A process that produces a specific section of your plan that answers these questions:

What hazards could affect your jurisdiction?	What areas of your jurisdiction are vulnerable to hazards?
What assets could be affected?	To what degree will these assets be affected?




## Risk Assessment: Why?

- Better-understand which hazards affect your community
  - Previous occurrences
  - Probability of future events
- Estimate potential impacts and losses
- Consider how future development impacts hazards, risk, and potential losses



## Risk Assessment: Outcomes


- Provide sufficient information to develop and prioritize mitigation actions to reduce the risk from identified hazards
- Information from local risk assessments is integrated into the State Plan to help establish statewide goals and policies



## Process


- Identify hazards that occur
  - Which ones are most prevalent?
  - Natural hazards required, technological hazards optional
- Describe the hazards
  - Type, extent, previous occurrences, severity, duration
- Estimate losses and impacts to your community





## Describe the Hazards

Item	Examples
<b>Hazard Extent</b> (strength, magnitude)	<ul style="list-style-type: none"> <li>High, medium, low (define)</li> <li>Enhanced Fujita Scale</li> <li>Water depth</li> <li>Wind speed</li> </ul>
<b>Previous Occurrences</b>	<ul style="list-style-type: none"> <li>Past damages</li> <li>Severity</li> <li>Duration</li> <li>Dates</li> </ul>
<b>Probability of Future Events</b>	<ul style="list-style-type: none"> <li>Unlikely, likely, highly likely (define)</li> <li>Historical frequencies</li> <li>Statistical probability (1% in any given year)</li> <li>Hazard probability maps</li> </ul>



## Identify Community Needs

**People**

- Visiting (students, second homeowners, migrant farm workers, special events)
- Access/functional needs (children, elderly, people with physical/mental disabilities, non-English speaking)

**Economy**

- Direct and indirect losses
- Loss of function
- Key economic sectors (agriculture, major employers, industries, etc.)

### Assess the Built Environment

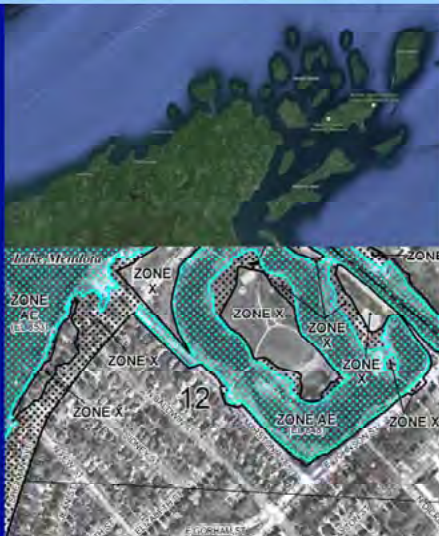
- Structures
- Infrastructure
- Utilities
- Cultural resources
- Critical facilities





Source: Google Earth; generated by Robyn Wiseman, (15 May 2014)

### Assess the Natural Environment

- Assets important to the community such as tourism/ recreation
- Clean air/water
- Wetlands and floodplains





Sources  
(Above) Google Earth; generated by Robyn Wiseman (15 May 2014)  
(Below) FEMA Map Service Center; \* generated by Robyn Wiseman, <http://msc.fema.gov> (15 May 2014)



## Analyze the Risk

- Evaluate vulnerable assets
- Describe the potential impacts
- Estimate potential losses
- List key issues or problem statements that describe the community's greatest vulnerabilities



## Questions to Ask

- When and how often is the hazard likely to occur?
- How bad will it get?
- Where is it most likely to strike?
- How large an area will be affected?
- How long will it last?
- When is it more likely to occur?
- Is there adequate warning time?
- Can more than one hazard occur simultaneously?

### Analysis Methods

- **Exposure**
  - Quantify the number, type and value of structures, critical facilities and infrastructure exposed to a specific hazard

**Example:** 10 residential structures are exposed to the 1% annual flood.
- **Historical**
  - Use data from previous events to predict losses from future events

**Example:** Based on historic data, Examplesville can expect to experience an average of \$5,000 in reported residential hail damage every year.

### Analysis Methods (Cont.)


- **Scenarios**
  - “What if” based on a particular scenario
  - HAZUS-MH

**100 Year Flood Scenario - Berlin, Wisconsin**


**Legend**

- 100 Year Flood Boundary
- 100 Year Flood Depth
  - High : 14.6076
  - Low : 0.000366211
- Streets (Local)
- County Outline
  - Green Lake County

Map Created by WEM using HAZUS-MH (2014)

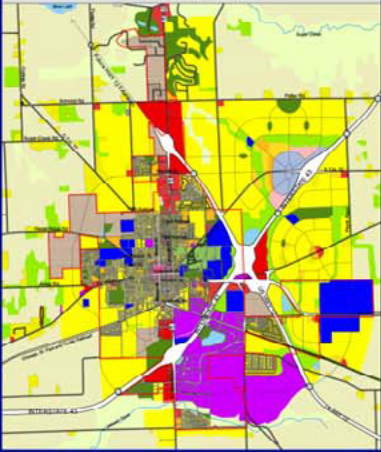
 **Repetitive Loss and Severe Repetitive Loss Properties**

- **Repetitive Loss (RL) Properties**
  - NFIP insured structure with at least 2 paid flood claims of at least \$1,000 each
- **Severe Repetitive Loss (SRL) Properties**
  - 4 or more separate claims exceeding \$5,000 and cumulative amount exceeding \$20,000, or
  - 2 separate payments with cumulative total exceeding market value of the structure
- **Privacy Act**
- **Contact WEM for information**

 **Land Use and Development Trends**

- **Describe land uses and development so mitigation can be considered in future land use decisions**
  - Declining or increasing populations
  - Anticipated annexations
  - Infrastructure expansion
  - Economic shifts

2030 COMPREHENSIVE PLAN □ City of Elkhorn, Wisconsin  
Future Land Use Plan




Source: City of Elkhorn, WI GIS Department; accessed by Robyn Wiseman, <http://www.cityofelkhorn.org/community/maps.asp> (15 May 2014)

### Multi-Jurisdictional Plans


- Include a risk assessment for each participating jurisdiction to reflect unique or varied risks as needed
  - Floodplains
  - Dams
  - Coastal areas
  - Wildland Urban Interface (WUI) for wildfire risk

### Map Hazards (Where and When Appropriate)

- Flood maps
- Road maps
- Parcel maps
- USGS topographic maps
- USGS digital orthophoto maps
- Aerial topographic and/or planimetric maps
- Land use maps
- Tornado track maps




<http://www.geotechmap.org/Pages/WisTorProj.aspx>



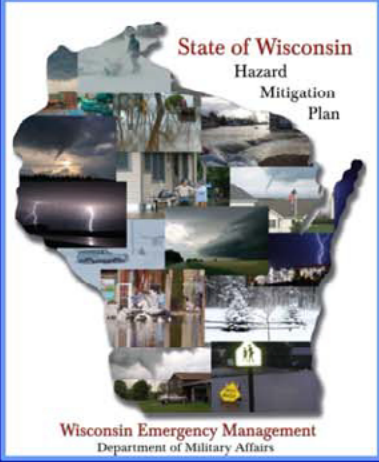
## Map Considerations

- Avoid using state or national scale maps
- Use multiple layers to clarify each hazard
- Clearly **show jurisdictional boundaries**
- Make them **legible**
- Include a **legible legend**
- **Document** map data **limitations**




## Information Sources

- Federal and state agencies and organizations
- State of Wisconsin Hazard Mitigation Plan
- State and local hazard analyses
- Newspapers and historical records
- National Weather Service/NOAA




State of Wisconsin  
Hazard  
Mitigation  
Plan

Wisconsin Emergency Management  
Department of Military Affairs



## Information Sources (Cont.)

- Existing plans and reports
- GIS data and experts
- HAZUS-MH
- Experts in the community
- Surveys or questionnaires
- Internet (USGS, NOAA/NWS, etc.)
- After-action reports
- Oral histories
- Other government documents



## Documentation



- Document the METHODOLOGY used
- Document SOURCES
- Address all hazards; if little or no impact, state this
- Use best available data
- Identify data limitations and deficiencies
- Build on risk assessment in future updates





**What is it?**



- **Blueprint for reducing potential losses identified in the risk assessment**
- **Based on existing authorities, policies, programs, and resources**



## Mitigation Strategy

**Strategy must include...**


- 1. Long-term goals**
- 2. Mitigation actions for each jurisdiction that will reduce risk for each identified hazard**
- 3. Action plan for implementing the identified actions**



## 3. Action Plan

**Action Plan =  
Mitigation Actions + Implementation**

- **What is the action?**
- **Who is responsible?**
- **When will it be completed?**
- **How are actions prioritized?**
- **Partners**
- **Resources**
- **Estimated cost**
- **Potential funding sources**



### 3. Action Plan


**Capability Assessment (each jurisdiction)**

- **Planning and regulatory**
  - Planning department, floodplain ordinances
- **Administrative and technical**
  - Public works department, WEM, FEMA
- **Financial**
  - Special taxing authority, FEMA grants
- **Education and outreach**
  - Hazard awareness campaigns, brochures



### Plan Maintenance






## Plan Maintenance

**Components:**

- Monitoring
- Evaluating
- Updating
- Integration with other planning mechanisms
- Continued public participation

Type of Mitigation	Description	Area Covered	Effectiveness and/or Enforcement	Options for Improvements or Changes
Federal, State and Local Regulations NPDES Phase II	Federal stormwater regulations	Any project within the City with 1 or more acres of land disturbed	In effect since 7/30/03	DPW in process of implementing Phase II Plan
Wetland Protection Act, Northampton Wetlands Ordinance, and Rivers Protection Act	State and local laws regulating development within the buffer zones of wetland resource areas and within the riverfront area	100 foot buffer around wetlands and the wetland resource area itself, and 200 foot resource area on both sides of every perennially flowing river and stream	Effective. Building permits cannot be issued without review by the Conservation Commission	Strengthen Wetland Ordinance; establish a no disturbance area adjacent to wetlands in less developed areas.
Stormwater	State and local	Non residential	Effective	City in process of



## Monitoring, Evaluating, Updating

**Monitoring** = tracking the implementation of the plan over time

**Evaluating** = assessing the effectiveness of the plan at achieving the purpose and goals

**Updating** = reviewing and revising the plan to reflect changes in development, progress in mitigation efforts, and changes in priorities



## Plan Integration

**How will the local government(s) integrate the hazard mitigation plan into other planning mechanisms? (required)**

- Comprehensive plans (9 elements)
- Capital improvement plans
- Stormwater management plans
- Sustainability plans
- Economic development plans
- Master plans
- Codes and ordinances





## Plan Integration

**Plan sections to consider integrating:**

- Risk assessment data (maps) – informs policies and decision-making
- Goals – contribute to overall community objectives
- Actions – take advantage of existing mechanisms for implementation

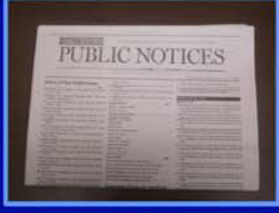
**Plan updates must explain how the previous plan was incorporated into other planning mechanisms.**



## Continued Public Participation

The plan must include a strategy for maintaining public participation between plan updates. Here are some ideas:

- Hold periodic public meetings
- Post monitoring and evaluation activities to a website
- Hold workshops
- Distribute newsletters
- Make information available in public places



## Plan Review







## Plan Review

**Steps**

1. Plan development
2. WEM plan review
3. FEMA plan review
4. Plan adoption
5. FEMA approval



## Planning Tools and Resources

- <http://emergencymanagement.wi.gov/mitigation>
- <http://www.fema.gov/hazard-mitigation-assistance>
- <https://www.fema.gov/multi-hazard-mitigation-planning>
- Resource Guide to All Hazards Mitigation Planning – April 2003
- State of Wisconsin Hazard Mitigation Plan
- HAZUS
- FEMA How-to-Guides (386-1 through 386-9) – <http://www.fema.gov/media-library/collections/6>



**Questions?**

**Please contact us anytime with questions or concerns.**

**Katie Sommers**  
**[katie.sommers@wisconsin.gov](mailto:katie.sommers@wisconsin.gov)**  
**(608) 242-3222**

**Roxanne Gray**  
**[roxanne.gray@wisconsin.gov](mailto:roxanne.gray@wisconsin.gov)**  
**(608) 242-3211**



## Exhibit B

**Washington County Hazard Mitigation Plan:  
Local Planning Team Meeting**  
April 16, 2015



SEWRPC  
Southeastern Wisconsin Regional Planning Commission  
# 224025

Joseph E. Boxhorn, Ph.D., Senior Planner  
Southeastern Wisconsin Regional Planning Commission

**Plan Components**

1. Documentation of the planning process
2. Description of study area
3. Analysis of hazard conditions
4. Hazard mitigation goals and objectives
5. Hazard mitigation strategies
6. Plan adoption, implementation, and maintenance

## Plan Components

### 1. Documentation of the Planning Process

- Chapter 1 and Appendix A
- Incorporated municipalities must participate in plan development in order to be covered
  - County adoption covers the towns
- Public and adjacent communities must be given an opportunity to comment during the drafting stage

## Plan Components

### 2. Description of Study Area – Chapter 2

- Demographic
- Surface waters
- Transportation systems
- Public facilities
  - Police facilities
  - Fire facilities
  - EMS facilities
- Related regulations and programs
- Land use
- Flood hazard areas
- Utility systems
- Critical community facilities
- Hazardous material use and storage
- Emergency operation planning

## Plan Components

### 3. Analysis of Hazard Conditions-Chapter 3

- Hazard identification
  - FEMA requires the plan to cover natural hazards
  - It can also cover human-generated hazards
- Seek planning teams views
- Look at communities' experience with hazards

## Plan Components

### 3. Analysis of Hazard Conditions-Chapter 3

- Vulnerability and Risk Analysis for each covered hazard
  - Historical and recent incidents
  - Vulnerabilities and community impacts
    - Human lives, property damages, crop damages
  - Potential for future changes in hazard conditions
- Multi-jurisdictional aspects

## Plan Components

### 4. Hazard Mitigation Goals-Chapter 4

- Express what we're trying to achieve
- Tie the plan to other active plans
  - *e.g.* The County comprehensive plan
- Fairly general

## Plan Components

### 5. Hazard Mitigation Strategies-Chapter 5

- Develop a range of actions and projects to reduce the impacts of each hazard
  - Structural, nonstructural, educational
- Prioritize actions for implementation
- Identify responsible parties
- Examine costs and benefits
- Consider multi-jurisdictional aspects

## Plan Components

### 6. Plan Adoption, Implementation, and Maintenance-Chapter 6

- County and incorporated municipalities must formally adopt the plan
  - Towns are covered by County adoption
- Detail available funding and technical assistance
- Monitoring of plan implementation
- Incorporation of the plan into existing planning mechanisms

Task	Estimated Completion Date
Submit First Quarterly Report to Wisconsin Division of Emergency Management	January 15, 2015
Develop Planning Team	April 6, 2015
Submit Second Quarterly Report to Wisconsin Division of Emergency Management	April 15, 2015
Kick-off Planning Team Meeting	April 14, 2015
Public Participation	April 6, 2015 through August 15, 2015
Develop Community Profiles and Inventories	June 15, 2015
Planning Team Meeting (Review Chapters 1 and 2)	Early July 2015
Identify and Inventory Hazards	July 15, 2015
Submit Third Quarterly Report to Wisconsin Division of Emergency Management	July 15, 2015
Submit Fourth Quarterly Report to Wisconsin Division of Emergency Management	October 15, 2015
Develop Risk and Vulnerability Assessment	November 30, 2015
Planning Team Meeting (Review Chapters 3 and 4)	Mid-December 2015
First Public Meeting	Mid-January 2016
Submit Fifth Quarterly Report to Wisconsin Division of Emergency Management	January 15, 2016
Develop Mitigation Actions	March 31, 2016
Submit Sixth Quarterly Report to Wisconsin Division of Emergency Management	April 15, 2016
Apply to Wisconsin Division of Emergency Management for Extension of Grant Duration	June 15, 2016
Develop Plan Maintenance Plan	June 30, 2016
Planning Team Meeting (Review Chapters 5 and 6)	Mid-July 2016
Submit Seventh Quarterly Report to Wisconsin Division of Emergency Management	July 15, 2016
Second Public Meeting	Early August 2016
Submit Draft Plan to WDEM for Review	August 31, 2016
Submit Eighth Quarterly Report to Wisconsin Division of Emergency Management	October 15, 2016
Revised Plan Based on State Review	October 31, 2016
Submit Final Plan to the Federal Emergency Management Agency for Approval/Printing/Adoption	November 15, 2016
Submit Ninth Quarterly Report to Wisconsin Division of Emergency Management	January 15, 2017
Final Adoption by Washington County Board	February 15, 2017

### Key Dates *(all tentative)*

- Local Planning Team Meetings
  - July 2015, December 2015, July 2016
- Public Meetings
  - January 2016, August 2016
- Submit for review
  - Late August 2016
- County Adoption
  - February 2017

### Local Planning Team Role

- Weigh in on hazard identification
- Review the plan chapters
- Help us get needed information
  - Recent and historical problems with hazards → Location, occurrence, damages
  - Recent projects, planned and contemplated projects
  - Inventory data

## Project Web Site

- <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>
  - Agendas and other meeting materials
  - Summary notes from meetings
  - Presentations
  - Draft chapters as they are completed
  - Comment screen
  - Other ways to send a comment

## Exhibit C

### ATTACHMENT 2

#### INSTRUCTIONS FOR COMPLETING HAZARD VULNERABILITY AND ASSESSMENT TOOL

The purpose of this Hazard Vulnerability and Assessment Tool is to evaluate the potential that specific hazards may occur, the likely severity of impacts resulting from these hazards, and the extent to which these impacts may be mitigated by current levels of preparedness. The tool uses estimates of probability of occurrence, likely severity of impacts, and level of preparedness to estimate the risk posed by each hazard.

Please address all of the potential threats that are listed. Instructions for completing entries in each column are given below.

##### **Probability**

For each of the listed hazards, please indicate the likelihood that it will occur, with 1 indicating a low probability of occurrence, 2 indicating a moderate probability of occurrence, and 3 indicating a high probability of occurrence. Issues to consider for probability include, but are not limited to:

- Known risk,
- Historical data and experience, and
- Local government or agency experience.

##### **Human Impacts**

For each of the listed hazards, please indicate what you consider to be the likely level of impacts to human life if the hazard occurs, with 1 indicating a low level of impacts, 2 indicating a moderate level of impacts, and 3 indicating a high level of impacts. Issues to consider for human impacts include, but are not limited to:

- Potential of the hazard to cause death, and
- Potential of the hazard to cause injury requiring medical treatment.

##### **Property Impacts**

For each of the listed hazards, please indicate the likely level of physical losses and damages to property if the hazard occurs, with 1 indicating a low level of losses and damages, 2 indicating a moderate level of losses and damages, and 3 indicating a high level of losses and damages. Issues to consider for property impacts include, but are not limited to:

- The potential of the hazard to cause damage to property or crops,
- The cost to replace damaged property,
- The cost to set up a temporary replacement for damaged property,
- The cost to repair damaged property, and
- The time to recover from the property damage.

##### **Business and Government Agency Impacts**

For each of the listed hazards, please indicate what the likely level of impacts to the operations of businesses and government agencies is if the hazard occurs, with 1 indicating a low level of impacts, 2 indicating a moderate level of impacts, and 3 indicating a high level of impacts. Issues to consider for business impacts include, but are not limited to:

- Business or agency interruption,
- Employees unable to report to work,
- Customers or clients unable to reach facility,
- Company or agency in violation of contractual agreements,
- Imposition of fines and penalties or legal costs,
- Interruption of access to critical supplies,
- Interruption of product or service distribution,
- Financial impact or burden, and
- Interruption of critical care and emergency services.



**Preparedness**

For each of the listed hazards, please indicate the current level of preparedness for dealing with the hazard and its impacts, with 1 indicating a high level of preparedness, 2 indicating a moderate level of preparedness, and three indicating a low level of preparedness or no preparedness. Issues to consider for preparedness include, but are not limited to:

- The status of current plans that address the hazard,
- The frequency of drills that address the hazard,
- The status of training related to the hazard and its impacts,
- Insurance,
- The availability of back-up systems, and
- The availability of community resources.

This survey will be compiled and the results will be reported during the hazard identification phase of developing or updating the hazard mitigation plan.

**HAZARD AND VULNERABILITY ASSESSMENT TOOL  
WASHINGTON COUNTY HAZARD MITIGATION PLAN**

EVENT	PROBABILITY	SEVERITY = (MAGNITUDE - MITIGATION)				RISK
		HUMAN IMPACT	PROPERTY IMPACT	BUSINESS AND AGENCY IMPACT	PREPAREDNESS	
		<i>Likelihood This Will Occur</i>	<i>Possibility of Death or Injury</i>	<i>Physical Losses and Damages</i>	<i>Interruption of Services</i>	
SCORE	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = High 2 = Moderate 3 = Low or none	0 - 100%
A1. Riverine flooding						0%
A2. Stormwater flooding						0%
A3. Lake flooding						0%
A4. Tornado						0%
A5. Earthquake						0%
A6. Thunderstorm						0%
A7. High straight-line wind						0%
A8. Lightning						0%
A9. Hail						0%
A10. Heavy snow storm						0%
A11. Blizzard						0%
A12. Ice storm						0%
A13. Extreme cold						0%
A14. Extreme heat						0%
A15. Drought						0%
A16. Fog						0%
A17. Dust storm						0%
B1. Contamination or loss of water supply system						0%
B2. Loss of sewerage system						0%
B3. Loss of telecommunication						0%
B4. Electrical system outage						0%
B5. Computer system incident/cyber attack						0%
C1. Hazardous materials railroad incidents						0%
C2. Hazardous materials roadway incidents						0%
C3. Hazardous materials pipeline incidents						0%
C4. Hazardous materials fixed facility incidents (industries, bulk fuel storage sites, grain elevators, agricultural chemical storage, and explosives, including fireworks storage)						0%
D1. Railroad transportation accidents						0%
D2. Roadway transportation accidents						0%
D3. Aviation accidents						0%
D4. Fuel shortage						0%
E1. Correctional center incidents						0%
E2. Civil unrest						0%
E3. Terrorism incidents (bomb threats, hostage situations, biological incidents)						0%
E4. Workplace violence						0%
E5. School violence						0%
F1. Communicable disease outbreak or epidemic						0%
F2. Large-scale food contamination						0%
G1. Wildfire						0%
G2. Large structure fires						0%
G3. Explosions						0%
G4. Mass casualty incidents						0%
G5. Building collapse or cave-in						0%
H1. Dam failure						0%
H2. Landslide						0%
H3. Land subsidence						0%
<b>AVERAGE SCORE</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0%</b>

\*Threat increases with percentage.

Source: Kaiser Permanente and SEWRPC.

<b>RISK = PROBABILITY * SEVERITY</b>		
0.00	0.00	0.00

Washington County Emergency Management Office  
Southeastern Wisconsin Regional Planning Commission

**Notice of Meeting and Agenda**

**WASHINGTON COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM**

DATE: October 19, 2015  
TIME: 2:00 to 5:00 p.m.  
PLACE: Washington County Sheriff's Department  
EOC/Training Room (Room 3011)  
500 N. Schmidt Road  
West Bend, Wisconsin

AGENDA:

1. Roll Call
2. Consideration of Summary Notes of April 16, 2015 Local Planning Team Meeting (a copy of the draft summary notes is available for download from the SEWRPC website at: <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>)
3. Consideration of Chapter I, "Introduction and Background," of SEWRPC Community Assistance Planning Report No. 326, *Washington County Hazard Mitigation Plan* (a copy of the draft chapter is available for download from the SEWRPC website at: <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>)
4. Consideration of Chapter II, "Basic Study Area Inventory and Analysis," of SEWRPC Community Assistance Planning Report No. 326, *Washington County Hazard Mitigation Plan* (a copy of the draft chapter is available for download from the SEWRPC website at: <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>)
5. Review of results from hazard and vulnerability assessment exercise (Attachment 1)
6. Discussion of hazards to be addressed by the Washington County Hazard Mitigation Plan
7. Adjourn

Joseph E. Boxhorn  
Secretary

*Individual County Board Supervisors may attend the above meeting. It is possible that such attendance may constitute a meeting of the county board or any of its committees pursuant to State ex rel. Badke v. Greendale Village Board, 173 Wis. 2d 553, 494 N.W. 2d 408 (1993). This notice does not authorize attendance at either the above meeting or the Badke meeting, but is given solely to comply with the notice requirements of the open meeting law.*

**AFFIDAVIT OF POSTING**

*This agenda was posted in the office of the County Clerk on this 18th day of September 2015. Notice was sent to the West Bend News, Express News, WBKV/WBWI Radio, WTKM Radio, My Community NOW, Hartford Times Press, Kewaskum Statesman, Milwaukee Journal-Sentinel. Individuals with disabilities requiring special accommodations for attendance at the meeting should contact the County Clerk at (262) 335-4301 at least 48 hours prior to the meeting.*

Enclosures: #227839 – Washington County HMP HVA Results

#227838 – WASHINGTON CO HMP MEETING NOTICE OCT 19 2015  
500-1110  
JEB/kmd  
09/16/15

## **SUMMARY NOTES OF THE OCTOBER 19, 2015 MEETING OF THE WASHINGTON COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM**

### **INTRODUCTION**

The October 19, 2015, meeting of the Washington County Hazard Mitigation Plan Local Planning Team was convened at the Washington County Sheriff's Department at 2:03 p.m. The meeting was called to order by Rob Schmid, Washington County Emergency Management Coordinator. Attendance was taken by circulating a sign-in sheet.

In attendance at the meeting were the following individuals:

#### Local Planning Team Members

Rob Schmid, Chair	Emergency Management Coordinator, Washington County
Joseph E. Boxhorn, Secretary	Senior Planner, Southeastern Wisconsin Regional Planning Commission
Jessi Balcom	Village of Slinger Administrator
Ryan Betancur	Emergency Preparedness Coordinator, Washington County Health Department
Tom Bishop	Chief of Police, Village of Kewaskum
Richard Engel	Chairman, Washington County Volunteer Organizations Active in Disasters/Assistant Emergency Coordinator Amateur Radio Emergency Service
Phil Gaudet	Land Resources Manager, Washington County Land Use Division
Mark Groescholz	Fire Chief, Kewaskum Fire Department
Peter Hoell	Chief of Police, Village of Germantown
Laura L. Kletti	Chief Environmental Engineer, Southeastern Wisconsin Regional Planning Commission
Gerald W. Kudek	Fire Chief, City of West Bend
Jamie Ludovic	Assistant to the Washington County Administrator
Chris Marks	Emergency Management Director, Village of Richfield
Michael R. Miller	Washington County Supervisor
Aaron W. Owens	Planner, Southeastern Wisconsin Regional Planning Commission
Jeff Puetz	Director of ERM, West Bend Mutual Insurance
Mark Piotrowicz	City Planner, City of West Bend
Deb Sielski	Deputy Administrator, Washington County Planning and Parks Department

Mr. Schmid welcomed the attendees to the meeting, thanked them for their participation, and asked them to introduce themselves.

### **CONSIDERATION OF THE SUMMARY NOTES OF THE APRIL 16, 2015 LOCAL PLANNING TEAM MEETING**

Mr. Schmid introduced Joseph E. Boxhorn of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) staff. At Mr. Schmid's request, Mr. Boxhorn reviewed the summary notes of the April 16, 2015 meeting of the Local Planning Team. Mr. Boxhorn asked whether there were any corrections, questions, or comments on the summary notes. None were offered. The consensus of the group was to approve the summary notes of the April 16, 2015 Local Planning Team meeting.

**CONSIDERATION OF CHAPTER I, “INTRODUCTION AND BACKGROUND,” OF SEWRPC COMMUNITY ASSISTANCE PLANNING REPORT NO. 326, WASHINGTON COUNTY HAZARD MITIGATION PLAN**

At Mr. Schmid’s request, Mr. Boxhorn reviewed preliminary draft Chapter I, “Introduction and Background,” of SEWRPC Community Assistance Planning Report No. 326, *Washington County Hazard Mitigation Plan*. Mr. Boxhorn indicated that he would display copies of the maps from Chapters I and II on the projection screen in the meeting room during discussion of these chapters.

[Secretary’s Note: Mr. Boxhorn’s presentation is attached herein as Exhibit A.]

Mr. Boxhorn noted that Table I-1 shows how each of the municipalities participated in plan development. He added that this table will be updated after each Local Planning Team meeting. He indicated that plan development, including the activities of the Local Planning Team, will be documented in Appendix A, which is yet to be developed.

Mr. Schmid stated that area given for the County on page 2 is incorrect. Mr. Boxhorn replied that he would double check and correct this area.

[Secretary’s Note: The first sentence in the last paragraph on page 2 of the draft chapter was revised to read as follows (text in bold is included here, and in similar subsequent Secretary’s Notes, to indicate language changed or added onto the text. Text will not be bold in the report):

“Washington County covers about **436** square miles and contains all or parts of two cities, all or parts of six villages, and twelve towns as shown on Map I-1.”]

Mr. Boxhorn noted that there is also a typographical error on page 5.

[Secretary’s Note: The last sentence in the second paragraph on page 5 of the draft chapter was revised to read as follows:

“Following completion of the community profiles and the risk and vulnerability assessments sections of the plan and review by the Local Planning Team, a public informational meeting was held to review these sections of the plan with local officials, business and industry, and citizens **and** to solicit their input.”]

Mr. Boxhorn asked whether there were any additional corrections or comments to Chapter I. None were offered. He indicated that members of the Local Planning Team could submit additional comments to him via the project website or electronic mail.

**CONSIDERATION OF CHAPTER II, “BASIC STUDY AREA INVENTORY AND ANALYSIS,” OF SEWRPC COMMUNITY ASSISTANCE PLANNING REPORT NO. 326, WASHINGTON COUNTY HAZARD MITIGATION PLAN**

At Mr. Schmid’s request, Mr. Boxhorn reviewed the preliminary draft of Chapter II of the plan report. He noted that the map and table references in the draft chapter are currently highlighted for his reference as he drafts and revises the chapter. He indicated that the highlighting will be removed prior to publication.

Mr. Miller commented that it is important to consider areas annexed by villages and suggested that the plan may need a map that is more up to date than year 2010. Mr. Boxhorn replied that the maps include changes in municipal boundaries since 2010. Mr. Schmid asked that Team members bring anything that is not current to his and Mr. Boxhorn's attention. Ms. Kletti noted that grants from the Federal Emergency Management Agency (FEMA) are project-based and are not tied to population projections. Mr. Schmid replied that this further clarifies the matter.

Ms. Ludovic noted that the plan is scheduled to be completed in 2016. She asked whether the numbers in Table II-5 will be updated, noting that the 2015 values are available. She asked that the table show the value of land and improvements, noting that there are differences in land values between parts of the County. Mr. Boxhorn replied that the table would be revised to show the values of land and improvements and would be updated to the 2015 values.

[Secretary's Note: Table II-5 was revised by the types of property and included in equalized value and updated to the 2015 values. The revised table is attached herein as Exhibit B.]

Mr. Engel asked whether the portions of the City of Hartford and the Village of Newburg that are located outside of Washington County will be excluded from the plan. Mr. Schmid replied that the portion of the City of Hartford that is located in Dodge County should be covered under the Dodge County hazard mitigation plan and the portion of the Village of Newburg that is located in Ozaukee County should be covered under the Ozaukee County hazard mitigation plan.

[Secretary's Note: The Commission staff requested clarification from the Wisconsin Division of Emergency Management (WEM) on this point. According to WEM staff, adoption of the plan by a city or village will result in the entire city or village being covered under the plan.]

Mr. Groescholz asked what the source of the data was on mobile home parks. Mr. Boxhorn replied that the parks and individual sites had been identified from aerial photographs taken in 2010. The numbers of mobile homes present at a site were counted from the photographs. He added that park names and numbers of sites were taken from license information at the Wisconsin Department of Safety and Professional Services.

Mr. Schmid pointed out that Highway 41's status has changed from U.S. Highway to Interstate Highway.

[Secretary's Note: The first sentence in the third full paragraph on page 4 of the draft chapter was revised to read as follows:

“Major arterial highways serving the County include U.S. Highway (USH) 45, Wisconsin State Highways (STH) 83, 144, and 164, which traverse all or portions of the County in a north-south directions; **Interstate Highway (IH)** 41, STH 145, and STH 175, which traverse all or portions of the County in a northwest-southeast direction; and STH 28, 33, 60, and 167, which traverse all or portions of the County in a generally east-west direction.”]

Mr. Piotrowicz commented that the planned land use shown on Map II-3 for urban centers represents generalized urban areas, not local planned land use. Mr. Boxhorn replied that this map was taken from the County's comprehensive plan. Ms. Sielski replied that because the comprehensive plan draws from local plans and each municipality has its own land use categories, this map shows a generalized urban land use category. Mr. Boxhorn indicated that he would discuss with Ms. Sielski how to resolve this.

[Secretary's Note: Map II-3A showing planned 2035 land use for incorporated municipalities was added to Chapter II. The following paragraph was added after the first partial paragraph on page 5:

“Map II-3 shows generalized planned urban land uses within the incorporated municipalities of the County. In order to detail planned 2035 land use for these communities, the land use plan maps adopted by local governments that provide sanitary sewer service, or plan to provide such service by 2035, were compiled. Planned land uses are shown on Map II-3A for areas within adopted sanitary sewer service areas and additional areas proposed to be provided with sewer service in local comprehensive plans. The maps include planned land uses from city and village comprehensive plans for their extraterritorial areas, because cities and villages typically require land to be annexed before extending sanitary sewers to serve urban development. The land use categories included in local plans were converted to a uniform legend for mapping and analysis purposes. Table A-2-1 in Appendix A-2 shows the relationship between the uniform categories used on the countywide maps and the corresponding categories used on the land use plan maps in local comprehensive plans.”

Appendix A-2 was added to the plan. Map II-3A and Appendix A-2 are included herein in Exhibit C.]

Ms. Balcom asked how often land use inventories are updated. Ms. Sielski replied that updating will begin for the County's comprehensive plan in 2016.

Mr. Schmid noted that there is a typographical error in the list of lakes given on page 7. Mr. Boxhorn indicated that it would be corrected. He added that the five lake management districts in the County have responsibilities for six lakes instead of five.

[Secretary's Note: The first paragraph on page 7 of the draft chapter was revised to read as follows:

“There are 14 major lakes—that is lakes of 50 acres or more—in Washington County. The major lakes include Bark Lake, Barton Pond, Big Cedar Lake, Druid Lake, Friess Lake, Green Lake, Lake Five, Lake Twelve, Little Cedar Lake, Lucas Lake, Pike Lake, Silver Lake, Smith Lake, and Wallace Lake. In addition, there are at least 39 lakes and ponds smaller than 50 acres located wholly or partially within the County.<sup>6</sup> There are five lake management districts in the County which have responsibilities related to the protection, rehabilitation, and management of six lakes. These special-purpose units of government are listed in Table II-8.”

Footnote 6 was not changed.]

A local planning team member asked who issues dam hazard ratings. Mr. Boxhorn and Mr. Schmid replied that this is done by the Wisconsin Department of Natural Resources based upon a dam failure analysis. Mr. Schmid added that larger dams are also required to have an emergency action plan. Mr. Piotrowicz commented that most of the dam studies that have been done in the County were based upon old FEMA floodplains and not the newly adopted floodplains. He noted that his understanding is that the

hazard ratings of Barton Dam and West Bend Dam, numbers 2 and 3, respectively, on Map II-6 have recently changed. He indicated that he would check into this.

[Secretary's Note: SEWRPC staff discussed the hazard ratings of Barton Dam and West Bend Dam with Michelle Hase, Wisconsin Department of Natural Resources (WDNR) dam safety engineer. Ms. Hase indicated that Barton Dam is currently rated as having a high hazard potential and West Bend Dam is currently rated as having a low hazard potential. She also noted that the WDNR is currently considering what actions should be taken regarding dam hazard ratings when the associated floodplains are revised based upon new flood studies. She indicated that if new flood studies showed major changes in flood flows, dam owners could be requested to perform new dam failure analyses.]

Mr. Piotrowicz stated that Hahn's Sky Ranch closed last spring. Mr. Schmid noted that it is currently being used only by model aircraft flying clubs.

[Secretary's Note: Hahn's Sky Ranch was removed from Map II-9. The first sentence of the last paragraph on page 10 continuing into page 11 of the draft chapter was revised to read as follows:

“Washington County has **two** publicly-owned airports which serve the public: West Bend Municipal Airport **and** Hartford Municipal Airport.”

The tenth sentence of the last paragraph on page 10 continuing into page 11 of the draft chapter was deleted.]

Mr. Boxhorn stated that he would look into adding electrical utility service areas to Map II-12. Mr. Piotrowicz stated that there are two small electrical substations in the City of West Bend: one near the intersection of State Highway 33 and Main Street and another at County Trunk Highway (CTH) P just south of Rusco Drive. Mr. Groeschez added that there is a third small substation located in Kewaskum near CTH H.

[Secretary's Note: The electric utility service areas were added to Map II-12. The map shows substations associated with major electric power transmission lines. Based upon examination of transmission system maps from the Public Service Commission of Wisconsin, the substations identified by Mr. Piotrowicz and Mr. Groeschez appear to be part of local distribution systems. Because they do not appear to be part of the transmission system, these facilities were not added to Map II-12. The last sentence in the first full paragraph on page 12 was revised to read as follows:

“The electric **utility service areas, major transmission lines, and major substations associated with the transmission system** in Washington County are shown on Map II-12.”]

Mr. Boxhorn stated that Mr. Schmid had recently sent him updates to the fire department and emergency medical service areas. He indicated that Maps II- 15 and II-16 would be revised to reflect the changes.



[Secretary's Note: Maps II-15 and II-16 were revised to reflect the service area boundaries shown in shapefiles provided by Washington County staff on October 13, 2015.]

Mr. Kudek asked that the discussion of MABAS agreement be reworded to reflect unwritten agreements. Mr. Schmid indicated that he would reword this section.

[Secretary's Note: The fourth full paragraph on page 14 was revised to read:

“In addition to the County mutual aid **and the MABAS agreements**, each fire and rescue department has reciprocal mutual aid agreements with one or more neighboring departments. Some of these are formal, written agreements; others are unwritten. Many departments have indicated that they would respond to any request for mutual aid, whether or not there is a mutual aid agreement, provided that they are able to do so without jeopardizing their own services.”]

Mr. Boxhorn noted that Table II-11 shows the working status of fire departments, emergency medical service providers, and law enforcement departments serving the County. Mr. Schmid asked the municipal representatives to the Local Planning Team to review this table and provide any corrections to Mr. Boxhorn.

[Secretary's Note: No corrections or revisions to Table II-11 were received by SEWRPC staff.]

Mr. Boxhorn stated that Maps II-18 through II-22 show critical facilities. He added that these are inventoried in a set of tables contained in Appendix D. He asked the Team to review this appendix and contact him with any corrections. Ms. Sielski noted that the name of Wayne Elementary School has been changed to i4Learning Community School.

[Secretary's Note: The facility name for entry 17 in Table D-1 was changed from “Wayne Elementary School” to “i4Learning Community School.”]

Mr. Boxhorn stated that Table II-14 shows the status of zoning ordinances and emergency operation plans for the municipalities in the County. He asked that municipal representatives review this table and provide him any additions or corrections. Ms. Balcom indicated that the Village of Slinger recently adopted a shoreland zoning ordinance.

[Secretary's Note: Table II-14 was revised to reflect the Village of Slinger's ordinances.]

## **REVIEW OF RESULTS FROM HAZARD AND VULNERABILITY ASSESSMENT EXERCISE**

Mr. Boxhorn reviewed the results of the hazard and vulnerability assessment tool (HVA) which the Local Planning Team completed at its April 16, 2015 meeting. He briefly explained how the data were analyzed and indicated that the highest-ranked hazard identified by the tool was automobile accidents. He noted that remaining nine of the 10 highest-ranked hazards identified by the tool were all related to severe storms or winter weather. Mr. Boxhorn added that other notable hazards identified by the tool were related to flooding and hazardous material incidents. He noted that a table and text were attached to the agenda for this meeting that summarized the results of the HVA. This table and text will be included in Chapter III of the plan report.

## **DISCUSSION OF HAZARDS TO BE ADDRESSED BY THE WASHINGTON COUNTY HAZARD MITIGATION PLAN**

Mr. Boxhorn stated that as part of the developing the hazard mitigation plan, it is important to select a set of hazards for the plan to address. He explained that FEMA requires that the plan address natural hazards. He added that at the option of the County and the Team, the plan can also address human-induced or technological hazards. He noted that two factors to consider in choosing which hazard to address are the results from the HVA tool and the County's historical experience with hazards. Mr. Boxhorn distributed a handout to the Local Planning Team. He explained that this handout contains tables with preliminary data related to the Washington County's historical experience with several hazards. He added that these data will be refined as he proceeds with the risk analysis.

[Secretary's Note: A copy of the handout distributed by Mr. Boxhorn is attached herein as Exhibit D.]

Mr. Boxhorn reviewed the preliminary damage estimates on the handout. He indicated that Table 1 in the handout presents preliminary inventories of occurrences of several hazards in the County and that Table 2 presents average annual incidence of the same hazards in the County.

Mr. Boxhorn stated that on an average annual basis automobile accidents are responsible for the highest amount of damages to property and crops and account for at least \$22 million of damages per year in Washington County. He noted that tornadoes, winter storms, and flooding are each responsible for over \$1.0 million of damages per year. He indicated that most of the damages resulting from tornadoes are attributable to one event, the 1981 tornado that affected West Bend. He added that most of the damages resulting from winter storms are also attributable to one event, the 1976 ice storm that affected the County. Mr. Boxhorn noted that that thunderstorm/high wind events, hazardous material incidents involving pipelines and drought each account for over \$450 thousand of damages per year and hail and railway accidents each account for over \$200 thousand of damages per year.

Mr. Boxhorn stated that on an average annual basis automobile accidents have the highest impact on human life and account for over 1,000 fatalities and injuries per year in Washington County. He noted that on average there are over two hundred cases of communicable diseases and over 100 cases of sexually transmitted diseases in the County each year. He indicated that railway accidents cause about 1.5 deaths and injuries each year. Tornadoes cause about 1.2 deaths and injuries per year, and this is largely attributable to the deaths and injuries caused by the 1981 West Bend tornado. Mr. Boxhorn noted that all other hazards for which he could find data cause less than one death or injury per year. There were a few hazards for which he could find confirmed incidences but no data on damages and several others for which he could find no data on incidences or damages.

Ms. Ludovic asked whether there are damages associated with the hazards listed in Table 1 of the handout. Mr. Boxhorn replied that damages are listed in the table and noted that amounts of damage to property and crops have all been adjusted to 2014 dollars.

Mr. Boxhorn stated that based upon the results of the HVA tool and the preliminary inventory hazard occurrences and impacts, he and Mr. Schmid developed a proposed list of hazards to be addressed in the hazard mitigation plan. He indicated that this list is presented in Table 3 of the handout.

Mr. Miller noted that prior to 2005 the County Health Department worked with local communities to develop response plans to disease outbreaks. Mr. Boxhorn indicated that he does not know what the current status of these plans are. He noted that the hazard mitigation plan is not a response plan and added that the purpose of the plan is to reduce the damages that result from the occurrence of hazard events. Mr.

Schmid said that the health response plans still exist. Mr. Betancur noted that as part of his duties at the Health Department, he is revamping these plans.

Mr. Gaudet asked what the source was for the number of incidents of contamination or loss of water supply. Mr. Boxhorn answered that the number of incidents reflects the number of special well casing depth areas that has been designated by the Wisconsin Department of Natural Resources. Mr. Gaudet noted that there were a number of wells contaminated due to agricultural activities in Newburg that had to be replaced and there were costs associated with that. Mr. Schmid noted that there were also costs related to wells contaminated by the pipeline spill in the Town of Jackson. He added that he anticipates that it may be difficult to get cost data related to these accidents.

Mr. Boxhorn asked whether the proposed list of hazards for the plan to address given in Table 3 of the handout was acceptable to the Local Planning Team or whether there were hazards that the Team felt should be added to the list or removed from the list.

Mr. Schmid asked whether there was any reason to drop technological hazards from the hazards to be profiled. Mr. Miller and Mr. Engel responded that they felt that the plan should profile some technological hazards.

Ms. Balcom asked whether the plan would require a community to implement recommendations if the community lacks the means to do so. Mr. Boxhorn replied that it does not. He noted that if a community is planning to implement mitigation measures for a specific hazard, they may want to add it to the list. He added that recommendations will not be developed for those hazards that are not profiled in the plan.

The Team discussed the proposed list of hazards to be profiled and addressed by the plan. They considered several different hazards that could be addressed. Mr. Puetz suggested that the plan should address terrorism, cyberattacks, loss of electric power, contamination of water supply, and hazardous material incidents. Mr. Betancur concurred with including terrorism and suggested including school violence and disease outbreaks. Ms. Balcom concurred with including cyberattack.

Ms. Balcom asked whether there would be any drawbacks to profiling and addressing a hazard in the plan. Mr. Boxhorn replied that if a hazard is profiled and addressed, the plan must include at least one recommended mitigation measure addressing that hazard. He added that implementation of such recommendations will be tracked in future updates of the plan.

Ms. Balcom asked whether profiling and addressing school violence in the plan would help schools become eligible for grant funding. Mr. Boxhorn answered that it is unlikely that FEMA would fund mitigation measures for school violence under its hazard mitigation programs. He added that he could not speak to other funding sources.

Mr. Schmid indicated that he wants the plan to address climate change. Mr. Boxhorn replied that the plan will address climate change. He noted that the guidance from FEMA requires that the plan examine future changes in hazard conditions as part of the risk analysis. He added that while he is still considering how best to address climate change in the plan, he is considering including climate projections and potential impacts in the sections on anticipated changes in hazard conditions.

It was the consensus of the Local Planning Team that the plan should profile and address all of the hazards listed in Table 3 of the handout. It was the consensus of the Local Planning Team that the plan should also profile and address cyberattack, disease outbreaks, school violence, and terrorism.

Mr. Boxhorn announced that draft chapters of the plan presenting the risk and vulnerability analysis and the goals and objectives of the plan would be presented at the next meeting of the Local Planning Team. He noted that after the next Local Planning Team meeting there will be a public meeting to present the progress to date and solicit public input. Ms. Sielski asked Mr. Boxhorn when he anticipated that the next Local Planning Team meeting would occur. He answered that the earliest possible date would be in February 2016.

Mr. Schmid thanked the members of the Local Planning Team for their participation at the meeting and in the planning effort.

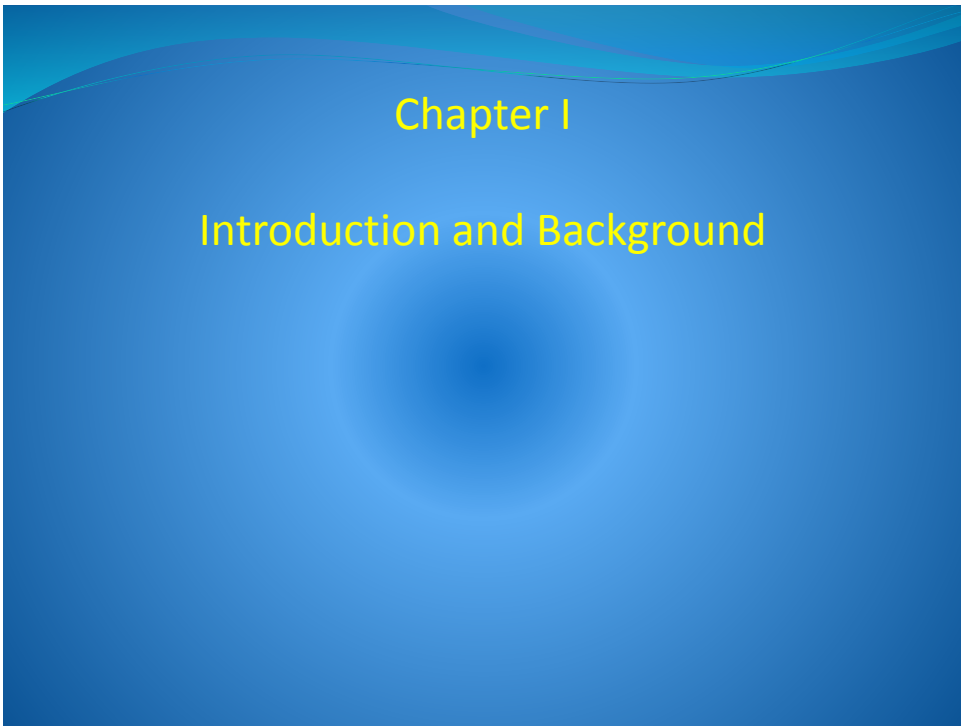
## **ADJOURNMENT**

There being no further business, the meeting was adjourned by unanimous consent at 4:09 p.m.

WASHINGTON CO HMP SUMMARY NOTES 10/19/2015 MTG (00228567).DOC  
500-1110  
LLK/JEB/kmd  
04/08/16/, 06/15/16

## **Exhibit A**

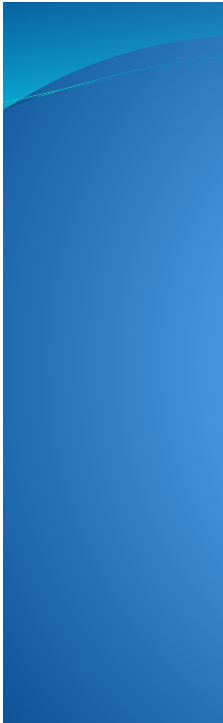
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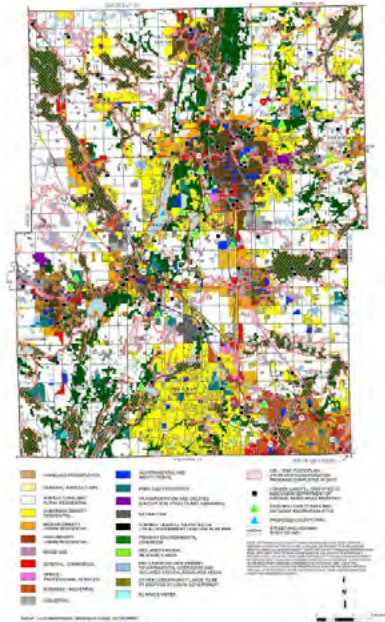






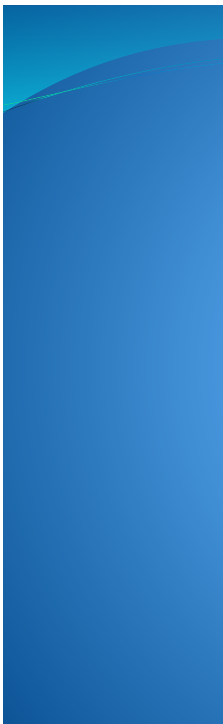


Map II - 3  
WASHINGTON COUNTY LAND USE PLAN: 2035

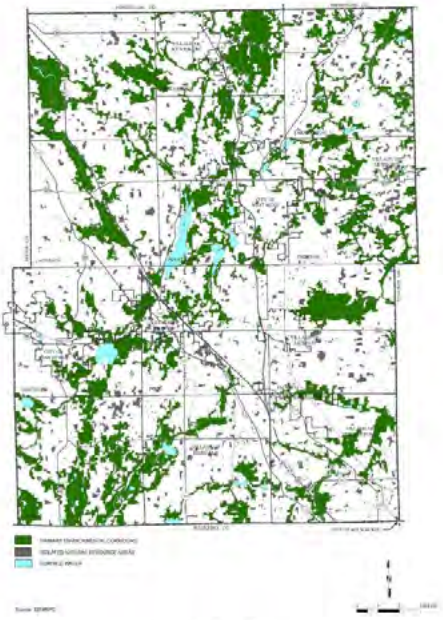


PRELIMINARY DRAFT

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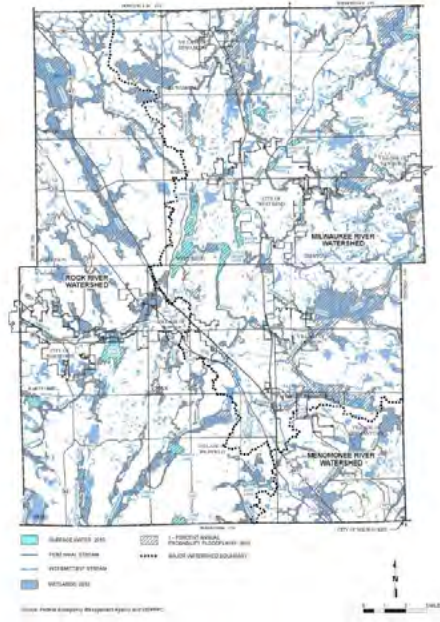
Map II - 4  
PRIMARY ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL RESOURCE AREAS  
IN WASHINGTON COUNTY: 2010



PRELIMINARY DRAFT



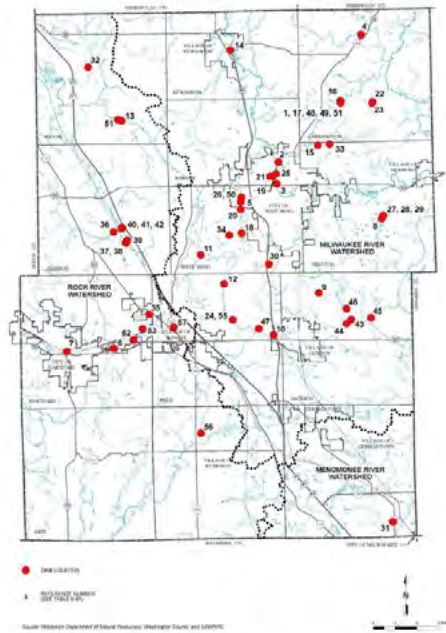
Map II - 5  
SURFACE WATERS, WETLANDS, AND FLOODPLAINS IN WASHINGTON COUNTY



PRELIMINARY DRAFT

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Map II - 6  
DAMS LOCATED WITHIN WASHINGTON COUNTY, 2015



PRELIMINARY DRAFT

Map II - 7  
 ARTERIAL STREETS AND HIGHWAYS IN WASHINGTON COUNTY: 2015



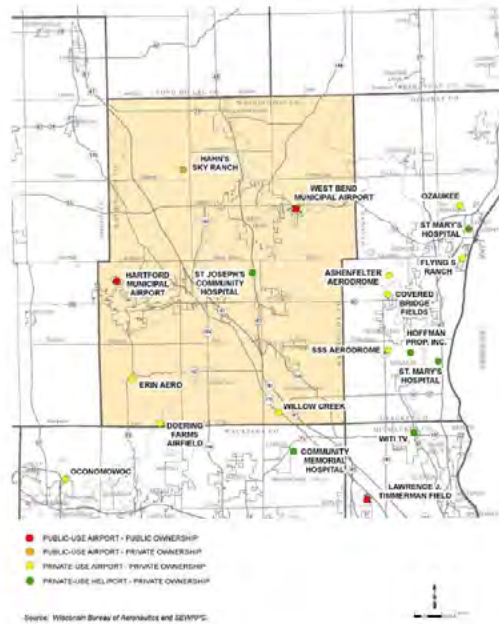
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Map II - 8  
 COMMON CARRIER RAIL FREIGHT LINES IN WASHINGTON COUNTY: 2015

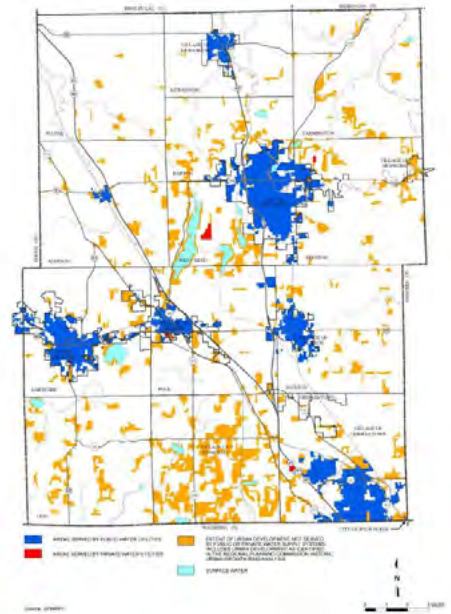


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Map II - 9  
 EXISTING AIRPORTS IN WASHINGTON COUNTY AND VICINITY: 2018

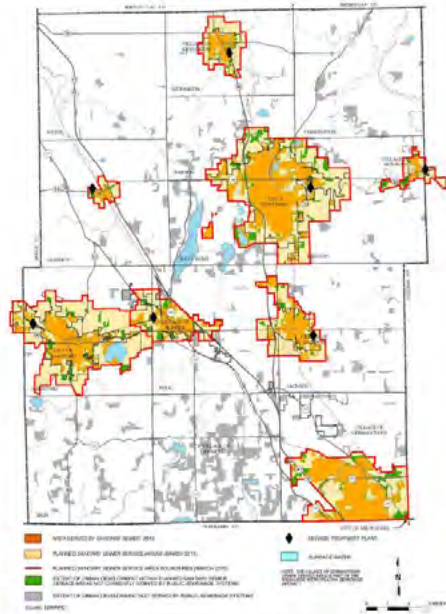


Map II - 10  
 AREAS SERVED BY PUBLIC AND PRIVATE WATER UTILITIES IN WASHINGTON COUNTY: 2010



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Map II - 11  
**PLANNED SANITARY SEWER SERVICE AREAS AND AREAS SERVED BY SEWER  
 IN WASHINGTON COUNTY**



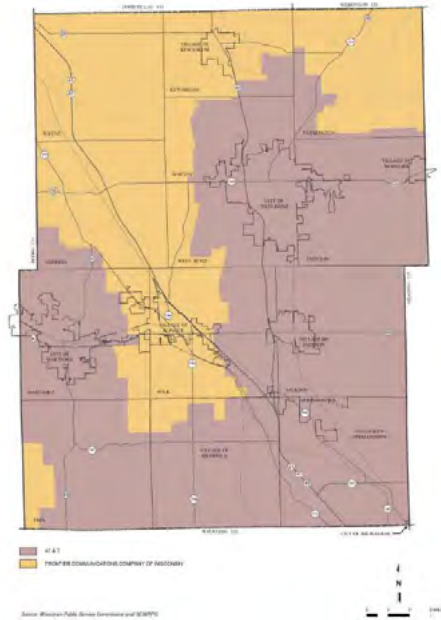
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Map II - 12  
**ELECTRIC POWER TRANSMISSION LINES, SUBSTATIONS, AND PIPELINES  
 IN WASHINGTON COUNTY, 2015**



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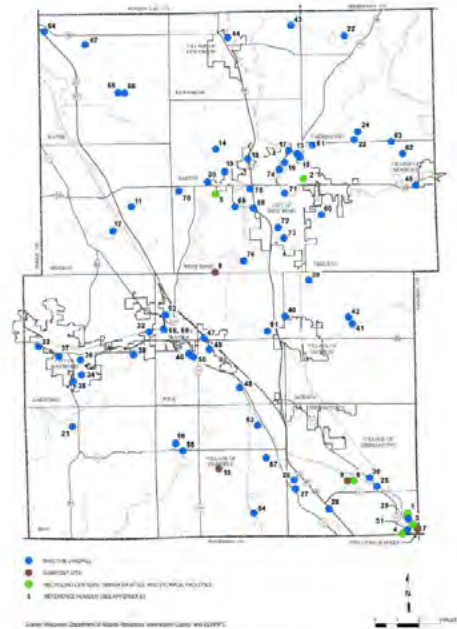
Map 8 - 13  
 TELEPHONE EXCHANGE CARRIER SERVICE AREAS IN WASHINGTON COUNTY, 2011



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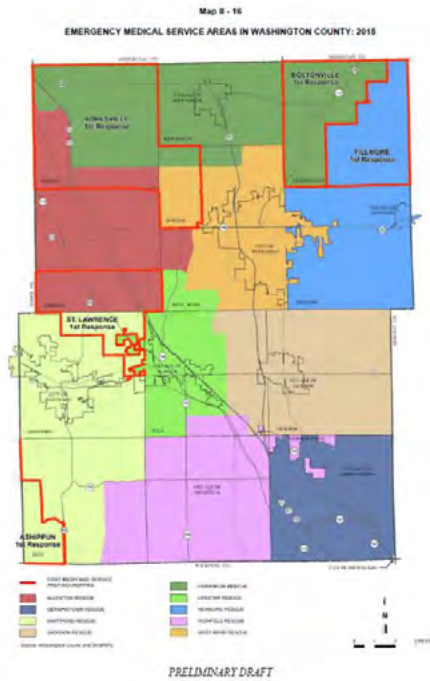
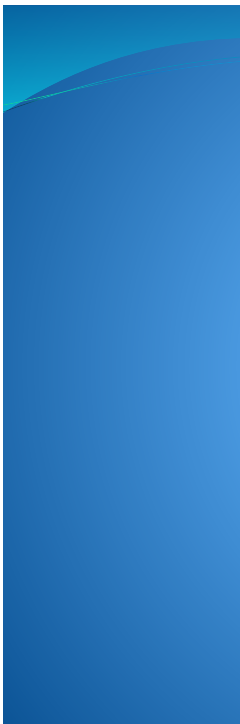
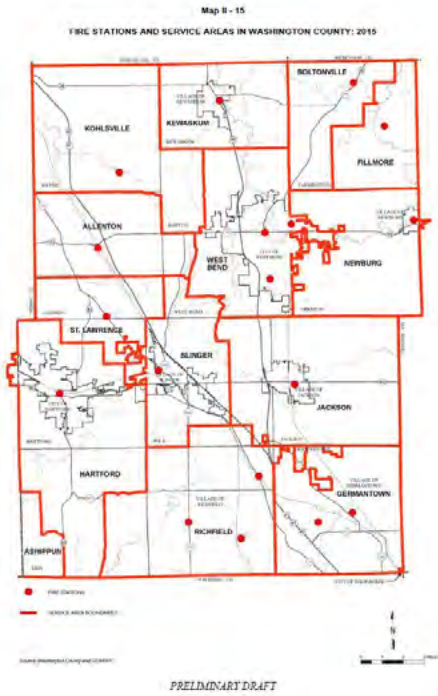
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Map 8 - 14  
 SOLID WASTE DISPOSAL SITES IN WASHINGTON COUNTY, 2015



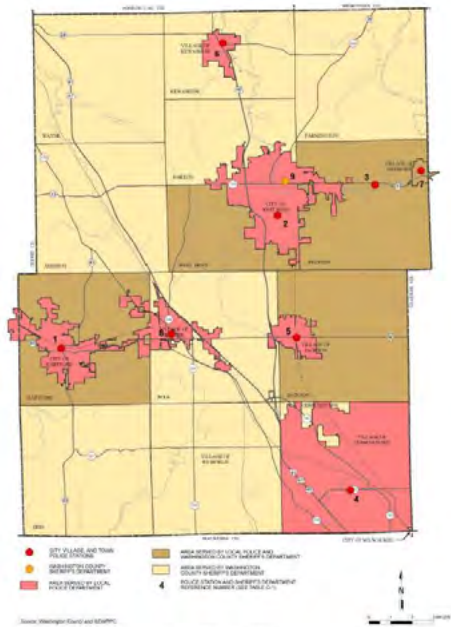
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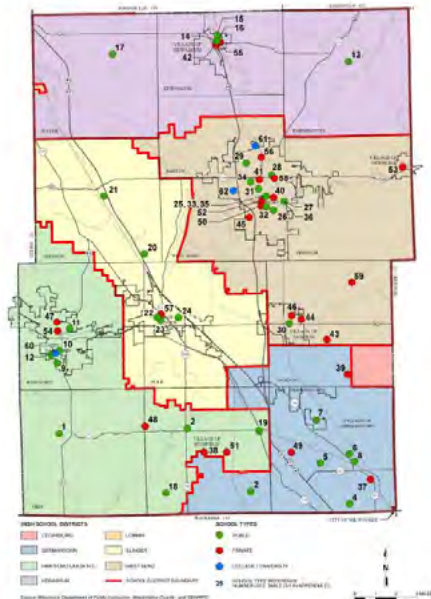


Map II - 17  
**POLICE STATIONS AND SERVICE AREAS IN WASHINGTON COUNTY: 2015**



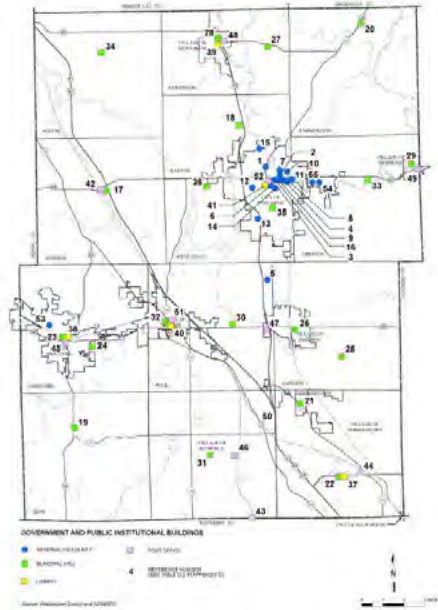
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Map II - 18  
**PUBLIC AND PRIVATE SCHOOLS AND PUBLIC HIGH SCHOOL DISTRICTS IN WASHINGTON COUNTY: 2015**



PRELIMINARY DRAFT

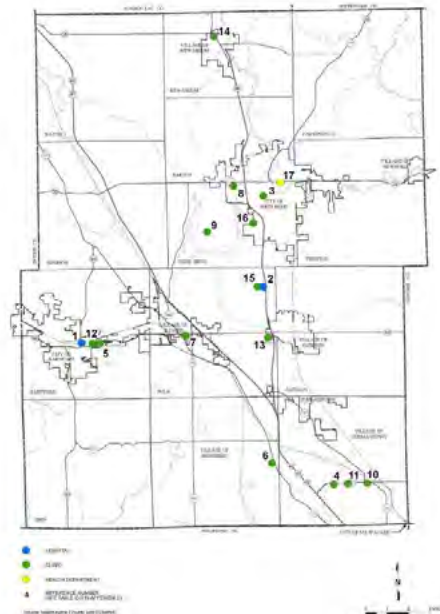
Map 8 - 19  
 GOVERNMENT AND PUBLIC INSTITUTIONAL BUILDINGS IN WASHINGTON COUNTY: 2015



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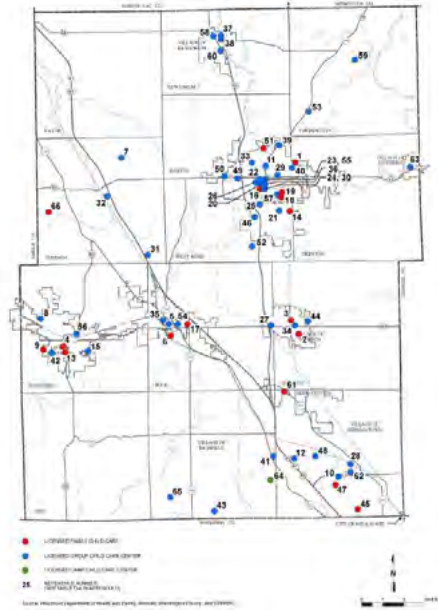
Map 8 - 20  
 HOSPITALS AND CLINICS IN WASHINGTON COUNTY: 2015



PRELIMINARY DRAFT

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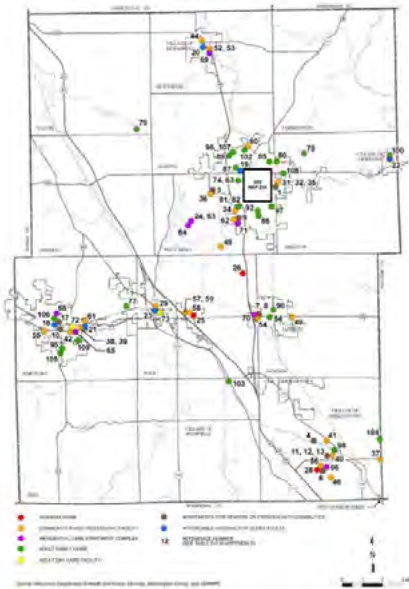
Map 8 - 21  
 CHILD CARE CENTERS IN WASHINGTON COUNTY, 2015



PRELIMINARY DRAFT

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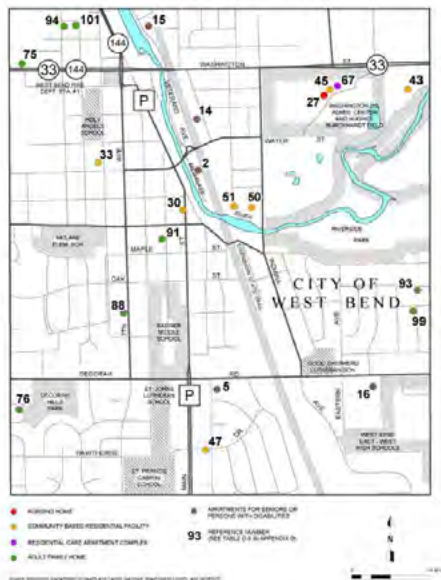
Map 8 - 22  
 NURSING HOMES, ASSISTED LIVING FACILITIES, INDEPENDENT HOUSING, AND SENIOR APARTMENTS  
 IN WASHINGTON COUNTY, 2015



PRELIMINARY DRAFT

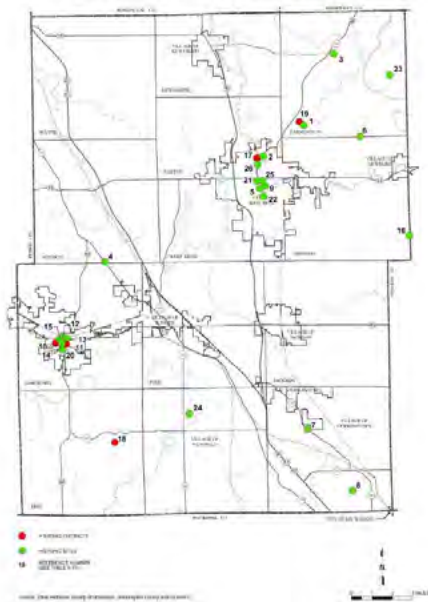
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Map 8 - 22A  
 NURSING HOMES, ASSISTED LIVING FACILITIES, INDEPENDENT HOUSING, AND SENIOR APARTMENTS  
 IN THE CITY OF WEST BEND CITY CENTER: 2015



PRELIMINARY DRAFT

Map 8 - 23  
 HISTORIC SITES AND DISTRICTS IN WASHINGTON COUNTY LISTED ON THE  
 NATIONAL AND STATE REGISTERS OF HISTORIC PLACES: 2015



PRELIMINARY DRAFT

## Hazard and Vulnerability Assessment Tool

**HAZARD AND VULNERABILITY ASSESSMENT TOOL  
WASHINGTON COUNTY HAZARD MITIGATION PLAN**

EVENT	PROBABILITY		PROPERTY VULNERABILITY		PREPAREDNESS	RISK
	Annual Probability	30 Year Probability	Human Impact	Property Impact		
<b>RISKS</b>	1-10%	1-5%	1-5%	1-5%	1-5%	1-10%
A1. Severe flooding						5%
A2. Moderate flooding						5%
A3. Low flooding						5%
A4. Tornado						5%
A5. Earthquake						5%
A6. Tsunami						5%
A7. High temperature and drought						5%
A8. Ice						5%
A9. Fire						5%
A10. Severe storm						5%
A11. Flood						5%
A12. Ice storm						5%
A13. Severe drought						5%
A14. Extreme heat						5%
A15. Drought						5%
A16. Fog						5%
A17. Dust storm						5%
B1. Contamination of use of water supply system						5%
B2. Loss of wastewater system						5%
B3. Loss of stormwater system						5%
B4. Firewater system failure						5%
B5. Electrical system failure (power outage)						5%
B6. Telephone system failure (power outage)						5%
B7. Gas system failure (power outage)						5%
B8. Water system failure (power outage)						5%
B9. Loss of emergency fuel supply (power outage)						5%
B10. Loss of emergency fuel supply (power outage)						5%
B11. Loss of emergency fuel supply (power outage)						5%
B12. Loss of emergency fuel supply (power outage)						5%
B13. Loss of emergency fuel supply (power outage)						5%
B14. Loss of emergency fuel supply (power outage)						5%
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B25. Loss of emergency fuel supply (power outage)						5%
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B28. Loss of emergency fuel supply (power outage)						5%
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B97. Loss of emergency fuel supply (power outage)						5%
B98. Loss of emergency fuel supply (power outage)						5%
B99. Loss of emergency fuel supply (power outage)						5%
B100. Loss of emergency fuel supply (power outage)						5%

**PROBABLE RISK**

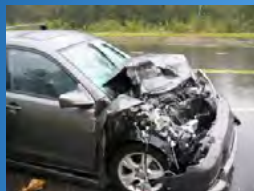
Risk = 100 x [(probability/3) x (Human impact + Property impact + Business impact + Preparedness)/(4 x 3)]

Risk = 100 x [(probability/3) x (Human impact + Property impact + Business impact + Preparedness)/(4 x 3)]

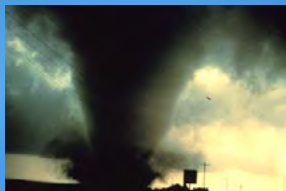
## Hazard and Vulnerability Assessment Tool

1. Risk assessment based determined by
 
$$\text{Risk} = 100 \times \left[ \left( \frac{\text{probability}}{3} \right) \times \left( \frac{\text{Human impact} + \text{Property impact} + \text{Business impact} + \text{Preparedness}}{4 \times 3} \right) \right]$$
2. Percent risk (0 to 100 percent)
3. Relative measure → Higher indicates greater perceived risk
4. Interquartile range is the range of the middle half of responses
5. Smaller interquartile range indicates greater agreement among team members → used to break ties

## HVA Results – Top 10 Perceived Risks



1. Automobile accidents



2. Tornadoes



3. Heavy snow



4. Thunderstorms



5. High straight-line wind

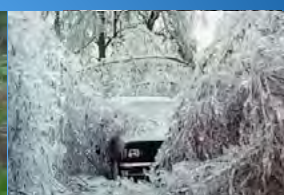
## HVA Results – Top 10 Perceived Risks



6. Lightning



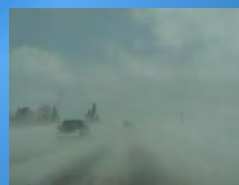
7. Hail



8. Ice storm



9. Extreme cold



10. Blizzard

## HVA Results – Other Notable Risks



### Flooding

- 11. Stormwater
- 20. Riverine

### Hazard Material Incidents

- 12. Fixed Facilities
- 13. Pipelines
- 14. Roadways
- 18. Railroads

## HVA Results – Bottom Ten Perceived Risks

- |                                    |                                   |
|------------------------------------|-----------------------------------|
| 36. Fuel shortage                  | 41. Correctional center incidents |
| 37. Large-scale food contamination | 42. Landslide                     |
| 38. Dam failure                    | 43. Land subsidence               |
| 39. Lake flooding                  | 44. Earthquake                    |
| 40. Civil unrest                   | 45. Dust storm                    |

## Hazard Identification

- FEMA requires the plan to address natural hazards
  - Examples:
    - Drought, Flooding, Thunderstorms, Tornadoes
- The plan can also address human-induced or technological hazards
  - Examples
    - Hazardous Material Incidents, Transportation Accidents

## Damage Totals

Hazard	Years	Incidents	Property Damages	Crop Damages	Total Damages
Automobile Accidents	15	39,107	339,508,400	0	339,508,400
Winter Storms	55	154	74,968,398	165,024	75,133,422
Tornadoes	51	16	72,687,186	200,140	72,887,326
Flood	17	34	20,889,857	15,900,501	36,790,358
Thunderstorms/Wind	57	218	27,508,664	8,977,811	36,486,475
Pipeline Hazmat	46	10	24,678,637	0	24,678,637
Drought	39	8	0	19,024,796	19,024,796
Hail	57	78	12,113,023	2,012,375	14,125,398
Railway Accidents	40	143	8,404,896	0	8,404,896
Lightning	57	37	5,064,470	44,763	5,109,233
Temperature Extremes	33	57	83,364	364,094	447,458



## Damage Totals

Hazard	Years	Incidents	Property Damages	Crop Damages	Total Damages
Automobile Accidents	15	39,107	339,508,400	0	339,508,400
Winter Storms	55	154	74,968,398	165,024	75,133,422
Tornadoes	51	16	72,687,186	200,140	72,887,326
Flood	17	34	20,889,857	15,900,501	36,790,358
Thunderstorms/Wind	57	218	27,508,664	8,977,811	36,486,475
Pipeline Hazmat	46	10	24,678,637	0	24,678,637
Drought	39	8	0	19,024,796	19,024,796
Hail	57	78	12,113,023	2,012,375	14,125,398
Railway Accidents	40	143	8,404,896	0	8,404,896
Lightning	57	37	5,064,470	44,763	5,109,233
Temperature Extremes	33	57	83,364	364,094	447,458

## Annual Damages

Hazard	Years	Incidents per Year	Annual Property Damages	Annual Crop Damages	Total Annual Damages
Automobile Accidents	15	2,607.13	22,633,893	0	22,633,893
Winter Storms	55	2.80	1,363,062	3,000	1,366,062
Tornadoes	51	0.32	1,469,969	3,924	1,473,893
Flood	17	0.50	614,408	467,662	1,082,070
Thunderstorms/Wind	57	3.82	482,608	157,505	640,113
Pipeline Hazmat	46	0.22	536,492	0	536,492
Drought	39	0.21	0	487,815	487,815
Hail	57	1.37	212,509	35,305	247,814
Railway Accidents	40	3.56	210,122	0	210,122
Lightning	57	0.65	88,850	785	88,065
Temperature Extremes	33	1.76	2,526	11,033	13,559

## Fatality and Injury Totals

Hazard	Years	Incidents	Fatalities	Injuries	Total
Automobile Accidents	15	39,107	206	15,356	15,562
Communicable Diseases	9	1,765	0	1,765	1,765
Sexually-Transmitted Diseases	9	1,513	0	1,513	1,513
Railway Accidents	40	143	14	46	60
<b>Tornadoes</b>	<b>51</b>	<b>16</b>	<b>3</b>	<b>56</b>	<b>59</b>
Aviation Accidents	51	75	4	16	20
Thunderstorm/Wind	39	218	1	6	7
Lightning	57	37	0	4	4
Pipeline Hazmat Accidents	46	10	0	3	3
Temperature Extremes	33	57	1	0	1

## Annual Fatalities and Injuries

Hazard	Years	Incidents per Year	Fatalities per Year	Injuries per year	Annual Total
Automobile Accidents	15	2,607.13	13.73	1,023.73	1,037.46
Communicable Diseases	9	234.20	0.00	234.20	234.20
Sexually-Transmitted Diseases	9	168.56	0.00	168.56	168.56
Railway Accidents	40	3.56	0.35	1.15	1.50
<b>Tornadoes</b>	<b>51</b>	<b>0.32</b>	<b>0.06</b>	<b>1.10</b>	<b>1.16</b>
Aviation Accidents	51	1.47	0.08	0.31	0.39
Thunderstorm/Wind	39	3.82	0.02	0.11	0.13
Lightning	57	0.64	0.00	0.07	0.07
Pipeline Hazmat Accidents	46	0.22	0.00	0.07	0.07
Temperature Extremes	33	1.73	0.02	0.00	0.02

## Hazard Identification

- Hazards with confirmed incidences, but no confirmed damage estimates
  - Dam Failure, Earthquake, Fog, Water Supply Loss or Contamination
- Hazards no confirmed incidences
  - Dust Storms, Wild Fire, Nuclear Power Plant Incidents, Terrorism
- Hazards without data on incidences or damages
  - Landslides, Land Subsidence, Correctional Center Incidents, School Violence, Transportation Hazmat, Workplace Violence

## Preliminary List of Hazards to Profile

### Natural Hazards

1. Drought
2. Flooding
3. Hail
4. Lightning
5. Temperature Extremes
6. Thunderstorm/High Wind
7. Tornadoes
8. Winter Storms

### Technological Hazards

9. Contamination or Loss of Water Supply
10. Electric Power Outages
11. Hazardous Material Incidents
12. Loss of Sewerage System
13. Transportation Accidents

## Preliminary List of Hazards to Not Profile

### Natural Hazards

1. Dam Failure
2. Dust Storms
3. Earthquake
4. Fog
5. Land Subsidence
6. Landslides

### Technological Hazards

7. Correctional Center/Jail Incidents
8. Disease Outbreaks
9. Nuclear Power Plant Incidents
10. School Violence
11. Terrorism
12. Workplace Violence

## Project Web Site

- <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>
  - Agendas and other meeting materials
  - Summary notes from meetings
  - Presentations
  - Draft chapters as they are completed
  - Comment screen
  - Other ways to send a comment
- Email to [jboxhorn@sewrpc.org](mailto:jboxhorn@sewrpc.org)

## **Exhibit B**

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Table II-5

EQUALIZED VALUE OF PROPERTY IN WASHINGTON COUNTY BY MUNICIPALITY: 2015

Municipality	Land	Improvements	Non-manufacturing Personal Property	Manufacturing Personal Property	Total
<b>Cities</b>					
Hartford <sup>a</sup> .....	\$ 252,377,700	\$ 788,389,600	\$ 19,777,400	\$ 7,572,300	\$ 1,068,117,000
Milwaukee.....	237,900	971,300	\$ 0	0	1,209,200
West Bend.....	518,787,800	1,846,141,400	49,320,900	3,829,900	2,418,080,000
Subtotal	\$ 771,403,400	\$2,635,502,300	\$ 69,098,300	\$11,402,200	\$ 3,487,406,000
<b>Villages</b>					
Germantown.....	\$ 645,711,900	\$1,705,709,400	\$ 32,989,100	\$21,503,000	\$ 2,405,913,400
Jackson.....	136,731,200	435,939,500	6,333,700	3,077,600	582,082,000
Kewaskum.....	67,894,000	212,181,700	3,354,400	449,800	283,879,900
Newburg <sup>b</sup> .....	15,531,100	51,737,400	485,200	17,100	67,770,800
Richfield.....	514,049,700	983,894,600	13,139,100	1,121,400	1,512,204,800
Slinger.....	125,504,800	332,664,700	7,882,800	434,900	466,487,200
Subtotal	\$1,505,422,700	\$3,722,127,300	\$ 64,184,300	\$26,603,800	\$ 5,318,338,100
<b>Towns</b>					
Addison.....	\$ 85,534,100	\$ 227,154,700	\$ 4,252,300	\$ 1,437,800	\$ 318,378,900
Barton.....	79,815,900	198,817,700	2,740,200	2,048,900	283,422,700
Erin.....	231,149,900	320,074,500	2,544,200	0	553,768,600
Farmington.....	110,453,000	253,323,200	1,552,800	20,100	365,349,100
Germantown.....	6,820,400	15,972,500	455,500	0	23,248,400
Hartford.....	131,194,100	229,719,300	903,900	331,100	362,148,400
Jackson.....	129,866,400	341,140,700	2,313,500	1,048,400	474,369,000
Kewaskum.....	39,596,300	81,034,000	3,040,300	0	123,670,600
Polk.....	223,316,500	354,384,900	4,771,800	1,735,900	584,209,100
Trenton.....	143,888,000	310,849,500	2,225,700	18,600	456,981,800
Wayne.....	47,912,900	147,814,600	854,900	207,100	196,789,500
West Bend.....	375,686,400	440,546,900	3,049,600	60,700	819,343,600
Subtotal	\$1,605,233,900	\$2,920,832,500	\$ 28,708,700	6,908,600	\$ 4,561,679,700
Washington County <sup>c</sup>	\$3,882,060,000	\$9,278,462,100	\$161,987,300	\$44,914,600	\$13,367,424,000

<sup>a</sup>This does not include the value of property in the portion of the City of Hartford that is located in Dodge County. The 2015 equalized values of property in the portion of the City of Hartford located in Dodge County was \$54,559,800. This consisted of \$4,354,800 of land, \$46,677,500 of improvements, \$198,800 in non-manufacturing personal property, and \$3,328,700 in manufacturing personal property.

<sup>b</sup>This does not include the value of property in the portion of the Village of Newburg that is located in Ozaukee County. The 2015 equalized values of property in the portion of the Village of Newburg that is located in Ozaukee County was \$5,665,300. This consisted of \$1,402,900 of land, \$4,185,900 of improvements, \$74,900 in non-manufacturing personal property, and \$1,600 in manufacturing personal property.

<sup>c</sup>This does not include the value of property in the portion of the City of Hartford that is located in Dodge County or the portion of the Village of Newburg that is located in Ozaukee County.

Source: Wisconsin Department of Revenue and SEWRPC.

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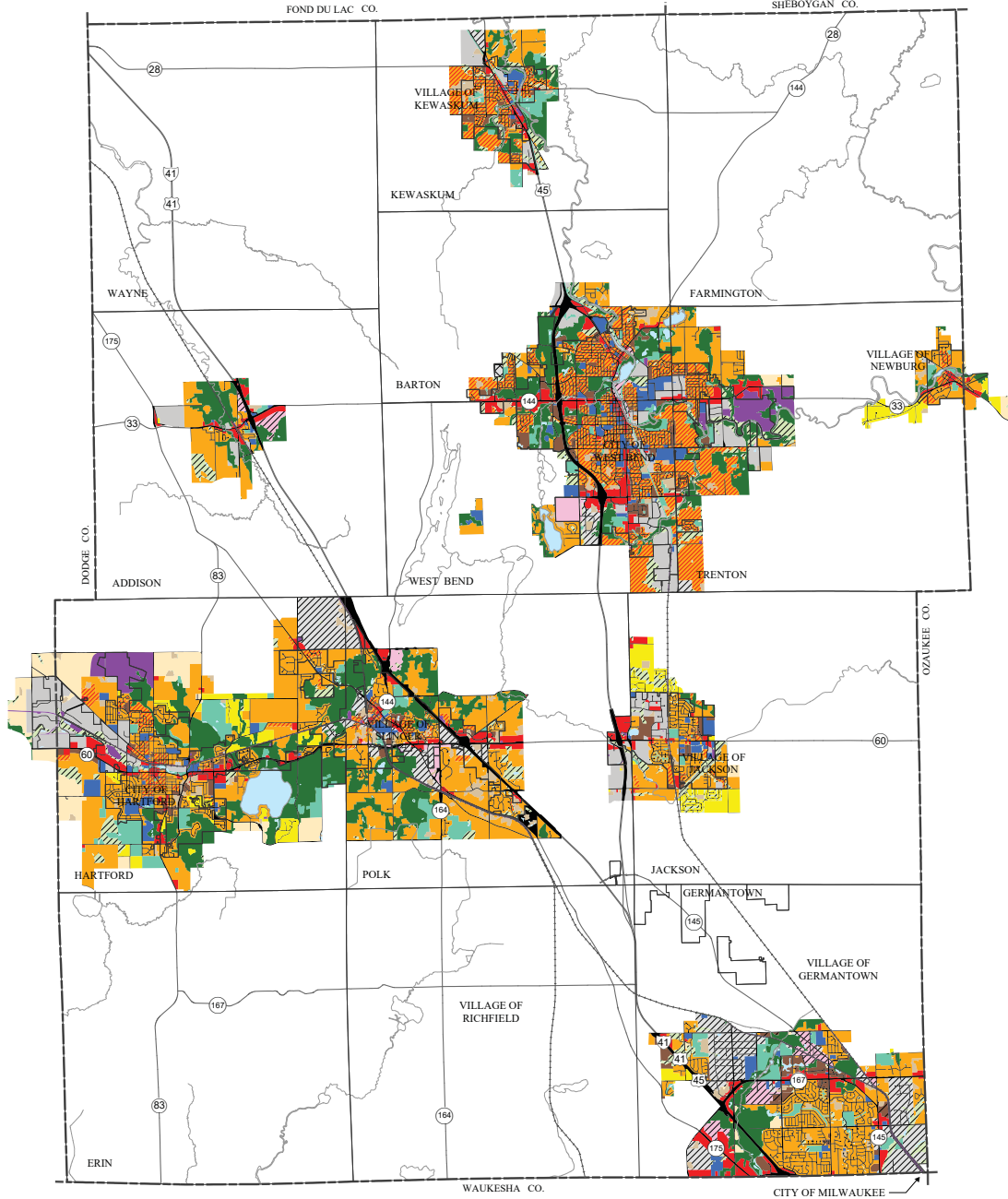


## **Exhibit C**

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Map II - 3A

LAND USE PLAN MAPS ADOPTED AS PART OF  
COMPREHENSIVE PLANS BY SEWERED COMMUNITIES IN WASHINGTON COUNTY: 2035



- |  |   |  |  |
|--|---|--|--|
|  | AGRICULTURAL AND RURAL RESIDENTIAL      |  | GOVERNMENTAL AND INSTITUTIONAL   |
|  | SUBURBAN DENSITY RESIDENTIAL            |  | PARK AND RECREATIONAL  |
|  | MEDIUM DENSITY URBAN RESIDENTIAL        |  | STREETS AND HIGHWAYS   |
|  | MEDIUM - HIGH DENSITY URBAN RESIDENTIAL |  | TRANSPORTATION AND UTILITIES (EXCEPT FOR STREETS AND HIGHWAYS)   |
|  | HIGH - DENSITY URBAN RESIDENTIAL        |  | FORMER LANDFILL IDENTIFIED ON LOCAL GOVERNMENT LAND USE PLAN MAP   |
|  | HOUSING FOR THE ELDERLY                 |  | PRIMARY ENVIRONMENTAL CORRIDOR   |
|  | MIXED USE                               |  | ISOLATED NATURAL RESOURCE AREA   |
|  | GENERAL COMMERCIAL                      |  | OTHER OPEN LAND TO BE PRESERVED (INCLUDES WETLANDS OUTSIDE OF PRIMARY ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL RESOURCE AREAS) |
|  | OFFICE / PROFESSIONAL SERVICES          |  | SURFACE WATER  |
|  | BUSINESS / INDUSTRIAL                   |  |  |
|  | INDUSTRIAL                              |  |  |

NOTE: PLANNED LAND USE CATEGORIES FROM CITY, VILLAGE, AND TOWN PLANS HAVE BEEN STANDARDIZED FOR MAPPING PURPOSES (SEE TABLE A-2-1). MAP INCLUDES AREAS WITHIN PLANNED SEWER SERVICE AREAS AND ADDITIONAL AREAS PROPOSED TO BE SERVED BY SANITARY SEWERS IN LOCAL COMPREHENSIVE PLANS.

Source: Washington County, Local Governments, and SEWRPC.

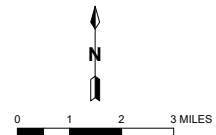


Table A-2-1

RELATIONSHIP BETWEEN LAND USE CATEGORIES USED ON LOCAL GOVERNMENT LAND USE PLAN MAPS IN WASHINGTON COUNTY TO STANDARDIZED URBAN RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL CATEGORIES USED TO PREPARE MAP III-3A

Community	Suburban Density Residential	Medium Density Residential	Medium-High Density Residential	High Density Residential and Housing for the Elderly	Mixed Use	General Commercial	Office and Professional Services	Business and Industrial	Industrial
Cities									
Hartford	Low Density Residential	Medium Density Residential, 1.1 to 2.9 units per acre and 3.0 to 5.81 units per acre	Medium Density Residential, 5.82 to 8.0 units per acre	High Density Residential, 8.0 to 11.0 units per acre and 11.0 to 14.0 units per acre	N/A	General Commercial	N/A	N/A	Industrial
West Bend	N/A	Single-Family Residential zoned RS-1 and RS-2	Two-Family Residential; Single-Family Residential zoned RS-3 and RS-4	Multi-Family Residential	Mixed Use	Commercial	Office Park	Business Park	Industrial
Villages									
Germentown	Rural Residential	Low Density Residential; Medium Density Residential	N/A	High Density Residential; Elderly Residential	Village Mixed Use; Mixed Use	Commercial	N/A	Industrial/Office	N/A
Jackson	N/A	One-Family Residential	Two-Family Residential	Multi-Family Residential	N/A	General Commercial	N/A	N/A	Industrial
Kewaskum	N/A	Medium-Low Density Residential; Low Density Residential	Medium-High Density Residential; Medium Density Residential	High Density Residential	N/A	Commercial	N/A	Business Park	Industrial
Newburg	Rural Residential	Village Residential zoned R-1, R-2, and R-3	Village Residential zoned R-4 and RD-1	Village Residential zoned RM-1	N/A	Village Commercial; Highway Commercial	N/A	N/A	Industrial
Slinger	N/A	Low Density Single Family Residential; Medium Density Single Family Residential	High Density Single Family Residential; Two Family Residential	Multiple Family Residential; Mobile Home Park; Potential Senior Housing	N/A	Neighborhood Commercial; Commercial	Office and Professional Services	Business Park; Light Industrial/Manufacturing and Service Business Park; Future Business/Industrial Park	N/A
Towns									
Addison	Residential--Unsewered	Residential--Sewered	N/A	N/A	Commercial/Residential--Sewered	Commercial	N/A	Mixed Commercial/Industrial	Industrial

<sup>a</sup>Includes only these land use categories within the portion of the Town proposed to be served by sanitary sewers in 2035.

Source: SEWRPC.

## **Exhibit D**

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Table 1

## PRELIMINARY ESTIMATES OF HAZARD INCIDENTS AND DAMAGES AFFECTING WASHINGTON COUNTY

Hazard	Period	Incidents	Fatalities	Injuries	Property Damages (2014 dollars)	Crop Damages (2014 dollars)
<b>Natural Hazards</b>						
Dam Failure	1964-2014	1	0	0	0	0
Drought	1976-2014	8	0	0	0	19,024,796
Dust Storms	1958-2014	0	0	0	0	0
Earthquake	1957-2014	15	0	0	0	0
Flood	1981-2014	17	0	0	20,889,857	15,900,501
Fog	1999-2014	79	0	0	0	0
Hail	1958-2014	78	0	0	12,113,023	2,012,375
Land Subsidence	No Data	--	--	--	--	--
Landslides	No Data	--	--	--	--	--
Lightning	1958-2014	37	0	4	5,064,470	44,763
Temperature Extremes	1982-2014	57	1	0	83,364	364,094
Thunderstorms/High Winds	1958-2014	218	1	6	27,508,664	8,977,811
Tornadoes	1964-2014	16	3	56	72,687,186	200,140
Winter Storms/Snow/Ice	1960-2014	154	0	0	74,968,398	165,024
Wild Fires/Forest Fires	1958-2014	0	0	0	0	0
<b>Human-Induced Hazards</b>						
Automobile Accidents	1999-2013	39,107	206	15,356	339,508,400	0
Aviation Accidents	1964-2015	75	4	16	0	0
Communicable Diseases	2005-2013	1,765	--	--	--	--
Sexually-Transmitted Diseases	2005-2013	1,513	--	--	--	--
Correctional Center Incident	No Data	--	--	--	--	--
Loss of Sewerage System	No Data	--	--	--	--	--
Nuclear Power Plant Incident	2000-2014	0	0	0	0	0
Pipeline Hazmat Accidents	1969-2014	10	0	3	24,678,637	0
Power Outages	No Data	--	--	--	--	--
Railway Accidents	1975-2014	143	14	46	8,404,896	0
School Violence	No Data	--	--	--	--	--
Terrorism	1970-2014	0	0	0	0	0
Transportation Hazmat Accidents	No Data	--	--	--	--	--
Water Supply Loss or Contamination	1991-2014	18	0	0	0	0
Workplace Violence	No Data	--	--	--	--	--

Source: SEWRPC.

Table 2

## ANNUAL INCIDENCE OF HAZARDS AND DAMAGES AFFECTING WASHINGTON COUNTY

Hazard	Years of Record	Incidents per Year	Fatalities per Year	Injuries per Year	Annual Property Damages (2014 dollars)	Annual Crop Damages (2014 dollars)
Natural Hazards						
Dam Failure	51	0.02	0.00	0.00	0	0
Drought	39	0.21	0.00	0.00	0	487,815
Dust Storms	57	0.00	0.00	0.00	0	0
Earthquake	58	0.26	0.00	0.00	0	0
Flood	34	0.50	0.00	0.00	614,408	467,662
Fog	16	4.94	0.00	0.00	0	0
Hail	57	1.37	0.00	0.00	212,509	35,305
Land Subsidence	No Data	--	--	--	--	--
Landslides	No Data	--	--	--	--	--
Lightning	57	0.65	0.00	0.07	88,850	785
Temperature Extremes	33	1.73	0.02	0.00	2,526	11,033
Thunderstorms/High Winds	57	3.82	0.02	0.11	482,608	157,505
Tornadoes	51	0.32	0.06	1.10	1,469,969	3,924
Winter Storms	55	2.80	0.00	0.00	1,363,062	3,000
Wild Fires	57	0.00	0.00	0.00	0	0
Human-Induced Hazards						
Automobile Accidents	15	2,607.13	13.73	1,023.73	22,633,893	0
Aviation Accidents	51	1.47	0.08	0.31	0	0
Communicable Diseases	9	234.20	--	--	--	--
Sexually-Transmitted Diseases	9	168.56	--	--	--	--
Correctional Center Incident	No Data	--	--	--	--	--
Loss of Sewerage System	No Data	--	--	--	--	--
Nuclear Power Plant Incident	15	0.00	0.00	0.00	0	0
Pipeline Hazmat Accidents	46	0.22	0.00	0.07	536,492	0
Power Outages	No Data	--	--	--	--	--
Railway Accidents	40	3.56	0.35	1.15	210,122	0
School Violence	No Data	--	--	--	--	--
Terrorism	45	0.00	0.00	0.00	0	0
Transportation Hazmat Accidents	No Data	--	--	--	--	--
Water Supply Loss or Contamination	24	0.75	0.00	0.00	0	0
Workplace Violence	No Data	--	--	--	--	--

Source: SEWRPC.



**Table 3**

**PRELIMINARY LIST OF HAZARDS TO PROFILE IN THE WASHINGTON COUNTY HAZARD MITIGATION PLAN**

Natural Hazards	Human-Induced Hazards
Drought	Contamination or Loss of Water Supply
Flooding	Electric Power Outages
Hail	Hazardous Material Incidents
Lightning	Loss of Sewerage System
Temperature Extremes	Transportation Accidents
Thunderstorms/High Winds	
Tornadoes	
Winter Storms	

Source: SEWRPC.

**Table 4**

**PRELIMINARY LIST OF HAZARDS NOT TO BE PROFILED  
IN THE WASHINGTON COUNTY HAZARD MITIGATION PLAN**

Natural Hazards	Human-Induced Hazards
Dam Failure	Correctional Center Incident
Dust Storms	Cyber Attack/Crime
Earthquake	Disease Outbreaks
Land Subsidence	Nuclear Power Plant Incidents
Landslide	School Violence
	Terrorism
	Workplace Violence

Source: SEWRPC

Washington County Emergency Management Office  
Southeastern Wisconsin Regional Planning Commission

**Notice of Meeting and Agenda**

**WASHINGTON COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM**

DATE: June 29, 2016  
TIME: 2:00 to 5:00 p.m.  
PLACE: Washington County Sheriff's Department  
EOC/Training Room (Room 3011)  
500 N. Schmidt Road  
West Bend, Wisconsin

AGENDA:

1. Roll Call
2. Consideration of Summary Notes of October 19, 2015 Local Planning Team Meeting (a copy of the draft summary notes is available for download from the SEWRPC website at: <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>)
3. Discussion of hazards to be addressed by the Washington County Hazard Mitigation Plan
4. Consideration of Chapter III, "Analysis of Hazard Conditions," of SEWRPC Community Assistance Planning Report No. 326, *Washington County Hazard Mitigation Plan* (a copy of the draft chapter is available for download from the SEWRPC website at: <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>)
5. Consideration of Chapter IV, "Hazard Mitigation Goals," of SEWRPC Community Assistance Planning Report No. 326, *Washington County Hazard Mitigation Plan* (a copy of the draft chapter is available for download from the SEWRPC website at: <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>)
6. Discussion of arrangements for August 10, 2016, public meeting
7. Adjourn

Joseph E. Boxhorn  
Secretary

*Individual County Board Supervisors may attend the above meeting. It is possible that such attendance may constitute a meeting of the county board or any of its committees pursuant to State ex rel. Badke v. Greendale Village Board, 173 Wis. 2d 553, 494 N.W. 2d 408 (1993). This notice does not authorize attendance at either the above meeting or the Badke meeting, but is given solely to comply with the notice requirements of the open meeting law.*

**AFFIDAVIT OF POSTING**

*This agenda was posted in the office of the County Clerk on this 15th day of June 2016. Notice was sent to the West Bend News, Express News, WBKV/WBWI Radio, WTKM Radio, My Community NOW, Hartford Times Press, Kewaskum Statesman, Milwaukee Journal-Sentinel. Individuals with disabilities requiring special accommodations for attendance at the meeting should contact the County Clerk at (262) 335-4301 at least 48 hours prior to the meeting.*

WASHINGTON CO HMP MEETING NOTICE JUNE 29 2016 (00232483).DOC  
500-1110  
LLK/JEB/kmd  
06/08/16

## **SUMMARY NOTES OF THE JUNE 29, 2016 MEETING OF THE WASHINGTON COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM**

### **INTRODUCTION**

The June 29, 2016, meeting of the Washington County Hazard Mitigation Plan Local Planning Team was convened at the Washington County Sheriff's Department at 2:03 p.m. The meeting was called to order by Rob Schmid, Washington County Emergency Management Coordinator. Attendance was taken by circulating a sign-in sheet.

In attendance at the meeting were the following individuals:

#### Local Planning Team Members

Rob Schmid, Chair	Emergency Management Coordinator, Washington County
Joseph E. Boxhorn, Secretary	Senior Planner, Southeastern Wisconsin Regional Planning Commission
Brad Bautz	Director of Emergency Management, Town of Erin
Ryan Betancur	Emergency Preparedness Coordinator, Washington County Health Department
Tom Bishop	Chief of Police, Village of Kewaskum
Richard Engel	Chairman, Washington County Volunteer Organizations Active in Disasters/Assistant Emergency Coordinator Amateur Radio Emergency Service
Phil Gaudet	Land Resources Manager, Washington County Land Use Division
Joe Gonnering	Chairman, Town of Trenton
Jim Healy	Village Administrator, Village of Richfield
Ray Heidtke	Chairman, Town of Jackson
Laura L. Kletti	Chief Environmental Engineer, Southeastern Wisconsin Regional Planning Commission
Don Kriefall	Washington County Supervisor
Gerald W. Kudek	Fire Chief, City of West Bend
Chris Marks	Emergency Management Director, Village of Richfield
Aaron W. Owens	Planner, Southeastern Wisconsin Regional Planning Commission
Jeff Puetz	Director of ERM, West Bend Mutual Insurance
Mark Piotrowicz	City Planner, City of West Bend
Scott Schmidt	County Engineer/Highway Commissioner, Washington County
Deb Sielski	Deputy Administrator, Washington County Planning and Parks Department
Paul J. Stephans	Fire Chief, City of Hartford

Mr. Schmid welcomed the attendees to the meeting, thanked them for their participation, and asked them to introduce themselves.

### **CONSIDERATION OF THE SUMMARY NOTES OF THE OCTOBER 19, 2015 LOCAL PLANNING TEAM MEETING**

Mr. Schmid introduced Joseph E. Boxhorn of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) staff. At Mr. Schmid's request, Mr. Boxhorn reviewed the summary notes of the

October 19, 2015 meeting of the Local Planning Team. He stated that several exhibits are attached to the summary notes. He indicated that Exhibit B contains a revised version of Table II-5. He noted that the table has been revised to show equalized property values from the 2015 equalization. He added that the table also give a more detailed breakdown of types of property.

Mr. Boxhorn stated that Exhibit C contains Map II-3A and Appendix A-2, which he proposes to add to Chapter II. He explained that this map shows planned land use for year 2035 for the incorporated municipalities in the County. He noted that Appendix A-2 shows how the categories on the map relate to the categories in the local plans. He noted that the accompanying text to be added to Chapter II can be found at the top of page 4 of the summary notes.

Mr. Boxhorn asked whether there were any corrections, questions, or comments on the summary notes. Mr. Schmid noted that Mr. Groelshel's name was misspelled in the summary notes. Mr. Boxhorn indicated that this would be corrected. No other additions or corrections were offered.

Mr. Boxhorn indicated that the Local Planning team members could send him any comments or corrections to the summary notes by electronic mail or through the comments screen on the project webpage. He proposed that if he receives no comments by July 8, 2016, he will consider the summary notes to present an accurate reflection of what transpired at the October 19, 2015, meeting.

## **DISCUSSION OF HAZARDS TO BE ADDRESSED BY THE WASHINGTON COUNTY HAZARD MITIGATION PLAN**

Mr. Schmid noted that the draft of Chapter III that the Local Planning Team will review during most of this meeting gives an assessment of risks associated with the hazards that the Team selected at the October 19, 2015 meeting for the plan to address. He stated that he would like the Team to review several hazards in light of the risk analyses presented in Chapter III and reconsider the appropriateness of addressing them in the County hazard mitigation plan. Mr. Schmid added that this also presents a final opportunity for the Team to propose any additional hazards for the plan to address.

Mr. Schmid stated that the risk analysis presented in Chapter III for school violence found no history of this hazard occurring in Washington County. He reported that he discussed the possibility of the hazard mitigation plan addressing this hazard with the law enforcement liaison officers to schools in the County. He stated that the liaison officers indicated that this issue was being adequately addressed through efforts of the school districts and the Sheriff's and police departments in the County. He added that the liaisons also indicated that they felt that this was not an appropriate issue to address within the hazard mitigation plan. Mr. Schmid proposed removing this hazard from the hazards to be addressed by the plan. Mr. Boxhorn explained that if the Team would decide to remove school violence from the list of hazards that the plan addresses, the risk analysis for this hazard would be removed from Chapter III and a short discussion of school violence would be added to the section of the chapter that discusses hazards that were considered for inclusion but rejected. The consensus of the Local Planning Team was to remove school violence from the list of hazards to be addressed by the hazard mitigation plan.

[Secretary's Note: The section discussing school violence on pages 92-97 of Chapter III was deleted from the Chapter. The entry for school violence was deleted from Table III-6. The following paragraph was added after the third full paragraph on page 11 of Chapter III:

*“School Violence*

School violence is violence that occurs on school property, on the way to or from school or school-sponsored events, or during school-sponsored events. Violence is the intentional use of physical force or power against another person, group, or community, with the behavior likely to cause physical or psychological harm. While systematic data are not available on incidents of school violence in schools located in Washington County, national data suggest that there has been a long-term decrease in the levels of school violence.<sup>10</sup> Liaisons from law enforcement departments to schools in Washington County have indicated that this issue is being adequately addressed through activities conducted by the school districts and law enforcement agencies within the County. Because of this, school violence will not be considered further in subsequent sections of this report.

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<sup>10</sup>*Simone Robers, Jana Kemp, Amy Rathburn, Rachel E. Morgan, and Thomas D. Snyder, Indicators of School Crime and Safety: 2013, U.S. Department of Education National Center for Educational Statistics and U.S. Department of Justice Bureau of Justice Statistics, (NCES 2014-042/NCJ 243229), June 2014.*

Subsequent footnotes in the chapter were renumbered.]

Mr. Schmid stated that he wanted to discuss the status of three additional hazards that were selected for the plan to address: cyberattack, communicable disease outbreaks, and terrorism.

Mr. Schmid asked whether the Team wished to retain cyberattack as a hazard for the plan to address. After some discussion, the consensus of the Local Planning Team was to retain this hazard.

Mr. Schmid asked whether the Team wished to retain communicable disease outbreaks as a hazard for the plan to address. After some discussion, the consensus of the Local Planning Team was to retain this hazard.

Mr. Schmid asked whether the Team wished to retain terrorism as a hazard for the plan to address. After some discussion, the consensus of the Local Planning Team was to retain this hazard.

Mr. Schmid asked the Team whether there were any other hazards that should be added to or removed from the list of hazards that the plan will address. None were offered.

**CONSIDERATION OF CHAPTER III, “ANALYSIS OF HAZARD CONDITIONS,” OF SEWRPC COMMUNITY ASSISTANCE PLANNING REPORT NO. 326, WASHINGTON COUNTY HAZARD MITIGATION PLAN**

At Mr. Schmid’s request, Mr. Boxhorn reviewed preliminary draft Chapter III, “Analysis of Hazard Conditions,” of SEWRPC Community Assistance Planning Report No. 326, *Washington County Hazard Mitigation Plan*. Mr. Boxhorn indicated that he would display copies of the maps from Chapters III and IV on the projection screen in the meeting room during discussion of these chapters.

[Secretary’s Note: Mr. Boxhorn’s presentation is attached herein as Exhibit A.]

Mr. Boxhorn explained that this chapter addresses three major issues: 1) it documents how the hazards addressed in the plan were identified, 2) it briefly describes how the risk and vulnerabilities associated with these hazards were assessed, and 3) it presents a profile of each of the identified hazards. He added that the profiles include a definition and description of the hazard, descriptions of notable historical instances of the hazard that affected the County, descriptions of notable recent instances of the hazard that affected the County, an assessment of vulnerabilities to and likely impacts from the hazard, a description of potential future changes in impacts from the hazard, and a discussion of any differences among communities in the risks that they face from the hazard.

Mr. Boxhorn reviewed the section of the chapter on hazard identification. He noted that the results from the hazard and vulnerability assessment tool that were discussed at the October 19, 2015 meeting were incorporated into this section. No comments or questions were offered on this section.

Mr. Boxhorn reviewed the section chapter on vulnerability assessment analysis methods and procedures. He noted that this section includes a subsection describing climate trends since 1950 and climate projections for the middle of the 21st century. He explained that this subsection is used in the discussion of potential future changes for individual hazards later in the chapter. No comments or questions were offered on this section.

Mr. Boxhorn reviewed the section of the chapter on flooding and associated stormwater drainage problems. He noted that the first two paragraphs of this section on page 16 will be rearranged and that the duplicated sentence will be removed.

[Secretary's Note: The first two paragraphs on page 16 were revised to read (text in bold is included here, and in similar subsequent Secretary's Notes, to indicate language changed or added onto the text. Text will not be bold in the report):

“Flooding is a significant hazard in Washington County. As described in Chapter II, there are approximately 220 miles of major streams in the County, located within four watersheds: the Fox (Illinois) River, the Menomonee River, the Milwaukee River, and the Rock River watersheds. Floodplains are the wide, gently sloping areas contiguous to, and lying on both sides of, a stream channel. For planning and regulatory purposes, **floodplains** are normally defined as the areas subject to inundation by the one-percent-annual-probability (100-year recurrence interval) flood event. The floodplains shown on Map II-5 in Chapter II of this report have been identified by Washington County, the Wisconsin Department of Natural Resources (WDNR), and FEMA. Approximately 38,850 acres, not including surface water in lakes and existing stream channels, or about 14 percent of the total area of the County, are located within the one-percent-annual-probability flood hazard area. **There are also 14 major lakes in Washington County. Some of the one-percent-annual-probability floodplains in the County are associated with these lakes.**

A consideration in flood hazard mitigation is the potential for increased flooding due to dam failures. **As indicated in Table II-8A in Chapter II, there are 57 existing dams in Washington County. Hazard ratings have been assigned by the WDNR for 28 of these. One of those dams has been assigned a high hazard rating, two have been assigned significant hazard ratings, and the remaining 25 have been assigned low hazard ratings.<sup>18</sup> Both dams built according to accepted engineering standards at the time**

**of construction and dams built without application of engineering principles can fail. When a dam fails or is subject to overtopping, large quantities of water can rush downstream with great destructive force. Because of the presence of one high hazard and two significant hazard dams in the County, future evaluation of floodplain areas related to dam failure should be considered. It should be noted that between 1990 and 2014 there was not loss of life associated with dam failures in Washington County.”**

The text of footnote number 18 was not changed.]

Mr. Schmidt noted that Main Street in the City of West Bend is no longer County Trunk Highway (CTH) P. He asked that the CTH P label be removed from Map III-5A. Mr. Boxhorn replied that it would be removed.

[Secretary’s Note: The CTH P label was removed from Map III-5A.]

Mr. Boxhorn reviewed the subsection on historical flood events. He noted that this subsection is organized by watershed. Mr. Schmid asked that West Branch of the Menomonee River be added to the streams listed as being in the portion of the watershed that is located in Washington County.

[Secretary’s Note: The sixth sentence in the last paragraph on page 20 of the draft chapter was revised to read:

“Other streams of this watershed that are located in Washington County include Goldenthal creek, the Nor-X-Way Channel, the North Branch of the Menomonee River, **the West Branch of the Menomonee River**, and Willow Creek.”]

Mr. Healy asked whether the discussion of flooding in the plan would make it easier for municipalities to receive funding for acquiring and removing flood prone lakeside properties. Mr. Boxhorn replied that adoption of the plan makes the municipalities eligible for funding through the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the Pre-disaster Mitigation Program, all of which are administered by FEMA.

Mr. Boxhorn noted that he had obtained pictures of flooding in the Village of Slinger that had apparently occurred during the 1940s, but could find no records or descriptions of the event. He asked that anyone who has information on this event pass it on to him.

Mr. Boxhorn reviewed the subsection on historical flood events. No comments or questions were offered on this subsection.

Mr. Boxhorn reviewed the subsection on recent flood events. No comments or questions were offered on this subsection.

Mr. Boxhorn reviewed the subsection on vulnerability and community impacts assessment. He stated that two different analyses were conducted to assess the impacts of a one-percent-annual probability flood: an analysis using FEMA’s HAZUS-MH software and a parcel-based analysis.

Mr. Boxhorn stated that the Wisconsin Division of Emergency Management (WEM) performed an analysis using HAZUS-MH to estimate the impacts of a one-percent-annual probability flood. He noted

that this analysis used a flood depth grid developed by the Wisconsin Department of Natural Resources (WDNR). He explained that HAZUS-MH makes estimates at the level of census blocks used in the 2010 U.S. Census. He added that the software estimates the value of structures at risk from flooding by value of structures in the census block based on the fraction of the block that is located within the floodplain. He thanked Caitlin Shanahan of the WEM staff for her efforts in performing this analysis. He noted that he feels that the estimates of flood damages resulting from the HAZUS-MH analysis probably represent an overestimate of the damages that would result from a one-percent-annual probability flood for reasons that are described in Chapter III.

Mr. Boxhorn stated that SEWRPC staff performed a parcel-based analysis to estimate the impacts of a one-percent-annual probability flood. He explained that this was done using a geographic information system (GIS) to identify structures in the floodplain. He added that damages resulting from flooding were estimated based upon the assessed value of the structure, flood elevations from the flood insurance study, and topographic mapping. He thanked Julia Orłowski of the SEWRPC staff for her efforts in conducting this analysis.

Mr. Piotrowicz asked whether the results of the parcel-based analysis were checked against FEMA's Letters of Map Amendment (LOMAs). Ms. Kletti replied that this is generally not done in this type of analysis.

[Secretary's Note: The parcel-based analysis was checked against the FEMA Letters of Map Amendment. Based upon the findings of this comparison the first three sentences in the first full paragraph on page 29 were revised to read:

“The parcel-based loss analysis refined the property value data presented by community in Chapter II to reflect specific flood prone structure information. There are currently **987** structures estimated to be located within the one-percent-annual-probability (100-year recurrence interval) flood hazard areas of Washington County. The locations of these structures are shown on Maps III-2 and II-3. There are **667** residential structures; **106** industrial, business, and commercial structures; **64** agricultural buildings; **137** residential mobile homes; **11** governmental structures; and **2** other structures.”

Maps III-3 and III-4 and Tables III-8 and III-9 were revised to reflect the findings of the comparison. Revised versions of Maps III-3 and III-4 and Tables III-8 and III-9 are included herein as Exhibit B.

The third full paragraph on page 29 was revised to read:

“Estimated damages from the parcel-based analysis are shown in Table III-8 for the one-percent-annual-probability (100-year recurrence interval) flood event. In 2015, the total value of the **987** structures that are identified as being subject to flooding was about **\$132.9 million**. Damages expected during a one-percent-annual-probability flood event affecting the entire County are estimated to be **\$22.9 million**.]

Mr. Healy noted that Maps III-2 and III-3 show 55 residential structures in the floodplain adjacent to Druid Lake. He indicated that the floodway for this floodplain has been adjusted and asked that the floodplain be checked.



[Secretary's Note: The structures within the floodplain adjacent to Druid Lake was reviewed in conjunction with the comparison of the results of the parcel-based analysis to the FEMA LOMAs. The number of residential structures was found to be 53. This is shown on the revised versions of Maps III-2 and III-3 that are included in Exhibit B.]

Mr. Gaudet asked what assumptions were made to produce the damage estimates in the parcel-based analysis. Mr. Boxhorn replied that the assumptions are discussed on pages 27-28 of the draft chapter. He indicated that the first floor of residential buildings were assumed to be one foot above ground level. He added that the value of buildings were taken from the 2015 assessed value of improvements to the properties obtained from the County Assessor's Office.

Mr. Healy commented that he feels that the floodplain modeling conducted by the WDNR was overly conservative. He indicated that the Village of Richfield will be contracting with a consultant to develop their own floodplain models. Mr. Piotrowicz commented that the most recent Digital Flood Insurance Rate Maps (DFIRMs) for the Milwaukee River are more generalized than the previous DFIRMs which were based on more specific models.

[Secretary's Note: The following paragraph was added after the second full paragraph on page 26:

“The analyses estimating the damages that would result from a one-percent-annual probability were based on the floodplains that were available at the time the analyses were conducted. Several floodplain mapping projects are being conducted in Washington County which would refine these floodplains and associated data and could potentially change the damage estimates. These projects are described in Chapter V of this report.]

Mr. Schmid noted that Table III-9 does not include any specific flood considerations for the Village of Slinger and asked whether this is correct. Mr. Boxhorn replied that the parcel-based analysis found that there were no structures located within the floodplain in the Village. He indicated that this finding was specifically double checked. A Team member noted that there are some stormwater issues in the Village.

Mr. Healy stated that the Richfield Volunteer Fire Company will be selling its fire station No. 4 and building a new facility at Heritage Park near the center of the Village of Richfield. He noted that the new station will be out of the floodplain.

Mr. Boxhorn reviewed the subsections on agricultural flood damages, stormwater drainage problems, potential future changes, and multi-jurisdictional risk analysis. Mr. Kriefall asked whether the agricultural damages presented are expressed in current dollars. Mr. Boxhorn answered that they are expressed in 2014 dollars.

Mr. Piotrowicz noted that the orange dots on Map III-5A are not located at the sites of schools. Ms. Sielski added that the legend for this map does not indicate what the yellow dots depict. Mr. Boxhorn replied that he would check and correct the legend for his map.

[Secretary's Note: The legend for Map III-5A was corrected.]

Mr. Boxhorn reviewed the section on thunderstorms and associated hazards. Ms. Sielski noted that the legend to Map III-7 should read Washington County instead of Kenosha County.

[Secretary's Note: The legend on Map III-7 was corrected to read "Washington County."]

Mr. Boxhorn reviewed the section on tornadoes. No comments or questions were offered on this section.

Mr. Boxhorn reviewed the section on extreme temperatures. No comments or questions were offered on this section.

Mr. Boxhorn reviewed the section on winter storms. No comments or questions were offered on this section.

Mr. Boxhorn reviewed the section on drought. He explained that Table III-21 compares crop damage estimates attributed to drought in the National Climatic Data Center storm event database to the indemnities paid for losses due to drought by Federal crop insurance programs. He noted that there was little overlap between the estimates from these two sources. He stated that in those cases where the two overlap, the higher value was used. No comments or questions were offered on this section.

Mr. Boxhorn reviewed the section on transportation accidents. Mr. Piotrowicz asked whether the accident rates shown on Map III-10 were normalized against traffic levels. Mr. Boxhorn replied that they were. Mr. Healy noted that the Wisconsin Department of Transportation's rationale for planned roadwork along State Trunk Highway 164 is based upon high accident rates at intersections. He added that Map III-10 does not seem to show this. Mr. Schmidt responded that the analysis shown in the map is conducted on a segment-by-segment basis. He noted that problems at specific intersections may not show up in this type of analysis.

Mr. Boxhorn reviewed the section on contamination or loss of water supply. He noted that the section examines both groundwater and surface water sources of supply. He explained that although public water supply in the County relies exclusively on groundwater, there are some surface water withdrawals for other uses.

Mr. Kudek asked what the area labeled "Critical Recharge Area" on Map III-12 represents. Mr. Boxhorn gave a brief description of the aquifer system under Washington County. He stated that there are two aquifer systems underneath the County: a shallow aquifer system consisting of aquifers in glacial deposits and dolomite and a deep aquifer system consisting of aquifers in sandstone. He explained that under most of the County, these systems are separated by a layer of shale that prevents water from moving between the two systems. He indicated that this shale layer is absent in the area labeled "Critical Recharge Area." He added that this is the only area in the County providing recharge to the deep aquifer system and consequently the only area in the County in which contaminants deposited on the land's surface could potentially contaminate the deep aquifer system.

Mr. Stephans stated that one of the City of Hartford's wells is located in Dodge County. He asked whether this well is located within the critical recharge area. Mr. Boxhorn replied that his understanding is that all of the City's wells are finished in the shallow aquifers.

[Secretary's Note: Examination of currently active and permanently abandoned wells for the City of Hartford in the WDNR Groundwater Retrieval Network (GRN) database shows that all of the City's currently active wells are finished in the shallow aquifer. The City abandoned its last well in the deep sandstone aquifer in around 2009.]

Mr. Stephans stated that the well for the Erin Hills Golf Course may be finished in the deep aquifer. Mr. Boxhorn replied that this may be so and noted that this is a private well.

[Secretary's Note: Review of information in the WDNR GRN database shows that the Erin Hills Golf Course has five wells. Four of these are finished in the shallow aquifer and one is finished in the deep aquifer. It should be noted that the WDNR classifies these wells as being part of a transient non-community water system. This type of water system was not inventoried as part of the hazard mitigation plan.]

Mr. Boxhorn reviewed the section on loss of sewerage system. He noted that this section only applies to municipalities with either sanitary sewage conveyance systems or sanitary sewage conveyance and treatment systems. No comments or questions were offered on this section.

Mr. Boxhorn reviewed the section on hazardous material incidents. No comments or questions were offered on this section.

Mr. Boxhorn reminded the Local Planning Team that based on their decision during the discussion of hazards for the plan to address, the section on school violence would be removed from the chapter.

Mr. Boxhorn reviewed the section on terrorism. No comments or questions were offered on this section.

Mr. Boxhorn reviewed the section on cyberattack on local government. He noted that based upon State and national data, there are large differences in the estimates of risk. No comments or questions were offered on this section.

Mr. Boxhorn reviewed the section on electrical system outages. He indicated that he has some additional material to add to this section. No comments or questions were offered on this section.

[Secretary's Note: The following paragraph was added after the first paragraph on page 109:

“Most recent power outage events affecting Washington County are short term, lasting from a few hours to, at most a few days. Long-term events can happen. Two examples from outside Wisconsin illustrate this. In January 1998, the Montreal, Canada area experienced a major ice storm. The power outages resulting from this storm impacted over four million residents. Portions of the Montreal area were without power for over three weeks. Similarly, an ice storm hit the State of Kentucky in January 2009. At the peak of the storm, about 700,000 customers were without power. Two weeks after the storm 50,000 customers were still without power. It took 38 days to restore power to all of the affected customers.”

The following paragraphs were added after the second paragraph on page 109:

“While likely to be rare, the impacts of a long-term power outage affecting Washington County could be large. Such an event would likely involve many downed trees and power lines. Downed power lines can present safety hazards for residents, travelers, and emergency responders. The response to such an event would be hampered by roads blocked by power lines and debris.

“Given experiences like the Montreal and Kentucky events and the 1976 Washington County ice storm described in the section on winter storms, it is

possible that a significant portion of Washington County's population and facilities could be without power for one to three weeks, should a particularly severe event occur. Following the 2009 Kentucky ice storm, about 37 percent of affected customers were without power one week after the storm. About 7 percent were still without power after two weeks. The Kentucky event resulted in 36 fatalities. The largest cause of death related to this event was carbon monoxide poisoning resulting from improper generator use. Given that the average high and low temperatures in Washington County during the winter are considerably colder than those in Kentucky,<sup>87</sup> the impacts on human life of an ice storm causing a power outage of similar severity in Washington County may be even greater.

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*<sup>87</sup>For example, average high temperatures during January are 43°F and 26°F, respectively in Louisville and West Bend. Average low temperatures during January are 27°F and 11°F, respectively, in Louisville and West Bend."*

The footnotes following this were renumbered.]

Mr. Boxhorn reviewed the section on communicable disease outbreaks. Mr. Schmid asked that definitions of disease outbreaks, epidemics, and pandemics be added to this section. He indicated that he would send suggested definitions via electronic mail. No other comments or questions were offered on this section.

[Secretary's Note: Mr. Schmid submitted suggested definitions to SEWRPC staff via electronic mail. A copy of Mr. Schmid's message is included herein as Exhibit C. The first full paragraph on page 110 was revised to read:

**"Several terms are used to describe episodes of communicable diseases. A "disease outbreak" describes a limited area of disease occurrence in a community at a particular time. An "epidemic" describes the outbreak and spread of a disease in a community that affects a significant number of people and/or animals over a relative short period of time. Epidemics may also occur as part of the aftermath of natural disasters, such as floods or tornadoes, or human-induced hazards, such as terrorist incidents. A "pandemic" is an epidemic that has spread over a large region, such as a country, a continent, or the world."**]

During the meeting, Mr. Bautz provided comments on Chapter III to Ms. Kletti of the SEWRPC staff. Mr. Bautz stated that Table III-13 lists tornado number 3 as having impacted the Town of Erin; however, Map III-8 shows this tornado in the City of Hartford. He also noted that some thunderstorms that are shown as having affected the Town of Erin on Map III-7 are listed in Table III-10 as having occurred in Holy Hill or Hartford.

[Secretary's Note: Mapping coordinates and location descriptions for all storm events shown on Maps III-7 and III-8 were obtained from the National Climatic Data Center's (NCDC) storm event database and supplemented with descriptions given in the monthly storm data reports published by the NCDC and previously published by its predecessor agencies. Three aspects of the NCDC's reporting practices should be kept in mind when interpreting the locations

shown on Maps III-7 and III-8 and listed in the tables. First, the NCDC reports locations to the nearest minute of a degree. On maps that show an individual county, this can add some uncertainty to locations. Second, storms such as thunderstorms and tornadoes move across the landscape. As a result of this, a single storm may affect multiple communities. The storms are shown on the maps as points, both for clarity purposes and because information on the actual storm tracks are not available for most of the storms. Third, the National Weather Service, which is the source of much of the data in the NCDC database, often identifies locations of storm events using names of nearby communities, including unincorporated settlements. These names may not be reflective of political boundaries.]

Mr. Bautz asked whether the May 31, 1998 derecho which affected the Town of Erin is shown on Map III-7.

[Secretary's Note: This event is listed in Table III-10 as number 134. It is listed on Map III-7 among the events that affected the entire County.]

**CONSIDERATION OF CHAPTER IV, "HAZARD MITIGATION GOALS," OF SEWRPC COMMUNITY ASSISTANCE PLANNING REPORT NO. 326, *WASHINGTON COUNTY HAZARD MITIGATION PLAN***

At Mr. Schmid's request, Mr. Boxhorn reviewed the preliminary draft of Chapter IV of the plan report. Mr. Boxhorn stated that the goals and objectives listed in this chapter have been largely taken from other plans such as land use, park and open space, and watershed plans. He explained that FEMA wants to see hazard mitigation planning integrated into other planning. He indicated that one way to do this is to link the plans through their goals.

Mr. Piotrowicz commented that he feels that the phrase "maintains biodiversity" should not be included in Goal No. 2, noting that he does not view this as being tied to hazard mitigation. He added that he feels that objectives 4, 5, and 6 under this goal should also be removed for the same reasons. He noted that he has no such difficulties with these issues in the context of other plans, such as comprehensive and park and open space plans.

The Team discussed Mr. Piotrowicz's comments. Mr. Puetz noted that the biodiversity is affected by drought hazards. Mr. Gaudet commented that preservation of biodiversity helps preserve wetlands, noting that this prevents development of monocultures in wetlands. He added that the presence of monocultures reduces the effectiveness of wetlands in storing water. Mr. Betancur noted that reductions in biodiversity can increase likelihood of vector-borne diseases occurring.

Mr. Schmid asked whether the goals and objectives presented in Chapter IV appear in other county hazard mitigation plans. Mr. Boxhorn replied that he used the goals and objectives from the Kenosha County hazard mitigation plan as a starting point for developing the goals and objectives for the Washington County plan. He added that these are also similar to those given in Racine County's plan and the City of Milwaukee's plan.

Mr. Boxhorn asked the Local Planning Team whether they wanted to remove the phrase "maintain biodiversity" and objectives 4 through 6 from Goal 2. Several Team members expressed reluctance to make a decision at this point, noting that they felt that there should be more examination of the issue. Ms. Sielski suggested that SEWRPC staff consult with the SEWRPC Chief Biologist and ask for his analysis

of the issue. Mr. Boxhorn indicated that he would discuss this topic with the Chief Biologist and report views of the Chief Biologist at the next meeting of the Local Planning Team.

[Secretary's Note: Goal 2 and Objectives 4 through 6 under Goal 2 were discussed with Dr. Thomas M. Slawski, SEWRPC Chief Biologist. Dr. Slawski indicated that when development occurs it is important to protect the integrity of natural systems to protect them from natural hazards. He emphasized that the protection of natural areas and the connectivity of natural areas is essential to protect human community infrastructure and quality of life from natural hazards. He explained that this is important to minimize the damage that occurs during a hazard event and to reduce the recovery time after such an occurrence. He noted that both of these effects act to reduce the total cost to the community resulting from a hazard incident. Based upon Dr. Slawski's suggestions, Goal 2 on page 4 was revised to read:

“A spatial distribution of the various land uses that maintains **connectivity among** and will result in the protection and wise use of the natural resources of the County, including its, soils, inland lakes and stream, groundwater, wetlands, woodlands, wildlife, and natural areas and critical species habitat.”

Goal No. 2 in Table IV-1 was revised to read:

“A spatial distribution of the various land uses that maintains **connectivity among** and will result in the protection and wise use of the natural resources of the County, including its, soils, inland lakes and stream, groundwater, wetlands, woodlands, wildlife, and natural areas and critical species habitat.”

Objectives and Standards 4, 5, and 6 under Goal No. 2 in Table IV-1 were revised to read:

“4. The types and distribution of land uses should be developed to minimize loss and fragmentation of Primary Environmental Corridors and isolated natural resource areas and wetlands (particularly those adjacent to streams and lakes) and promote connectivity among those natural resource areas in order to protect and preserve the ecological resilience and resistance to natural hazards.”]

## **DISCUSSION OF ARRANGEMENTS FOR THE AUGUST 10, 2016 PUBLIC MEETING**

Mr. Boxhorn announced that the first public informational meeting regarding the hazard mitigation plan will be held on Wednesday, August 10, 2016, from 6:00 p.m. to 8:00 p.m. He note that this meeting will be held in Rooms 1113A and B at the County's Public Agency Center, at 333 E. Washington Street, West Bend. He stated that the purposes of the meeting will be to present progress on plan development to date and solicit public input. He indicated that members of the Local Planning Team are welcome to attend this meeting, but that it is not a meeting of the Team.

Mr. Schmid stated that WEM has applied to FEMA for an extension of the deadlines for completing several hazard mitigation plans, including the Washington County plan. He indicated that this extension request was planned as part of the schedule for plan development, due to the short performance period attached to the grant.

Mr. Boxhorn reminded the Local Planning Team that additional comments on Chapters I through IV can be emailed to him. He added that they can also be sent through the comment screen on the hazard mitigation planning page of the SEWRPC website.

[Secretary's Note: This page also has materials from meetings and draft chapters and is at: <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>]

Mr. Schmid thanked the members of the Local Planning Team for their participation at the meeting and in the planning effort.

## **ADJOURNMENT**

There being no further business, the meeting was adjourned by unanimous consent at 4:03 p.m.

## **INFORMATION ON HAZARDOUS MATERIAL COMMODITY FLOW THROUGH WASHINGTON COUNTY PROVIDED BY ROB SCHMID, WASHINGTON COUNTY EMERGENCY MANAGEMENT COORDINATOR**

Subsequent to the June 29, 2016 meeting of the Local Planning Team, Mr. Schmid provided SEWRPC staff with copies of a study examining the flow of hazardous materials through Washington County and information from the Canadian National Railroad regarding the types and quantities of dangerous goods transported through the County on their rail lines.

[Secretary's Note: The following paragraphs were added after the first full paragraph on page 92 of Chapter III:

“In 2011, Washington County examined the flow of hazardous materials through the County via several elements of the County's transportation network, including highways and railways.<sup>66</sup> As part of this study, random observations of traffic were conducted on highways at 10 locations and railroads at two locations in the County during late June and early July 2011. These observations noted the information displayed on the required hazardous material placards shown on vehicles carrying hazardous material cargo.

The study found that the number of vehicles displaying placards while traveling along the highway that passed these sites ranged between 0 vehicles per hour and 36.0 vehicles per hour, with an average of 6.1 vehicles per hour. Average numbers of vehicles per hour displaying placards varied among highway sites, ranging between 0.0 vehicles per hour and 14.5 vehicles per hour. Vehicles transporting hazardous materials were observed more frequently on USH-41<sup>67</sup> than on USH-45 or State trunk highways. Average numbers of vehicles observed transporting hazardous materials on USH-41, USH 45, and State trunk highways were 12.39 vehicles per hour, 3.2 vehicles per hour, and 1.9 vehicles per hour, respectively. The study also found that the number of railroad cars displaying placards while passing railroad crossings in the County ranged between 0 cars per hour and 16.0 cars per hour, with an average of 4.5 cars per hour.

The placards indicating eight out of nine general categories of hazardous materials were observed on vehicles traveling on highways in Washington

County. No placards indicating the presence of radioactive materials were observed. Flammable liquids, corrosive substances, and compressed gases accounted for 53 percent, 20 percent, and 18 percent, respectively, of the general categories shown on the placards that were observed. Specific placards for 54 different substances were observed. About 44 percent of vehicles carrying placards that specifically identified a substance were carrying gasoline. Six other substances were observed being carried by 3 percent or more of vehicles with placards identifying specific substances: sodium hydroxide solution, liquids held at elevated temperatures, alcohols, liquefied petroleum gas, refrigerated liquefied carbon dioxide gas, and refrigerated liquefied nitrogen gas. The majority of vehicles displaying hazardous material placards while travelling along highways in the County consisted of tanker and semi-trailer trucks. About 94 percent of the railroad cars displaying placards were tanker cars.

The study also examined the types and quantities of extremely hazardous and hazardous substances present at fixed facilities in the County. This was done by examining a random sample of 31 emergency response contingency plans from fixed facilities that are on file with the County. The substances present at these facilities in the largest quantities were sulfuric acid, anhydrous ammonia, aluminum sulfide, nitric acid, and phosphoric acid. Four substances were reported as being present at more than facility: sulfuric acid, anhydrous ammonia, nitric acid, and chlorine.

The Canadian National Railroad provided the Washington County Emergency Management Office with a list of dangerous goods which it transported through the Village of Slinger for the year 2013. This list included 50 hazardous substances. Materials in seven out of nine general categories of hazardous substances were represented on the list. In addition, the list included substances classified as “combustible liquids,” which are not included among the nine general categories. The list did not include any explosive or radioactive substances. Based upon “dangerous goods units” given on the list, the majority of hazardous materials shipped along the Canadian National Railroad through Washington County in 2013 consisted of flammable liquids, combustible liquids, flammable solids, and corrosive substances.”

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<sup>66</sup>*Washington County Local Emergency Planning Committee, “Hazardous Materials Commodity Flow Study,” August 2011.*

<sup>67</sup>*Since the study was conducted, this highway has been redesignated IH-41.*

The subsequent in the Chapter footnotes were renumbered.]



## EXHIBIT A

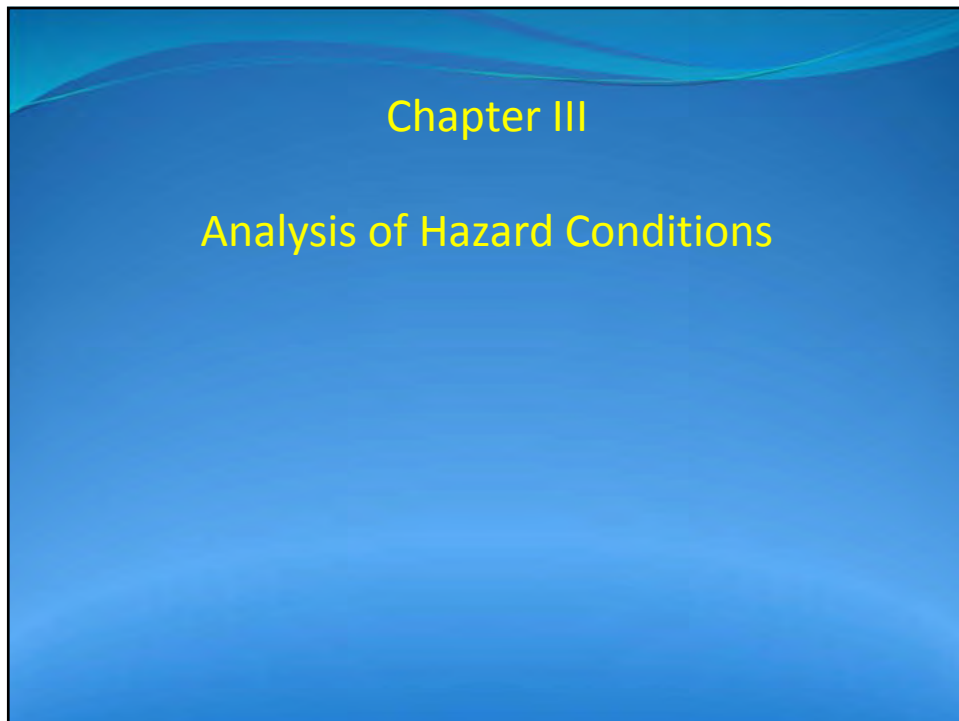


**Washington County Hazard Mitigation Plan:  
Local Planning Team Meeting**  
June 29, 2016

**SEWRPC**  
Serving the counties of  
Kenosha, Milwaukee,  
Ozaukee, Racine, Walworth,  
Washington, and Waukesha

Joseph E. Boxhorn, Ph.D., Senior Planner  
Southeastern Wisconsin Regional Planning Commission

# 232242



**Chapter III**

**Analysis of Hazard Conditions**

## EXHIBIT A

### Chapter III Overview

- Documents the identification of the hazards that the plan addresses
  - This includes brief descriptions of hazards that are not addressed but were considered for inclusion during the planning process
- Describes how risks and vulnerabilities were assessed
- Gives a profile of each hazard addressed by the plan

### Hazard Identification

Table III-6  
SUMMARY OF HAZARDS TO BE CONSIDERED IN THE WASHINGTON COUNTY HAZARD MITIGATION PLAN

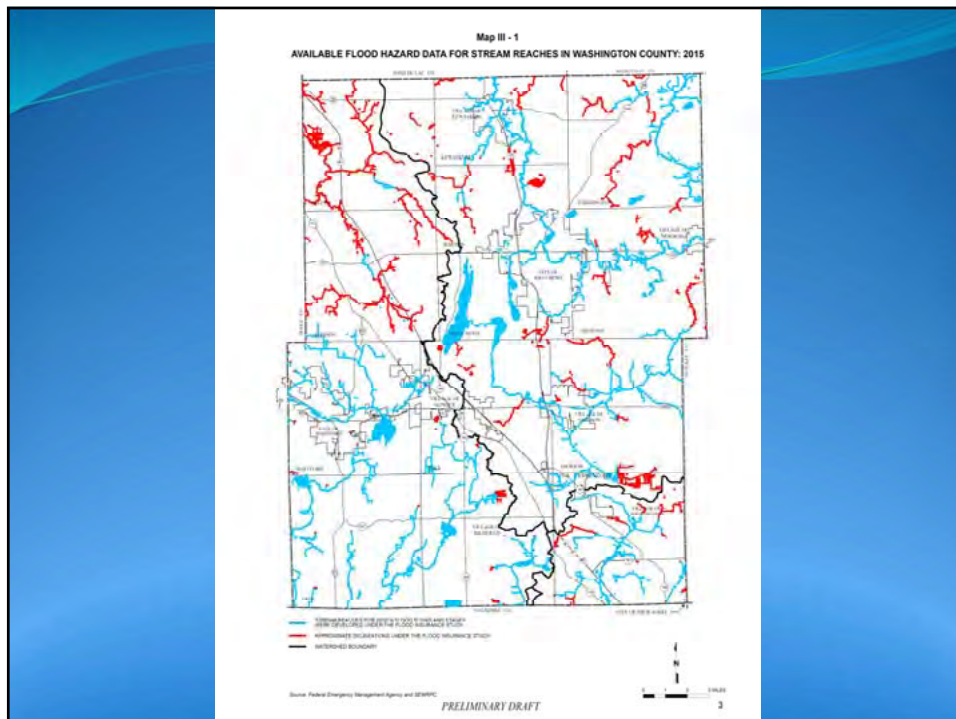
Hazard	Risk of Occurrence (high, medium, or low)	Warning Time (short, medium, or long)	Damage to Property (high, moderate, or low)	Threat to Life Safety (high, medium, or low)	Duration of Impact (long, moderate, or short)	Size of Area Affected (large, medium, or small)
<b>Natural Hazards</b>						
Flooding and Stormwater Drainage Problems	High	Medium	High	Low	Moderate	Large
Thunderstorms, High-Wind, Hail, and Lightning	High	Short	High	High	Long	Small
Tornadoes	Low	Medium	High	Medium	Short	Large
Extreme Temperatures	Medium	Long	Low	Medium	Moderate	Large
Winter Storms	Medium	Medium	Low	Medium	Moderate	Large
Drought	Medium	Medium	Low	Low	Long	Large
<b>Technological/Human-Induced Hazards</b>						
Transportation Accidents	Medium	Short	Moderate	High	Short	Small
Contamination or Loss of Water Supply System	Low	Short	Moderate	Medium	Moderate	Medium
Loss of Sewerage System	Low	Short	Moderate	Medium	Moderate	Medium
Hazardous Material Incidents	High	Short	Low	Medium	Moderate	Small
School Violence	Low	Short	Low to moderate	Medium	Short	Small
Terrorism Incident	Low	Short	Moderate to high	High	Short	Small to medium
Cyberattack on Local Government	Low	Short	Moderate	Low	Moderate	Small to medium
Electrical System Outage	Medium	Short	Low	Low	Short	Small to medium
Communicable Disease Outbreak	Low	Short to medium	Low	High	Moderate to long	Small to large

Source: Washington County Division of Emergency Management, Washington County All Hazards Mitigation Plan Local Planning Team, and SEWRPC.

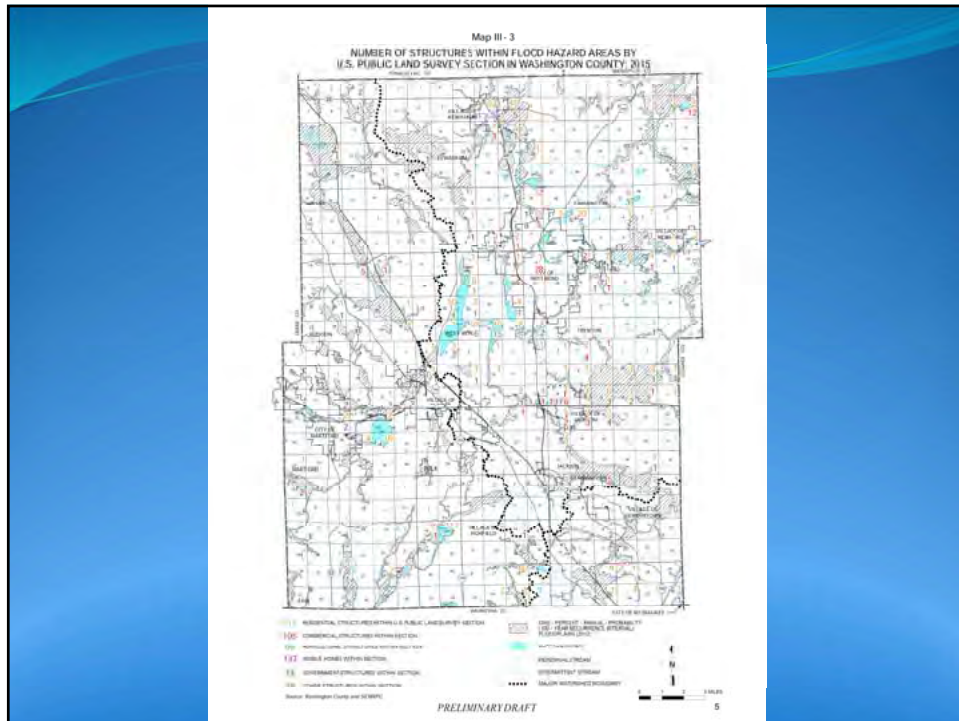
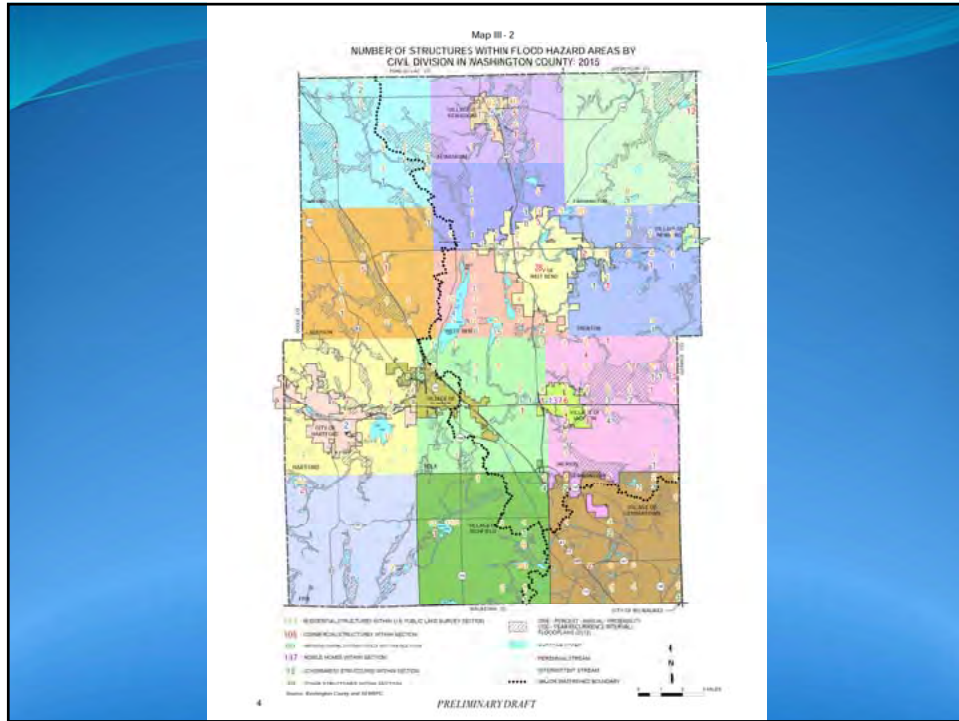
## EXHIBIT A

### Hazard Profiles

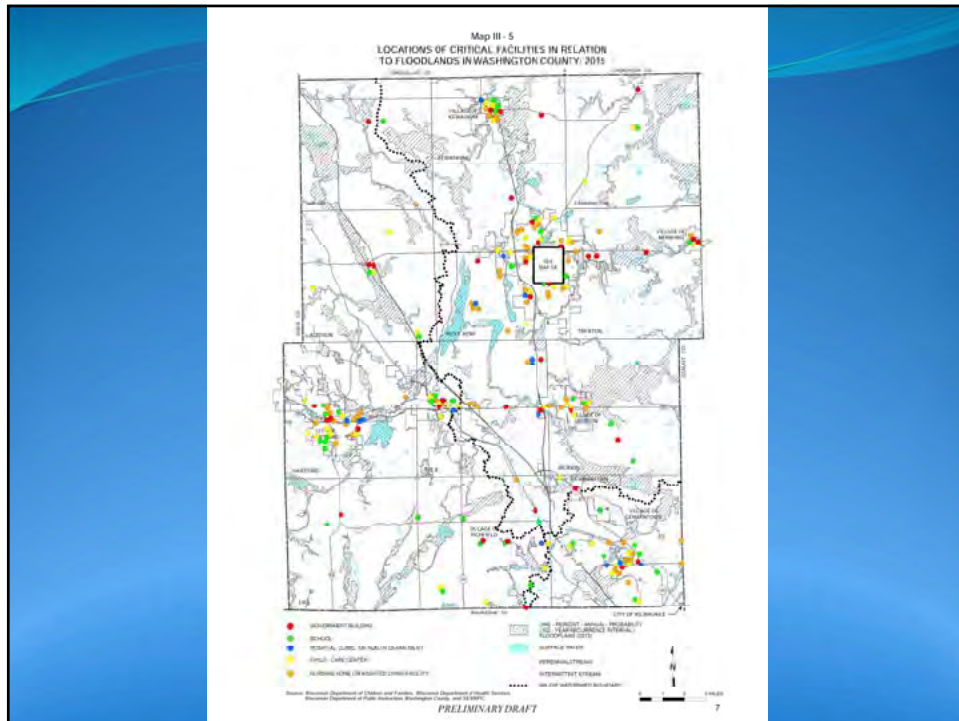
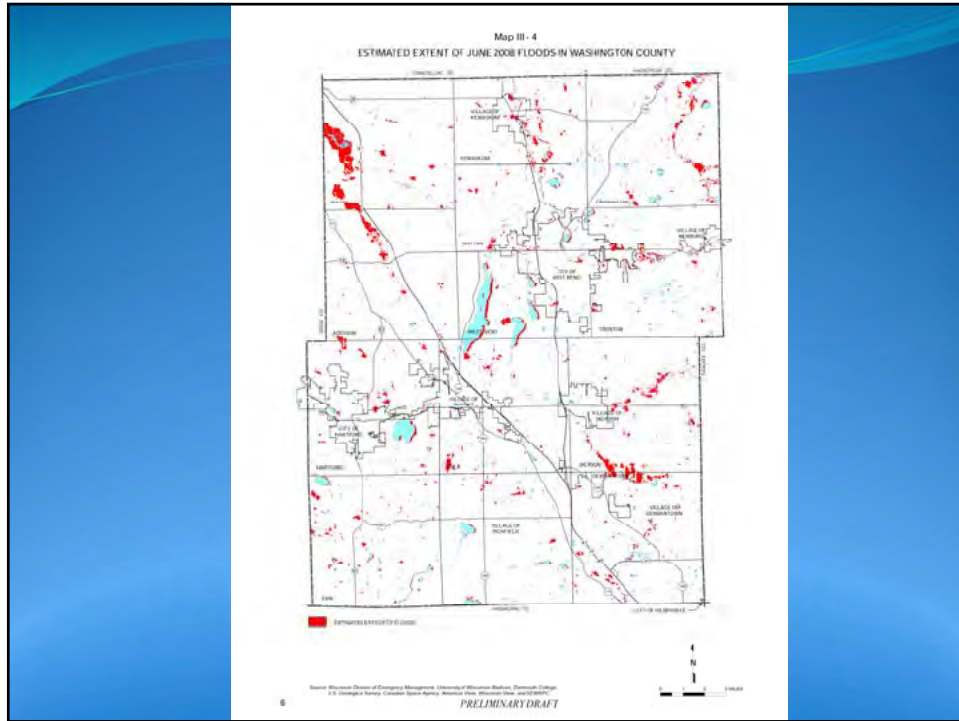
- Most profiles follow a similar format
  - Definition and description of the hazard
  - Description of notable historical events that affected the County
  - Description of some notable recent events that affected the County
  - Assessment of vulnerabilities to the hazard and community impacts from the hazard
  - Description of potential future changes in impacts
  - Discussion of any differences among communities in risks



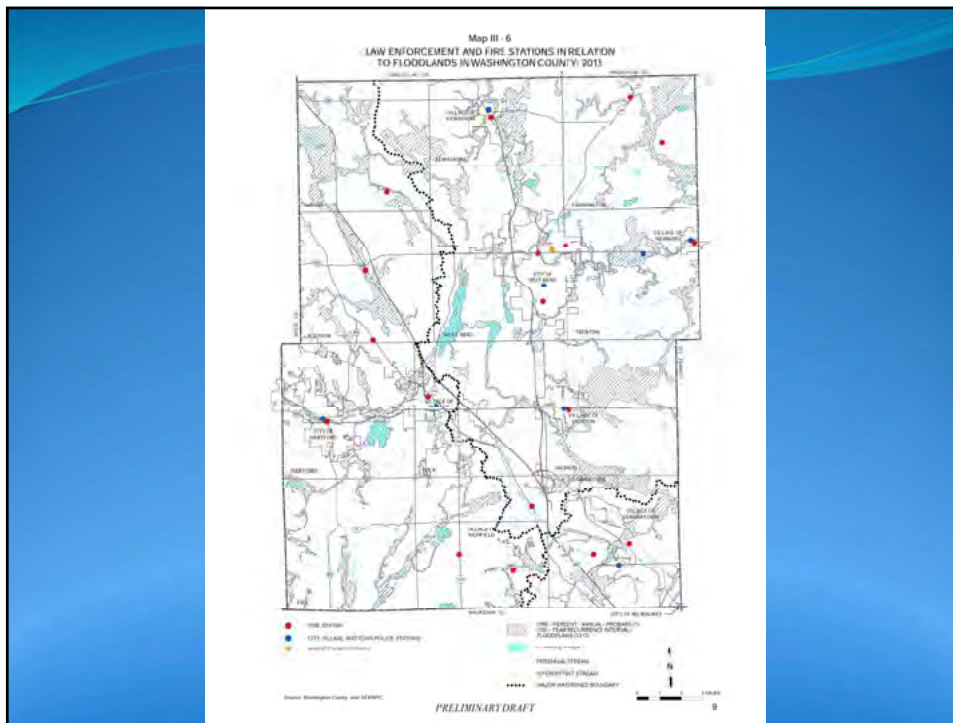
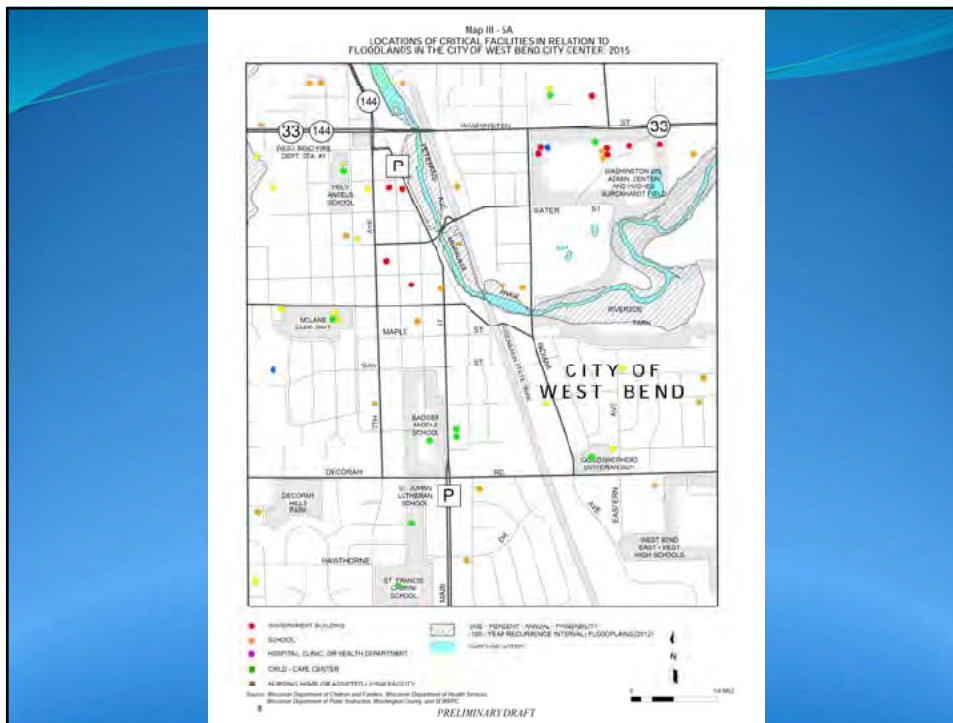
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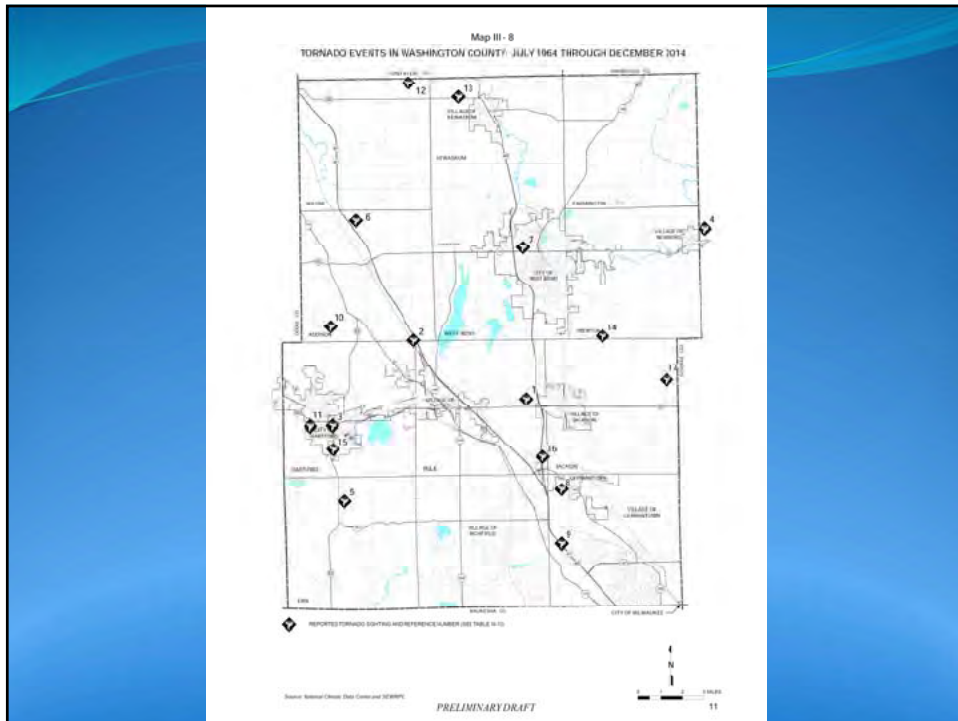
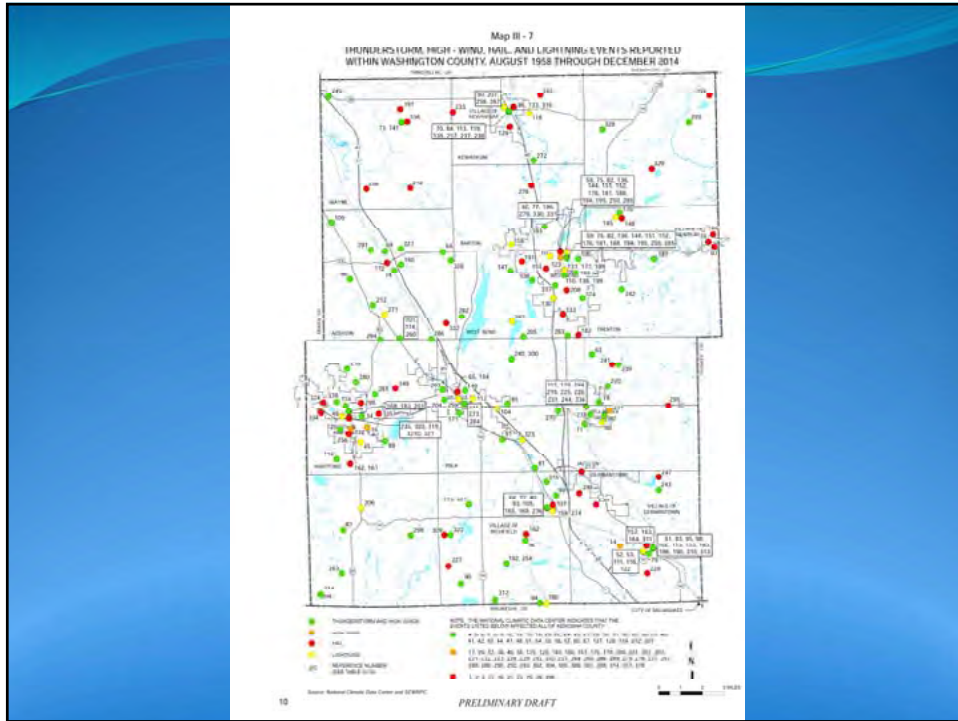
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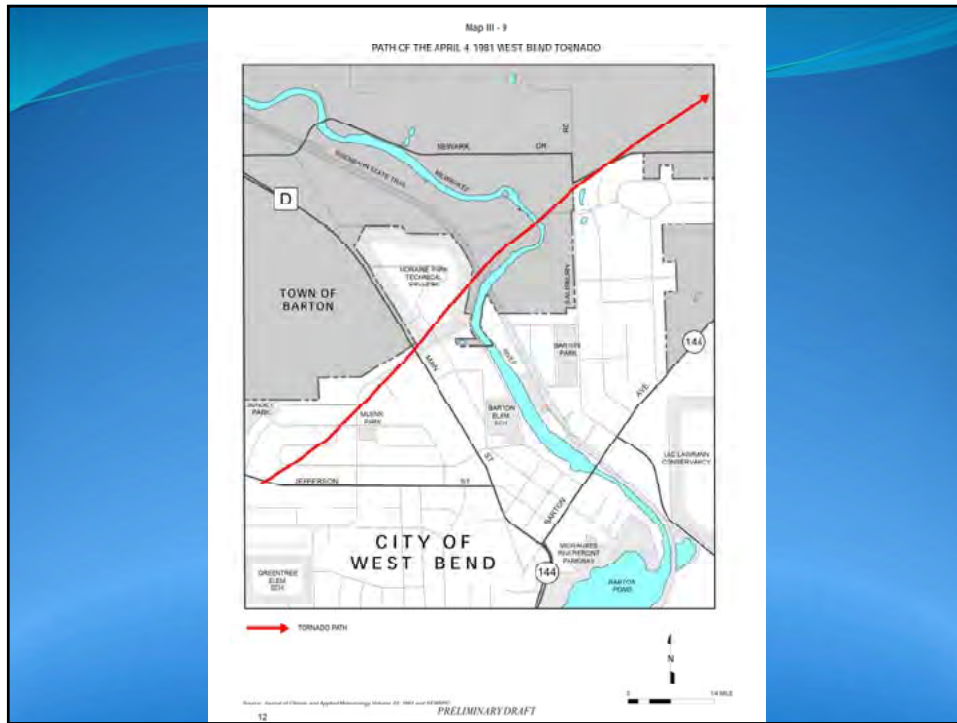


Figure III-1

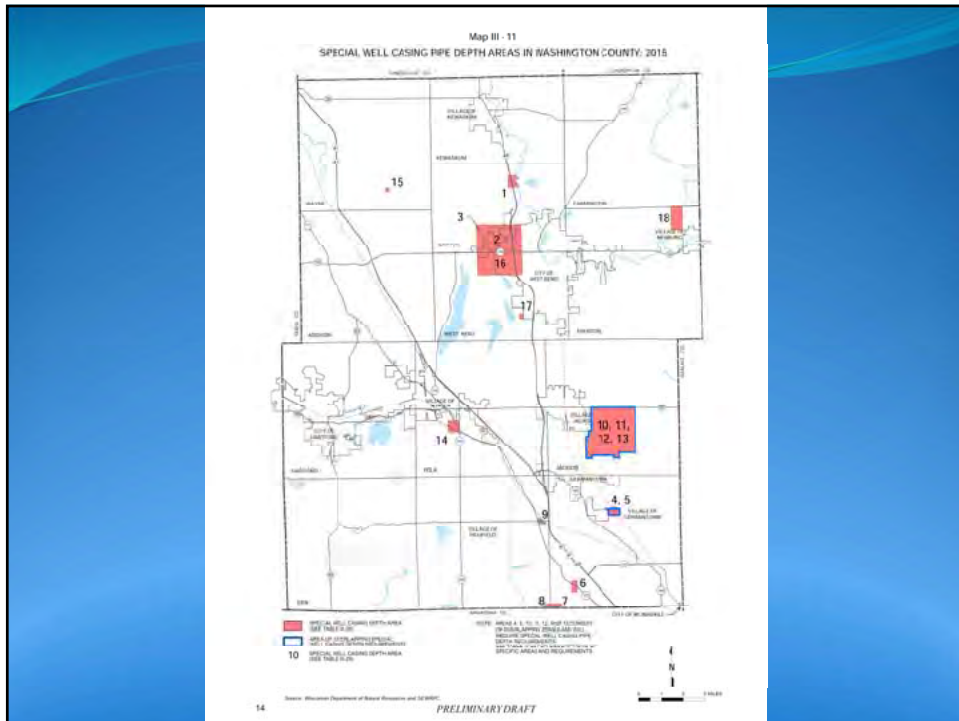
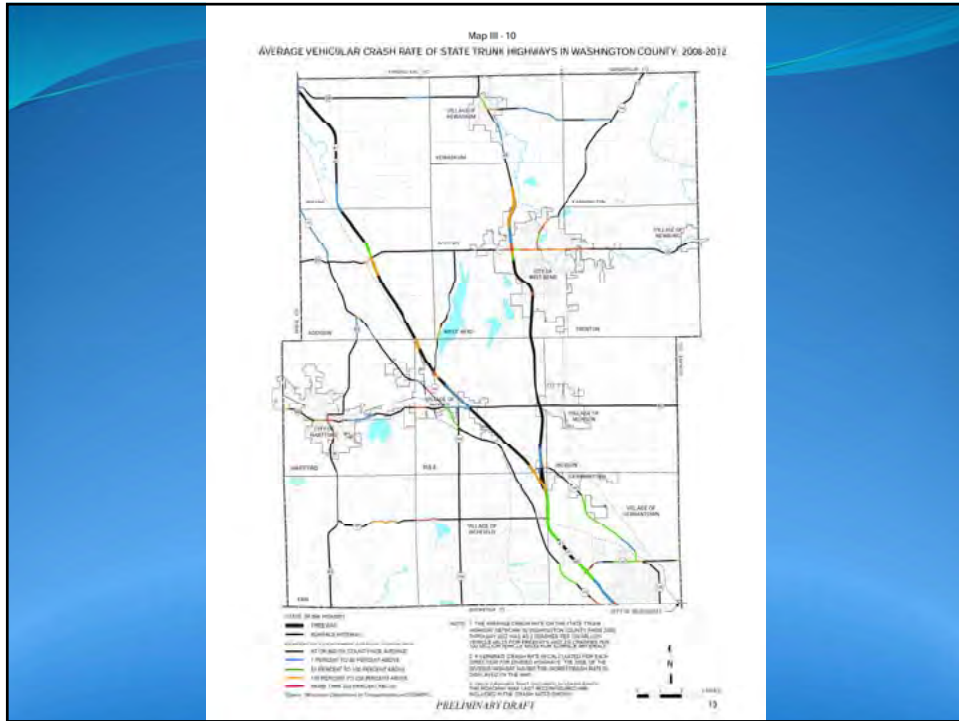
ICE STORM DAMAGE NEAR  
HARTFORD MARCH 4-5 1976



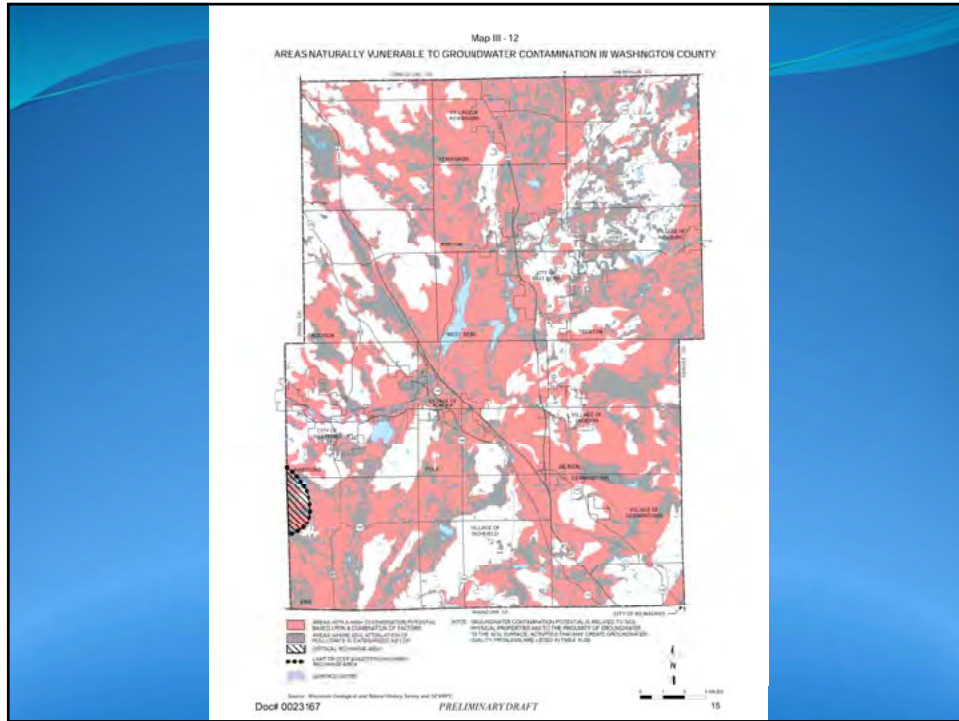
Source: Wisconsin Division of Emergency Management.



# EXHIBIT A



# EXHIBIT A



## Chapter IV

### Hazard Mitigation Goals

## EXHIBIT A

### Hazard Mitigation Goals

1. A spatial distribution of the various land uses that minimizes hazards and dangers to health, welfare, and safety as well as further enhancing the economic base of the County, and will result in a compatible arrangement of land uses properly related to the existing and proposed supporting transportation, utility, public safety, and public facility systems.
2. A spatial distribution of the various land uses that maintains biodiversity and will result in the protection and wise use of the natural resources of the County, including its soils, inland lakes and streams, groundwater, wetlands, woodlands, and natural areas and critical species habitats.

### Hazard Mitigation Goals

3. An integrated transportation system that, through its location, capacity, and design, will safely, economically, and effectively serve the existing and proposed land use pattern and promote the implementation of the land use plan, meeting the current and anticipated travel demand and minimizing the potential for accidents and the associated toll on life and property damage.
4. The provision of facilities necessary to maintain a high quality of fire and police protection and emergency medical services throughout the County.

## EXHIBIT A

### Hazard Mitigation Goals

5. The development of a stormwater and floodplain management system that reduces the exposure of people to drainage- and flooding-related inconvenience and to health and safety hazards and that reduces the exposure of real and personal property to damage through inundation resulting from flooding and inadequate stormwater drainage.
6. The identification and development of programs that complement County and local emergency operations plans to mitigate the potential exposure to health and safety and the exposure of real and personal property resulting from a broad range of hazards that are unpredictable and not geographically specific in nature.

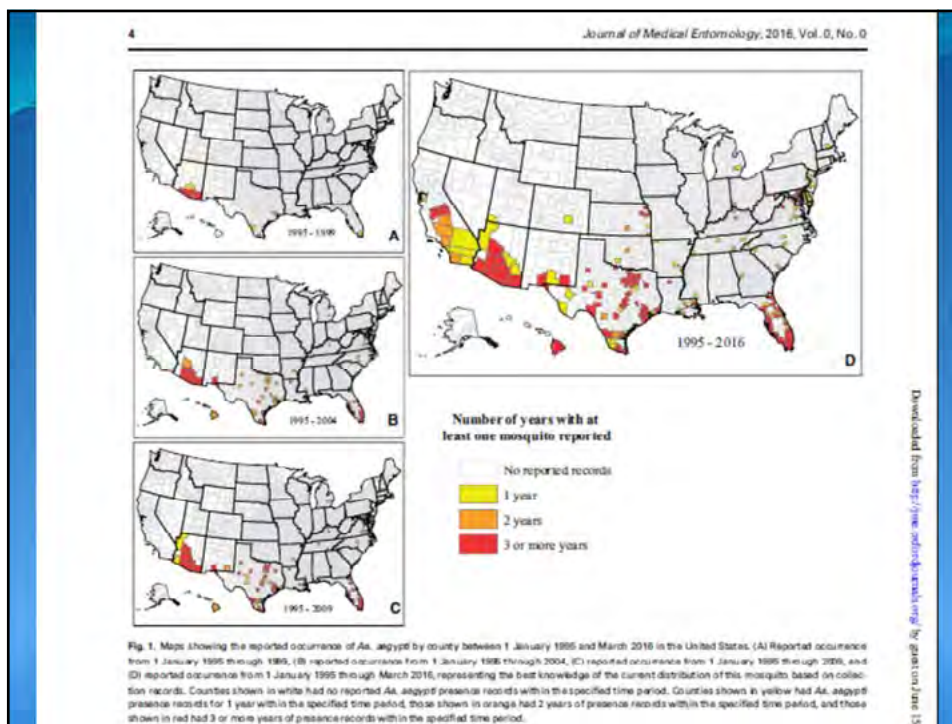
### Public Meeting on Hazard Mitigation Plan

- August 10, 2016
  - 6:00 p.m.
  - Public Agency Center, Room 1113A/B
- Review progress on the plan update to date
- Seek public input
  - Problem areas relative to hazards
  - Potential mitigation measures and projects
  - Comments on draft plan

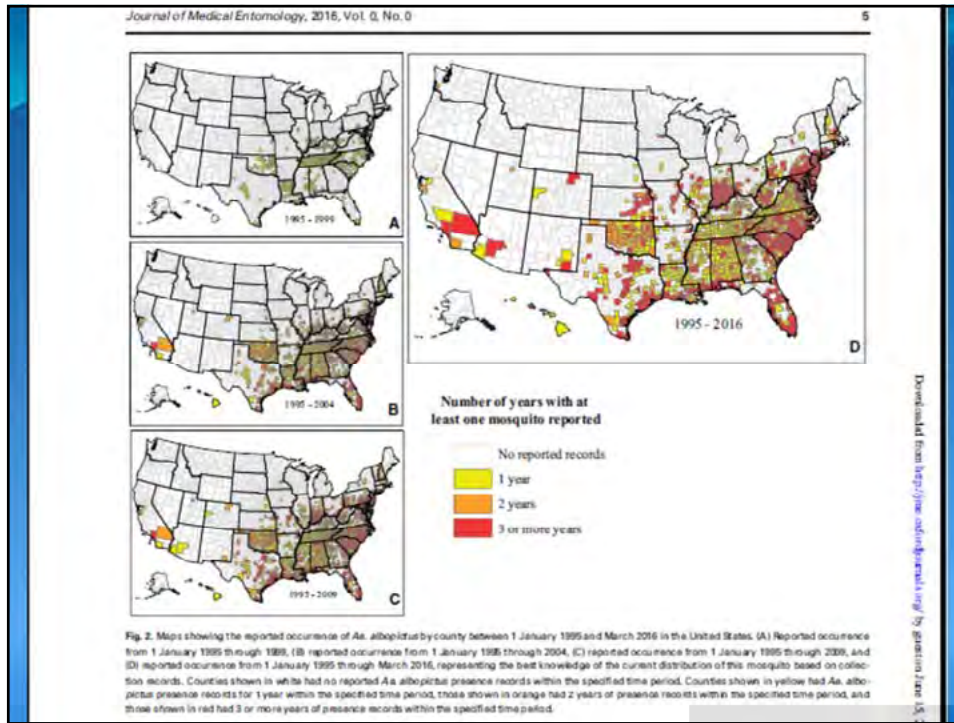
## EXHIBIT A

### Project Web Site

- <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>
  - Agendas and other meeting materials
  - Summary notes from meetings
  - Presentations
  - Draft chapters as they are completed
  - Comment screen
  - Other ways to send a comment
- Email to [jboxhorn@sewrpc.org](mailto:jboxhorn@sewrpc.org)

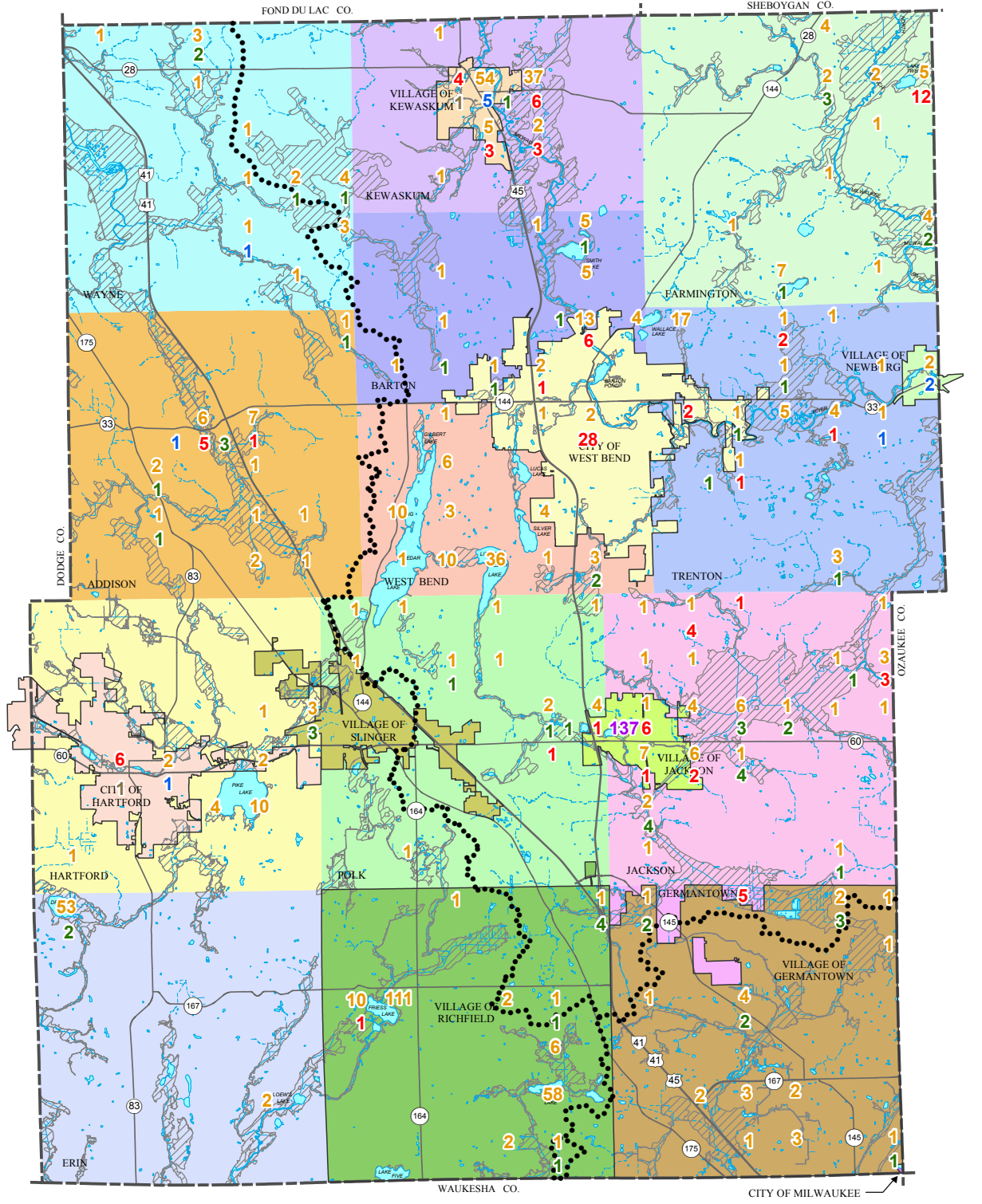


# EXHIBIT A



Map III - 3

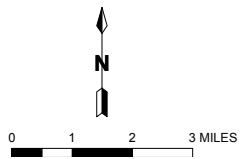
NUMBER OF STRUCTURES WITHIN FLOOD HAZARD AREAS BY CIVIL DIVISION IN WASHINGTON COUNTY: 2015



- 667** RESIDENTIAL STRUCTURES WITHIN U.S. PUBLIC LAND SURVEY SECTION
- 106** COMMERCIAL STRUCTURES WITHIN SECTION
- 64** AGRICULTURAL STRUCTURES WITHIN SECTION
- 137** MOBILE HOMES WITHIN SECTION
- 11** GOVERNMENT STRUCTURES WITHIN SECTION
- 2** OTHER STRUCTURES WITHIN SECTION

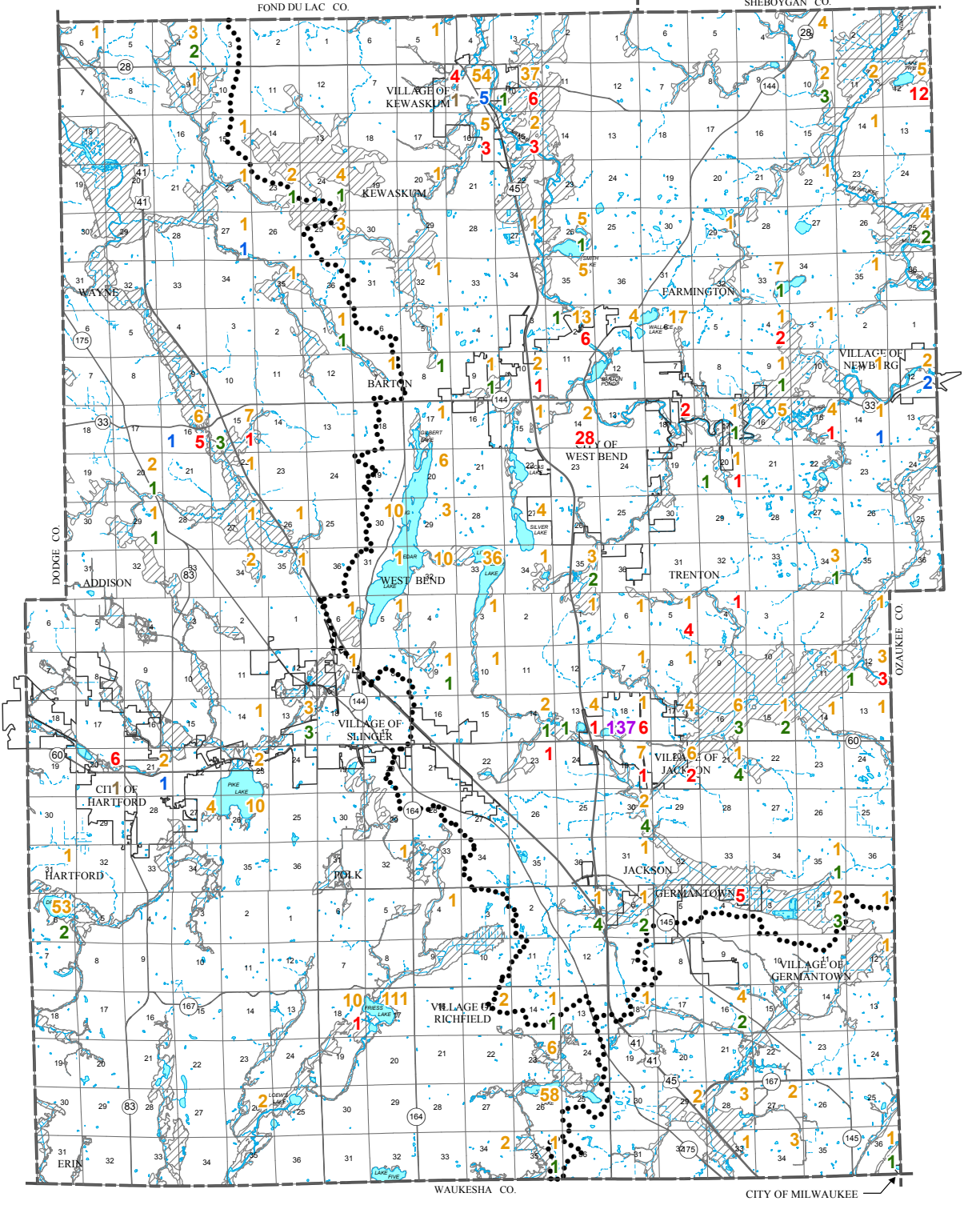
- ONE - PERCENT - ANNUAL - PROBABILITY (100 - YEAR RECURRENCE INTERVAL) FLOODPLAINS (2012)
- SURFACE WATER
- PERENNIAL STREAM
- INTERMITTENT STREAM
- MAJOR WATERSHED BOUNDARY

Source: Washington County and SEWRPC.



Map III - 4

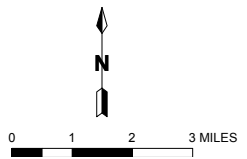
NUMBER OF STRUCTURES WITHIN FLOOD HAZARD AREAS BY U.S. PUBLIC LAND SURVEY SECTION IN WASHINGTON COUNTY: 2015



- 667** RESIDENTIAL STRUCTURES WITHIN U.S. PUBLIC LAND SURVEY SECTION
- 106** COMMERCIAL STRUCTURES WITHIN SECTION
- 64** AGRICULTURAL STRUCTURES WITHIN SECTION
- 137** MOBILE HOMES WITHIN SECTION
- 11** GOVERNMENT STRUCTURES WITHIN SECTION
- 2** OTHER STRUCTURES WITHIN SECTION

- ONE - PERCENT - ANNUAL - PROBABILITY (100 - YEAR RECURRENCE INTERVAL) FLOODPLAINS (2012)
- SURFACE WATER
- PERENNIAL STREAM
- INTERMITTENT STREAM
- MAJOR WATERSHED BOUNDARY

Source: Washington County and SEWRPC.





**Table III-8**

**PARCEL-BASED STRUCTURE FLOOD DAMAGES FROM A  
ONE-PERCENT-ANNUAL-PROBABILITY FLOOD EVENT: WASHINGTON COUNTY, WISCONSIN**

Annual Probability of Flood Occurrence	Number of Structures in Floodplain	Flood Damages		
		Direct	Indirect	Total
Detailed Studies (Zone AE) .....	826	\$16,308,860	\$3,465,590	\$19,774,450
Approximate Floodplains (Zone A) .....	161	2,695,040	484,050	3,157,590
Total	987	\$19,003,900	\$3,949,640	\$22,965,040

Source: SEWRPC.

**Table III-9**

**COMMUNITIES IN WASHINGTON COUNTY WITH  
SPECIAL FLOOD AND RELATED STORMWATER  
DRAINAGE CONSIDERATIONS**

Community	Reason for Special Consideration
City of Hartford	10 structures estimated to be in flood hazard area
City of West Bend	41 structures estimated to be in flood hazard area
Village of Germantown	27 structures estimated to be in flood hazard area
Village of Jackson	165 structures estimated to be in flood hazard area
Village of Kewaskum	112 structures estimated to be in flood hazard area
Village of Newburg	Four structures estimated to be in flood hazard area
Village of Richfield	200 structures estimated to be in flood hazard area, including three repetitive loss structures that are located in the Village
Town of Addison	36 structures estimated to be in flood hazard area. Substantial agricultural flood damages
Town of Barton	37 structures estimated to be in flood hazard area
Town of Erin	57 structures estimated to be in flood hazard area, including one repetitive loss structure that is located in the Town
Town of Farmington	46 structures estimated to be in flood hazard area
Town of Germantown	Eight structures estimated to be in flood hazard area
Town of Hartford	24 structures estimated to be in flood hazard area
Town of Jackson	47 structures estimated to be in flood hazard area
Town of Kewaskum	11 structures estimated to be in flood hazard area
Town of Polk	17 structures estimated to be in flood hazard area
Town of Trenton	45 structures estimated to be in flood hazard area
Town of Wayne	23 structures estimated to be in flood hazard area
Town of West Bend	77 structures estimated to be in flood hazard area

NOTE: See Maps III-3 and III-4.

Source: SEWRPC.

## EXHIBIT C

Joe

I mentioned and/or passed along to Aaron all of my Chapter III edits except for this one:

Please add the following definitions regarding disease outbreaks to the end of the text section at the top of page 110.

- Disease Outbreak – limited area of disease occurrence in a community at a particular time.
- Disease Epidemic – the outbreak and rapid spread of a disease in a community affecting a significant amount of people and/or animals in a relatively short period of time. Epidemics may also be secondary to some other disaster such as flood, tornado or terrorist incident.
- Disease Pandemic – disease is prevalent over an entire region, country or the world.

Feel free to adapt/reword as needed but I feel the terms need to be defined in this section for clarity.

Thanks and have a nice holiday.

P.S. – Those definitions are copied from the Washington Co. Hazard Analysis. Do you have a copy of that document?

I believe I sent it to you but could not confirm that. Please let me know.

Rob Schmid  
Coordinator,  
Washington Co. Office  
Of Emergency Management  
500 N. Schmidt Rd.  
West Bend, WI 53095  
262-335-4399

The information in this email, and any attachments, may contain confidential information. Use and further disclosure must be consistent with applicable laws. However, if you believe you've received this email in error, delete it immediately and do not use, disclose or store the information it contains

Washington County Emergency Management Office  
Southeastern Wisconsin Regional Planning Commission

**Notice of Meeting and Agenda**

**WASHINGTON COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM**

DATE: July 10, 2017  
TIME: 2:00 to 5:00 p.m.  
PLACE: Washington County Sheriff's Department  
EOC/Training Room (Room 3011)  
500 N. Schmidt Road  
West Bend, Wisconsin

AGENDA:

1. Roll Call
2. Consideration of Summary Notes of June 29, 2016 Local Planning Team Meeting (a copy of the draft summary notes is available for download from the SEWRPC website at: <http://www.sewrpc.org/HMP>)
3. Consideration of Chapter V, "Hazard Mitigation Strategies," of SEWRPC Community Assistance Planning Report No. 326, *Washington County Hazard Mitigation Plan* (a copy of the draft chapter is available for download from the SEWRPC website at: <http://www.sewrpc.org/HMP>)
4. Consideration of Chapter VI, "Plan Adoption, Implementation, Maintenance and Revision," of SEWRPC Community Assistance Planning Report No. 326, *Washington County Hazard Mitigation Plan* (a copy of the draft chapter is available for download from the SEWRPC website at: <http://www.sewrpc.org/HMP>)
5. Discussion of arrangements for July 27, 2017, public meeting
6. Review of plan approval and adoption process
7. Adjourn

Joseph E. Boxhorn  
Secretary

*Individual County Board Supervisors may attend the above meeting. It is possible that such attendance may constitute a meeting of the county board or any of its committees pursuant to State ex rel. Badke v. Greendale Village Board, 173 Wis. 2d 553, 494 N.W. 2d 408 (1993). This notice does not authorize attendance at either the above meeting or the Badke meeting, but is given solely to comply with the notice requirements of the open meeting law.*

**AFFIDAVIT OF POSTING**

*This agenda was posted in the office of the County Clerk on this 5th day of July 2017. Notice was sent to the West Bend News, Express News, WBKV/WBWI Radio, WTKM Radio, My Community NOW, Hartford Times Press, Kewaskum Statesman, Milwaukee Journal-Sentinel. Individuals with disabilities requiring special accommodations for attendance at the meeting should contact the County Clerk at (262) 335-4301 at least 48 hours prior to the meeting.*

WASHINGTON CO HMP LPT MEETING NOTICE JULY 10, 2017 (00238106).DOCX  
500-1110  
JEB  
07/05/17

## **SUMMARY NOTES OF THE JULY 10, 2017 MEETING OF THE WASHINGTON COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM**

### **INTRODUCTION**

The July 10, 2017, meeting of the Washington County Hazard Mitigation Plan Local Planning Team was convened at the Washington County Sheriff's Department at 2:07 p.m. The meeting was called to order by Rob Schmid, Washington County Emergency Management Coordinator. Attendance was taken by circulating a sign-in sheet.

In attendance at the meeting were the following individuals:

#### Local Planning Team Members

Rob Schmid, Chair	Emergency Management Coordinator, Washington County
Joseph E. Boxhorn, Secretary	Senior Planner, Southeastern Wisconsin Regional Planning Commission
Tom Bishop	Chief of Police, Village of Kewaskum
Richard Engel	Chairman, Washington County Volunteer Organizations Active in Disasters/Assistant Emergency Coordinator Amateur Radio Emergency Service
Phil Gaudet	Land Resources Manager, Washington County Land Use Division
Laura K. Herrick	Chief Environmental Engineer, Southeastern Wisconsin Regional Planning Commission
Donald Kriefall	Washington County Supervisor
Aaron W. Owens	Planner, Southeastern Wisconsin Regional Planning Commission
Mark Piotrowicz	City Planner, City of West Bend
Albert Schulteis	Chair, Town of Polk
Deb Sielski	Deputy Administrator, Washington County Planning and Parks Department

Mr. Schmid welcomed the attendees to the meeting, thanked them for their participation, and asked them to introduce themselves.

### **CONSIDERATION OF THE SUMMARY NOTES OF THE JUNE 29, 2016 LOCAL PLANNING TEAM MEETING**

Mr. Schmid introduced Joseph E. Boxhorn of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) staff. At Mr. Schmid's request, Mr. Boxhorn reviewed the summary notes of the June 29, 2016 meeting of the Local Planning Team. He stated that he wanted to highlight six items discussed in the summary notes.

Mr. Boxhorn stated that the risk analysis for school violence was removed from the hazards addressed in the draft of Chapter III. He added that the Secretary's note on at the top of page 3 contains a paragraph on school violence that was added to the discussion of hazards that were considered by the Local Planning Team (LPT), but not included among the hazards addressed by the plan.

Mr. Boxhorn stated that SEWRPC staff compared the results of the parcel-based analysis of structures in the floodplain to FEMA's Letters of Map Amendments (LOMAs) for the County. He explained that as a result of this comparison the number of structures identified as potentially being located in the floodplain was reduced from 1,077 to 987. He indicated that Maps III-3 and III-4 were revised to reflect this and that

the damage estimates and numbers of structures in the floodplain located in each municipality in the County given in Tables III-8 and III-9, respectively, were revised accordingly. He added that the revised maps and tables are attached to the summary notes as Exhibit B.

Mr. Boxhorn said that he added some text to the risk assessment for electrical systems outages in draft Chapter III. He noted that the new text describes the impacts of two major power loss incidents outside of Wisconsin. He indicated that this text is given in the Secretary's note on pages 9 and 10 of the summary notes.

Mr. Boxhorn stated that at Mr. Schmid's request he added definitions of disease outbreak, epidemic, and pandemic to the risk analysis for communicable disease outbreaks in Chapter III. He indicated that the revised text is given in the Secretary's note in the middle of page 10 of the summary notes. He noted that the definitions are based upon wording suggested by Mr. Schmid in an electronic mail message and added that a copy of that message is shown in Exhibit C.

Mr. Boxhorn reported that, as requested by the Local Planning Team, he discussed the text of Goal 2 in draft Chapter IV with SEWRPC Chief Biologist Dr. Thomas Slawski. Mr. Boxhorn indicated that Dr. Slawski suggested revised wording which is shown in the Secretary's note on page 12 of the summary notes.

Mr. Boxhorn stated that following the last LPT meeting, Mr. Schmid sent him a copy of a commodity flow study that the County conducted on the transport of hazardous materials within the County. Mr. Boxhorn indicated that based on the findings of that study, he added several paragraphs to the risk analysis on hazardous material incidents in draft Chapter III. He noted that the added text is contained in the Secretary's note on pages 12 and 13 of the Summary notes.

Mr. Boxhorn noted that the summary notes include three exhibits. He explained that Exhibit A contains his presentation from the June 29, 2016 LPT meeting, Exhibit B contains maps and tables that were revised as a result of comparing the parcel-based analysis of structures in the floodplain to FEMA's LOMAs, and Exhibit C is a copy of an electronic mail message that he received from Mr. Schmid regarding definitions Mr. Schmid had asked be added to the risk analysis on communicable disease outbreaks.

Mr. Boxhorn asked whether there were any corrections, questions, or comments on the summary notes. None were offered. Mr. Engle moved and Mr. Piotrowicz seconded that the summary notes from the June 29, 2016 meeting of the LPT be approved. The summary notes were approved.

**CONSIDERATION OF CHAPTER V, "HAZARD MITIGATION STRATEGIES," OF SEWRPC COMMUNITY ASSISTANCE PLANNING SEWRPC REPORT NO. 326, WASHINGTON COUNTY HAZARD MITIGATION PLAN**

At Mr. Schmid's request, Mr. Boxhorn reviewed preliminary draft Chapter V, "Hazard Mitigation Strategies," of SEWRPC Community Assistance Planning Report No. 326, *Washington County Hazard Mitigation Plan*. Mr. Boxhorn indicated that he would display copies of the maps from Chapter V and some of the tables from Chapters V and VI on the projection screen in the meeting room during discussion of these chapters.

[Secretary's Note: Mr. Boxhorn's presentation is attached herein as Exhibit A.]

Mr. Boxhorn explained that this chapter addresses three major issues: 1) it presents and evaluates alternative approaches to mitigating the impacts of each hazard addressed by the plan, 2) it identifies and recommends priority mitigation measures for mitigating hazards addressed by the plan, and 3) it examines costs and

benefits related to the mitigation measures and presents a prioritization of hazards. He indicated that, with some variations, the sections on mitigation measures for individual hazards follow a standard format consisting of the identification of alternative mitigation approaches, a review of current programs, an evaluation of the alternatives, a discussion of any multijurisdictional considerations, and a recommendation of priority mitigation measures.

Mr. Boxhorn reviewed the section of the draft chapter on flooding and related stormwater drainage problems. He explained that the priority mitigation measures for this hazard are presented as a series of five elements addressing preservation of floodplains and environmentally sensitive lands, floodplain management, stormwater management, public information and education, and secondary recommendations.

Mr. Boxhorn reviewed the floodplain and environmentally sensitive land preservation element of the flooding section. Mr. Schmid noted that the labels of County and State park and open spaces sites in the legend of Map V-1 appear to be switched. Mr. Piotrowicz added that ownership of a County park shown on Map V-1 as being within the City of West Bend has been transferred to the City.

[Secretary's Note: The labels on Map V-1 have been corrected. The park in question has been removed from Map V-1.]

In reference to Map V-6, Mr. Piotrowicz commented on the need for the County hazard mitigation plan to include a Milwaukee Metropolitan Sewerage District (MMSD) plan. He explained that he does not oppose preservation, but noted that MMSD does not go through a public discussion process. Mr. Boxhorn replied that Map V-6 was taken from the County comprehensive plan. He asked whether the County had input in this. Ms. Sielski explained that there is an overlap of acquisitions proposed in the County park and open space plan with areas in the MMSD conservation plan and this illustrates where some MMSD areas may align with County goals for acquisition. Mr. Piotrowicz stated that if the map is acceptable to the County, it can remain in the hazard mitigation plan.

In reference to the proposed conversions of restorable wetlands in agricultural uses in the floodplains to wetland, Mr. Schulteis asked what the incentive is for the farmers to participate. Mr. Boxhorn replied that the incentives would be offered through Federal agricultural conservation programs.

Mr. Boxhorn reviewed the floodplain management element of the flooding section. No questions or comments were offered.

Mr. Boxhorn reviewed the stormwater management element of the flooding section. No questions or comments were offered.

Mr. Boxhorn reviewed the public information and education element of the flooding section. No questions or comments were offered.

Mr. Boxhorn reviewed the secondary plan element of the flooding section. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on thunderstorms, high wind, hail, and lightning. During the discussion of this section Mr. Schmid provided Mr. Owens an update on the number of outdoor warning sirens that are located in the County.

[Secretary's Note: The third sentence of the second paragraph on page 30 was revised to read (text in bold is included here, and in similar subsequent Secretary's Notes, to

indicate language changed or added onto the text. Text will not be bold in the report):

“A total of **45** other outdoor warning and communication siren systems are owned and operated by municipalities in the County, with 15 located within the Village of Germantown, **10** within the City of Hartford, eight within the City of West Bend, four within the Village of Kewaskum, **four** within the Village of Slinger, two within the Village of Jackson, and one each within the Village of Newburg and the Town of Addison.”

The first full sentence in the first partial paragraph on page 36 was revised to read:

“In addition, local municipalities in the County own and operate **45** other outdoor warning and communication siren systems.”]

Mr. Boxhorn reviewed the section of the draft chapter on tornadoes. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on extreme temperatures. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on winter storms. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on drought. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on transportation accidents. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on contamination and loss of water supply. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on loss of sewerage systems. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on hazardous material incidents. Mr. Schulteis asked whether local governments have much control over rail transportation. Mr. Boxhorn replied that this is mostly in the hands of the railroad companies. Mr. Schmid concurred, noting that most of the crude oil that is transported through the County is not Bakken crude and therefore not subject to reporting. Mr. Schulteis suggested that the approach that local governments can take is to have their first response personnel trained and prepared to respond to hazardous material incidents.

Mr. Schmid stated that local governments can request a dangerous goods report from the railroad companies. He explained that this report will give average loads of hazardous materials that are shipped through the County. He added that the report gives information on large classes of hazardous substances rather than specifically identifying particular substances. Mr. Schmid noted that flammable liquids are the most common substances shipped through the County. Mr. Kriefall asked whether radioactive substances were being transported through the County by rail. Mr. Schmid replied that he was unaware of any incidents occurring within the County that involved radioactive substances. Mr. Boxhorn concurred, noting that in



his review of the data regarding releases of hazardous material, he found that releases involving radioactive substances were quite rare.

Mr. Boxhorn reviewed the section of the draft chapter on terrorism. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on cyberattack on local government. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on power outages. Mr. Schmid commented that it is not widely known that buildings need to be adapted to operate on generators. Mr. Piortowicz commented that the Department of Public Works (DPW) cannot respond to power outages if they are unable to fuel their vehicles. He noted that the City of West Bend has made arrangement with some fuel providers to adapt their facilities to accept generators so that the City DPW can obtain fuel in the event of a power outage.

Mr. Boxhorn reviewed the section of the draft chapter on communicable disease outbreaks. No questions or comments were offered.

Mr. Boxhorn reviewed the section of the draft chapter on hazard risk analysis and prioritization. No questions or comments were offered.

Mr. Boxhorn reviewed the summary section of the draft chapter. No question or comments were offered.

**CONSIDERATION OF CHAPTER VI, “PLAN ADOPTION, IMPLEMENTATION, MAINTENANCE, AND REVISION,” OF SEWRPC COMMUNITY ASSISTANCE PLANNING REPORT NO. 326, *WASHINGTON COUNTY HAZARD MITIGATION PLAN***

At Mr. Schmid’s request, Mr. Boxhorn reviewed the preliminary draft of Chapter VI of the plan report. Mr. Boxhorn explained that this chapter discusses plan adoption, refinement, and review and presents plan implementation strategies.

Mr. Boxhorn reviewed the section of the draft chapter on adoption of the plan. He noted that this would need to be pursued by the County Board and the governing boards of the incorporated municipalities following approval of the plan by the Federal Emergency Management Agency (FEMA). No questions or comments were offered on this section.

Mr. Boxhorn reviewed the section on implementation strategies. He noted that Table VI-1 summarizes recommendations, shows the status of implementation of recommendations, indicates priorities, and points to potential funding sources. He indicated that Table VI-2 assigns implementation responsibilities to specific departments and agencies. He noted that this was something that FEMA requested during review of a hazard mitigation plan for another county. Mr. Schulteis indicated that assignments of responsibilities for fire departments serving the Town of Polk should include the Village of Slinger Fire Department.

[Secretary’s Note: Table VI-2 was reviewed and the Village of Slinger Fire Department was added to the assignments for the Town of Polk, where appropriate.]

Mr. Boxhorn reviewed the section on hazard mitigation funding sources. He noted that potential sources of funding for implementing recommendations are listed and briefly described in Appendix J, with contact information given in Appendix K. He explained that information regarding potential funding sources is continually changing.

Mr. Boxhorn reviewed the section on plan monitoring and reevaluation. Mr. Schmid noted that this section calls for the LPT to meet annually and asked whether it is common for other counties to hold an annual meeting. Mr. Boxhorn replied that it depends upon the county. He noted that Kenosha County holds an annual LPT meeting. He explained that this is driven by that County's participation in the National Flood Insurance Program's Community Rating System and the fact that it is pursuing an ongoing major flood mitigation program along the Fox River.

Mr. Schmid expressed concerns that there may not be enough activity to justify an annual meeting. He added that his preference would be to call meetings of the LPT following major disasters or when funding becomes available. Mr. Boxhorn replied that the text would be revised to reflect this.

[Secretary's Note: The last paragraph on page 10 was revised to read (the bold type in the headings to the paragraph is part of the text of the report):

**“Plan Monitoring**

***Review***

Toward ensuring successful monitoring of the hazard mitigation plan, it is recommended that the Washington County Hazard Mitigation Plan Local Planning Team meet **periodically** to review the plan and the status of its implementation with a view toward enhancing and improving responses to natural and other hazards. **Plan review meetings will be held following any disasters that affect the County and at the discretion of the Director of the County Office of Emergency Management.** These meetings will provide the opportunity to develop and recommend any necessary revisions of the plan to the Washington County Board of Supervisors, as well as to the local units of government involved. The revisions would be proposed, considered, and adopted in the form of formal amendments to the hazard mitigation plan. This review process will be coordinated and conducted by the County Office of Emergency Management, with input from, coordination with, and participation by all concerned County officials and staff, all units and agencies of government involved in plan implementation and concerned private parties.”]

**DISCUSSION OF ARRANGEMENTS FOR THE JULY 27, 2017, PUBLIC MEETING**

Mr. Boxhorn stated that staff from SEWRPC and the Washington County Office of Emergency Management will hold a public information meeting regarding the hazard mitigation plan from 5:30 p.m. to 6:30 p.m. on Thursday, July 27, 2017, at the Washington County Public Agency Center. He explained that the purposes of the meeting will be to review the draft plan, and answer questions and take comments from the public.

Mr. Boxhorn stated that following the public meeting, he would accept comments on the draft hazard mitigation plan until 4:30 p.m. on Friday, August 4, 2017.

**REVIEW OF PLAN APPROVAL AND ADOPTION PROCESS**

Mr. Boxhorn outlined the plan approval and adoption process. He stated that after the comment period ends, he will compile a complete draft of the plan and submit it to the Wisconsin Division of Emergency Management (WEM) for review. He added that SEWRPC would make any revisions requested by WEM, and the plan update would then be submitted to FEMA for review. He noted that following completion of any requested revisions, FEMA will indicate that the plan is approvable upon adoption. He explained that at this point, the Washington County Board must formally adopt the plan. He noted that, following adoption

by the County Board, the incorporated municipalities in the County will need to formally adopt the plan. He explained that communities will not be eligible for funding through the Hazard Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation Grant Program (PDM), or the Flood Mitigation Assistance (FMA) Program unless they adopt the plan. He indicated that adoption by the County covers the unincorporated towns.

Mr. Schmid noted that while we are on our timeline for plan development, WEM has requested that we apply for an extension of the grant funding plan development in case anything would delay the review process. He indicated that he has submitted an application for such an extension to WEM.

Mr. Boxhorn thanked the Local Planning Team for their participation in the planning effort.

## **ADJOURNMENT**

There being no further business, the meeting was adjourned by unanimous consent at 3:57 p.m.

## **REVISIONS TO DRAFT CHAPTER V REQUESTED BY ROB SCHMID, WASHINGTON COUNTY EMERGENCY MANAGEMENT COORDINATOR**

Subsequent to the July 10, 2017 meeting of the Local Planning Team, SEWRPC staff received an electronic mail message from Mr. Schmid requesting several revisions to draft Chapter V.

[Secretary's Note: A copy of Mr. Schmid's email message is attached herein as Exhibit B.]

Mr. Schmid noted that the County has developed and maintains a hazardous materials plan.

[Secretary's Note: The following sentences were added after the first sentence of the first paragraph on page 71:

“Washington County also utilizes a hazardous materials plan. This plan was adopted in 1998 and is reviewed and updated annually.”]

Mr. Schmid provided additional details on the hazardous materials response teams that are available to respond to hazardous material incidents that may occur in Washington County.

[Secretary's Note: The fourth paragraph on page 71 was revised to read:

“In the event of a hazardous materials incident, Washington County can utilize its county-wide hazardous materials response team, **which is also a Type III State-contracted team**, or utilize the **State-wide hazardous material task force** response system. The nearby City of **Milwaukee Fire Department, which is a Type I State-contracted team**, has a certified Hazardous Materials Team, made up of firefighters who have been trained to respond to chemical-related emergencies throughout the **Southeastern Wisconsin** region, and the Team has specialized equipment and a state-of-the-art hazardous materials response vehicle to assist in responding to regional hazardous material incidents, **including chemical, biological, radiological, and nuclear capabilities.**”]

Mr. Schmid noted that while draft Appendix D of the report lists 14 fire departments and emergency medical service agencies, the Slinger Fire Department provides only firefighting services, while Lifestar EMS provides only EMS services. He added that because of this, the totals given on page 74 should be adjusted.

[Secretary's Note: The first sentence of the last paragraph on page 74 was revised to read:

“As described in Chapter II, there are **13** fire departments, **13** rescue departments; 17 hospitals, major clinics, and health departments that serve communities in Washington County (see Appendices C and D).”]

Mr. Schmid noted that the Washington County and Ozaukee County health departments have merged and the Department is now called the Washington-Ozaukee Public Health Department.

[Secretary's Note: The first sentence of the last paragraph on page 86 was revised to read:

“The **Washington-Ozaukee Public** Health Department conducts surveillance, investigations, and follow up of incidents of reportable communicable diseases in the County.”]

WASHINGTON CO HMP SUMMARY NOTES 10-JUL-2017 MTG (00238216).DOCX  
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LKH/JEB  
07/13/17, 07/17/2017

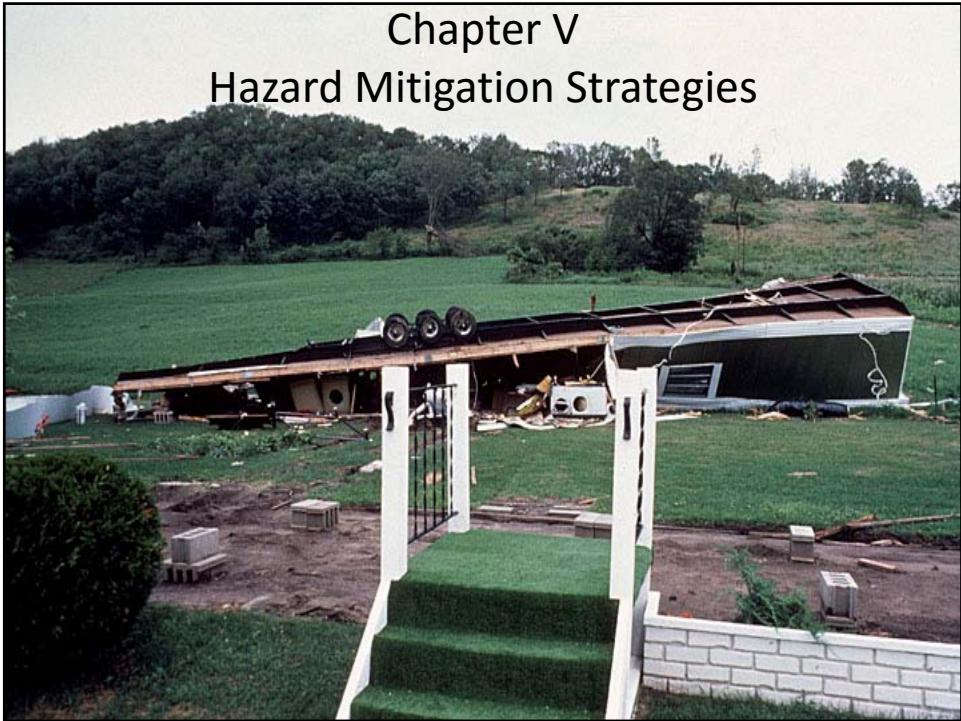
**Washington County Hazard Mitigation Plan:  
Local Planning Team Meeting**  
July 10, 2017



 SEWRPC  
Serving the counties of  
Eau Claire, Milwaukee, Dodge,  
Lincoln, Walworth,  
Washington, and Waukesha

Joseph E. Boxhorn, Ph.D., Senior Planner  
Southeastern Wisconsin Regional Planning Commission

# 237310



## Chapter V Overview

- Presents and evaluates alternative approaches to mitigating each hazard
- Identifies and recommends priority mitigation measures for each hazard
- Summary section looks at costs and benefits and prioritizes hazards

## Hazard Sections

- Most profiles follow a similar format
  - Identification of alternative mitigation strategies
    - Nonstructural, structural, public information and education
  - Review of current programs
    - Federal, State, and Local
  - Evaluation of alternatives and identification of mitigation actions
  - Multijurisdictional considerations
  - Priority mitigation measures

## Alternative Mitigation Strategies for Flooding

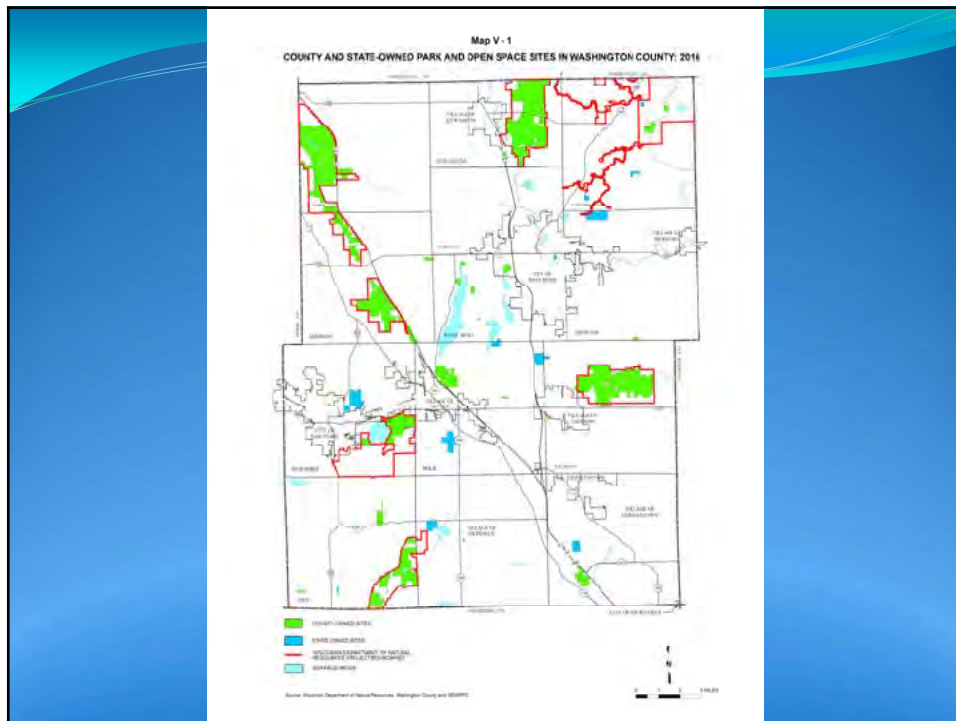
1. Preservation of floodplains and environmentally sensitive lands
2. Actions to remove structures from high-risk areas or enable them to better withstand flooding
3. Stormwater management measures
4. Participation in the National Flood Insurance Program
5. Actions to manage the potential flood-related impacts of dam failure

## Alternative Mitigation Strategies for Flooding

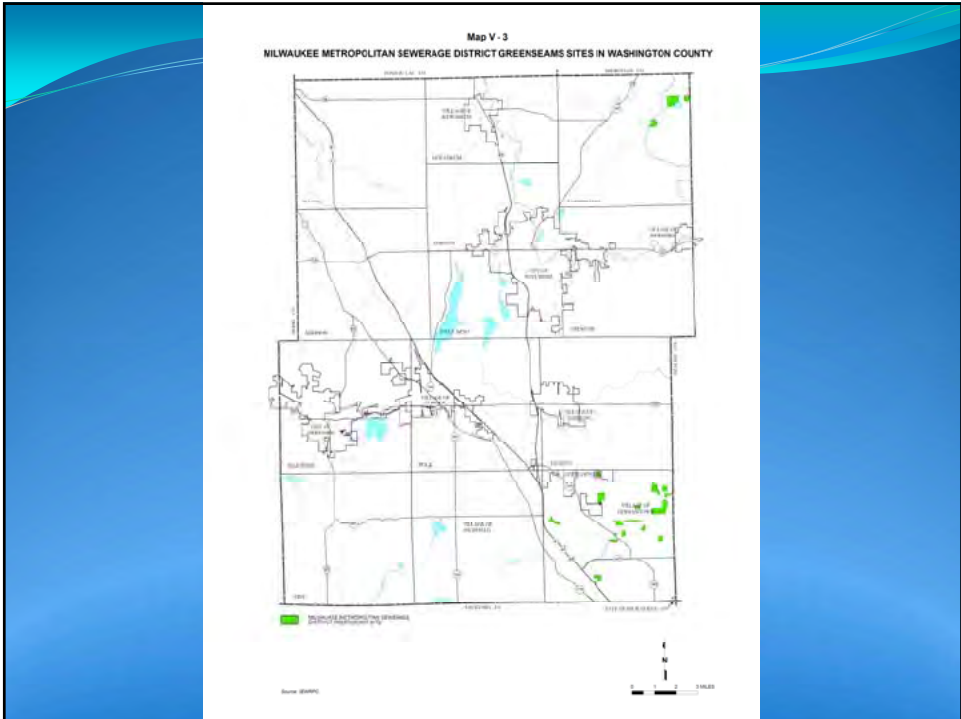
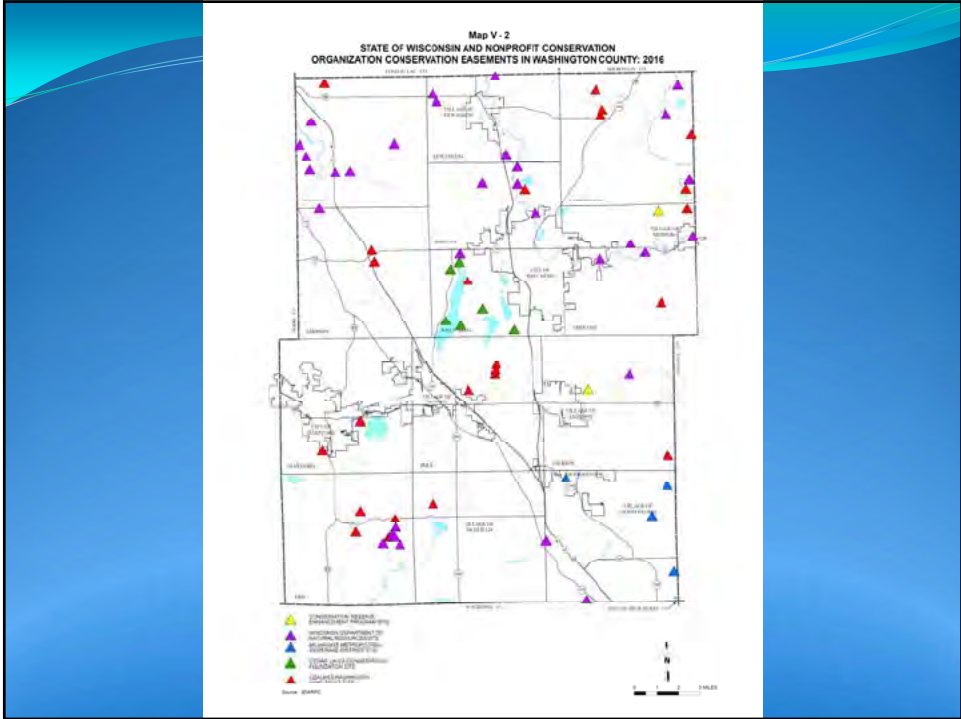
6. Improve the available data related to flooding
7. Continuation of desirable policies by lenders and realtors concerning sale of properties in floodplains
8. Public outreach and community education
9. Emergency services
10. Structural flood control measures

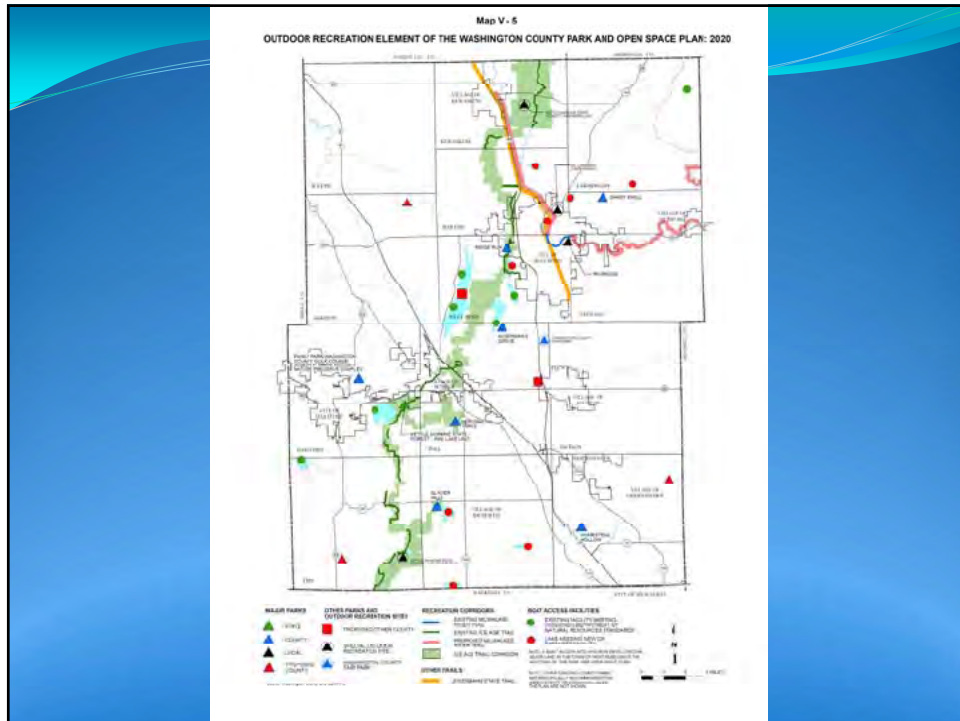
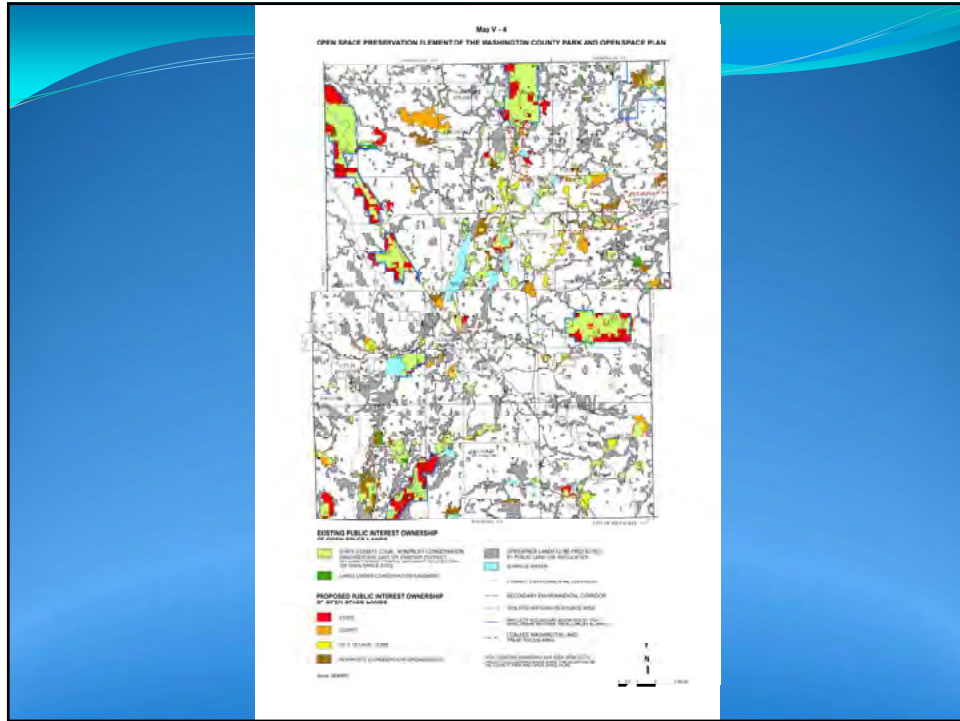
## Flood Mitigation Plan Elements

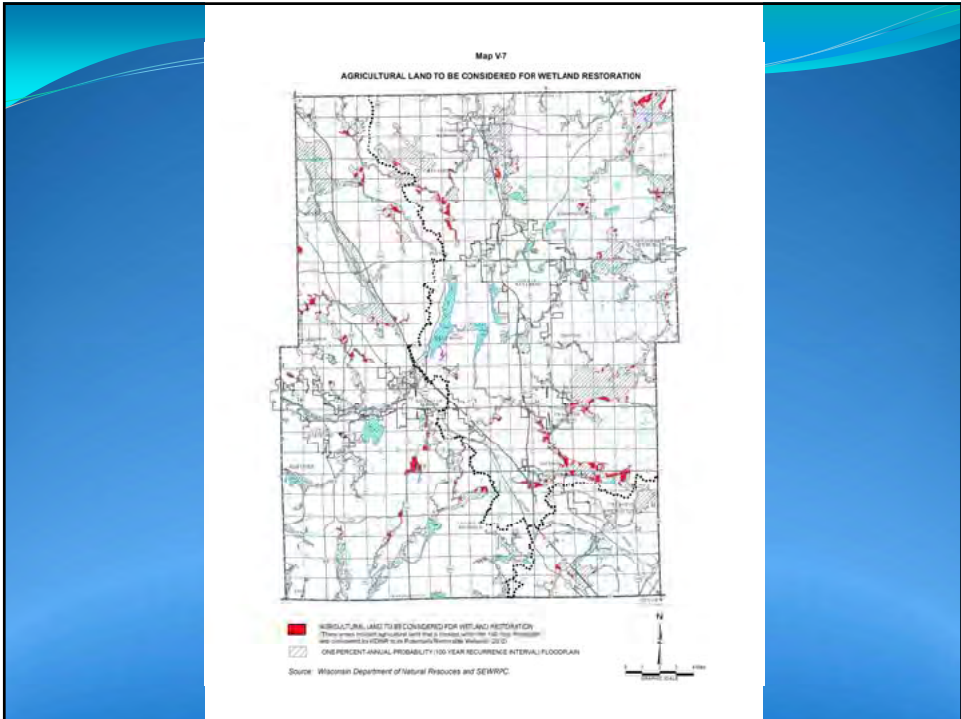
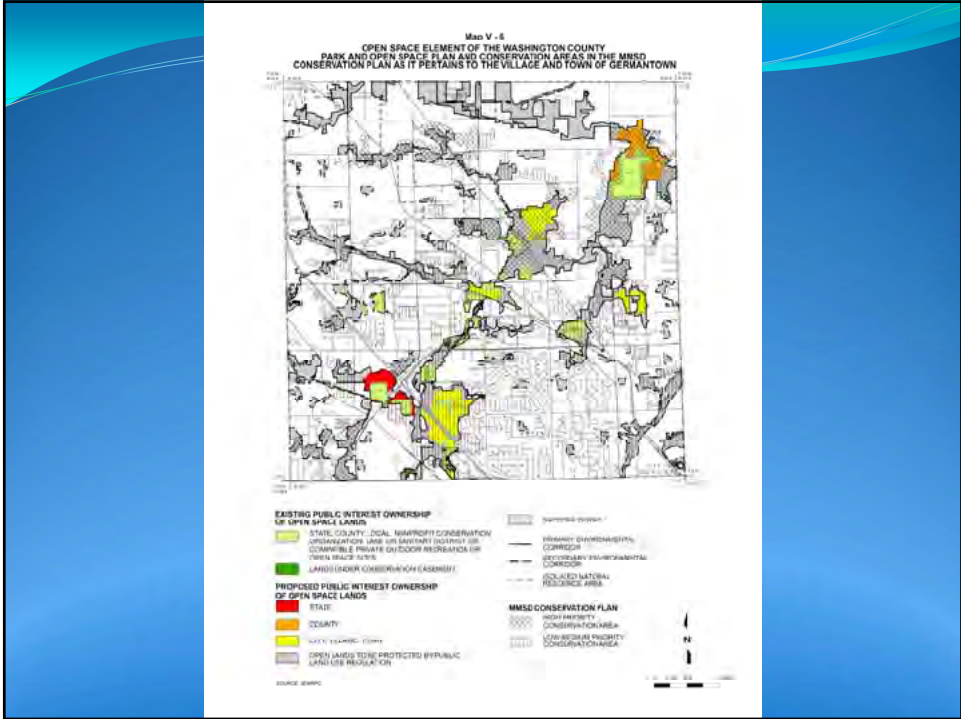
- Floodplain and Environmentally Sensitive Land Preservation Element
- Floodplain Management Element
- Stormwater Management Element
- Public Information and Education Element
- Secondary Plan Element





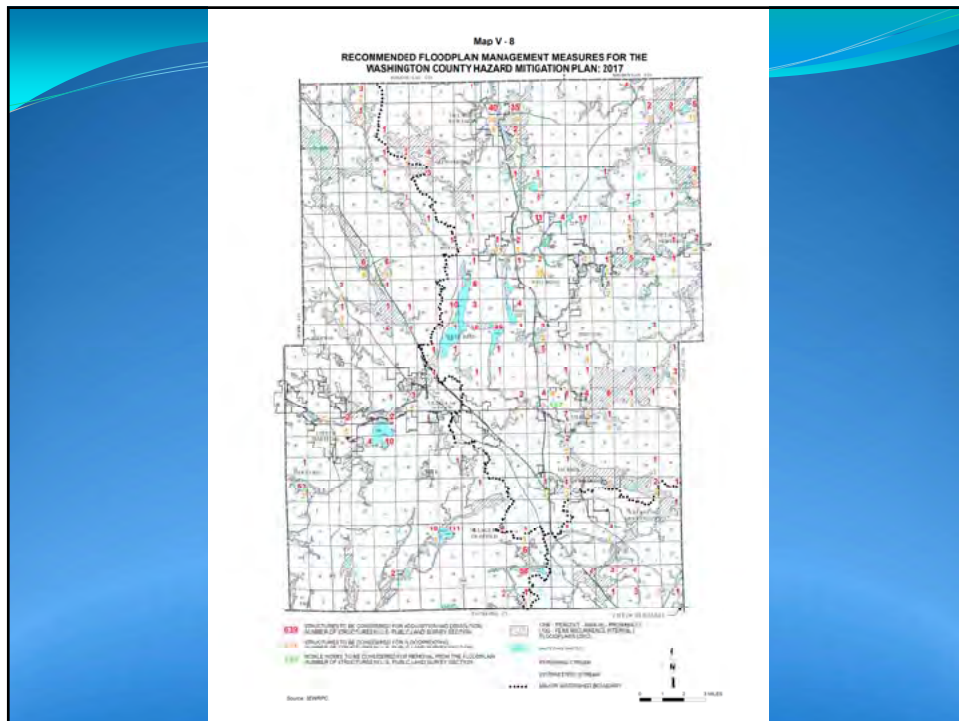






## Flood Mitigation Plan Elements

- Floodplain and Environmentally Sensitive Land Preservation Element
- Floodplain Management Element
- Stormwater Management Element
- Public Information and Education Element
- Secondary Plan Element



## Flood Mitigation Plan Elements

- Floodplain and Environmentally Sensitive Land Preservation Element
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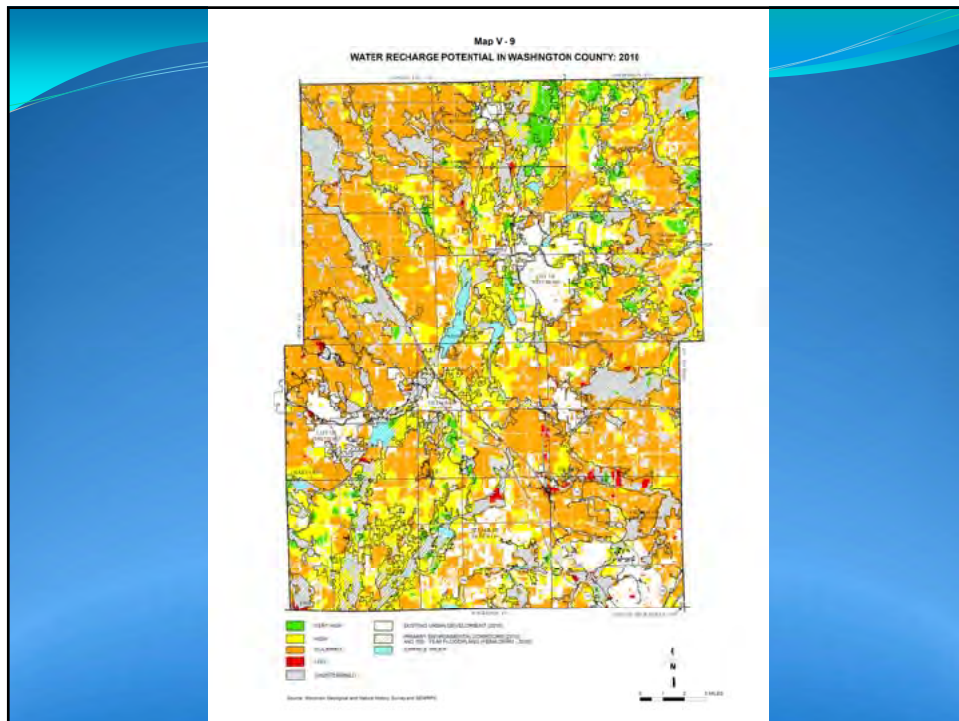


TABLE V-3

PRIORITY RANKING OF NATURAL AND OTHER HAZARDS AFFECTING WASHINGTON COUNTY BASED UPON MORTALITY AND INJURY

Order Based on Local Planning Team Perception <sup>a</sup>	Natural and Other Hazards	Period of Record	Number of Incidents per Year (average)	Number of Mortalities per Year (average)	Number of Injuries per Year (average)	Sum of Average Mortality and Injury Incidences per Year	Priority Ranking Based on Analysis
1	Transportation Accidents	1999-2013 <sup>b</sup>	2,610 <sup>b</sup>	14 <sup>b</sup>	1,034 <sup>b</sup>	1,038 <sup>b</sup>	1
12	Communicable Disease Outbreak	2005-2013	362.2	0.0	362.22	362.22	2
2	Tornadoes	1964-2014	0.3	0.06	1.17	1.18	3
4	Thunderstorms, High Wind, Hail, and Lightning	1958-2014	5.9	0.02	0.18	0.20	4
7	Hazardous Material Incidents	1969-2014 <sup>c</sup>	1.1 <sup>c</sup>	0.00 <sup>c</sup>	0.12 <sup>c</sup>	0.12 <sup>c</sup>	5
6	Extreme Temperatures	1967-2014	1.7	0.0	0.0	0.0	6
3	Winter Storms	1960-2014	2.8	0.0	0.0	0.0	7
10	Drought	1976-2014	0.7	0.0	0.0	0.0	8
6	Flooding	1981-2014	0.5	0.0	0.0	0.0	9
13	Terrorism Incidents	1970-2014	0.0	0.0	0.0	0.0	10
8	Power Outages	--	--	--	--	--	11
9	Contamination or Loss of Water Supply	--	--	--	--	--	12
9	Cyberattack on Local Government	--	--	--	--	--	13
14	Loss of Sewerage System	--	--	--	--	--	14

<sup>a</sup>These numbers indicate the ranked order of the hazards assigned by the Washington County Hazards Mitigation Plan Local Planning Team through responses given in the Hazard and Vulnerability Assessment Tool (HVA). Where hazards listed in the HVA have been consolidated for analysis and planning purposes, the order is based upon the highest rank given in the HVA. For more details see Hazard Identification section and Table III-1 in Chapter III in this report.

<sup>b</sup>Data reflect automobile accidents from years 1999 through 2013 and railroad accidents from years 1970-2014.

<sup>c</sup>Based upon pipeline-related incidents from years 1969 through 2014 and transportation-related incidents from years 1971 through 2014.

<sup>d</sup>Incidents have been reported, but no data available to calculate averages.

<sup>e</sup>No data available are available.

Source: National Climatic Data Center; U.S. Department of Transportation, Office of Pipeline Safety; Wisconsin Department of Transportation; Washington County Emergency Management Office; and SEWRPC.

TABLE V-4

PRIORITY RANKING OF NATURAL AND OTHER HAZARDS AFFECTING WASHINGTON COUNTY BASED UPON PROPERTY AND CROP DAMAGE

Order Based on Local Planning Team Perception <sup>a</sup>	Natural and Other Hazards	Period of Record	Number of Incidents per Year (average)	Total Property Damage per Year (dollars) <sup>b</sup>	Total Crop Damage per Year (dollars)	Sum of Property and Crop Damage per Year (dollars) <sup>b</sup>	Priority Ranking Based on Analysis
1	Transportation Accidents	1999-2013 <sup>b</sup>	2,610.7	22,044,010 <sup>c</sup>	0	22,044,010 <sup>c</sup>	1
2	Tornadoes	1964-2014	0.3	1,469,969	3,924	1,473,893	2
3	Winter Storms	1960-2014	2.2	1,363,062	3,000	1,366,062	3
9	Flooding	1981-2014	0.5	914,402	481,524	1,395,926	4
4	Thunderstorms, High Wind, Hail, and Lightning	1958-2014	5.9	482,608	157,505	640,113	5
7	Hazardous Material Incidents	1969-2014 <sup>d</sup>	1.1 <sup>d</sup>	537,676 <sup>d</sup>	0 <sup>d</sup>	537,676 <sup>d</sup>	6
10	Drought	1976-2014	0.7	0	487,815	487,815	7
5	Extreme Temperatures	1962-2014	1.7	2,526	11,033	13,559	8
13	Terrorism Incidents	1970-2014	0.0	0	0	0	9
12	Communicable Disease Outbreak	2005-2013	364.2	--	--	--	10
8	Power Outages	--	--	--	--	--	11
11	Contamination or Loss of Water Supply	--	--	--	--	--	12
9	Cyberattack on Local Government	--	--	--	--	--	13
14	Loss of Sewerage System	--	--	--	--	--	14

<sup>a</sup>These numbers indicate the ranked order of the hazards assigned by the Washington County Hazards Mitigation Plan Local Planning Team through responses given in the Hazard and Vulnerability Assessment Tool (HVA). Where hazards listed in the HVA have been consolidated for analysis and planning purposes, the order is based upon the highest rank given in the HVA. For more details see Hazard Identification section and Table III-1 in Chapter III in this report.

<sup>b</sup>Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.

<sup>c</sup>Data reflect automobile accidents from years 1999 through 2013 and railroad accidents from years 1970-2014.

<sup>d</sup>Based upon pipeline-related incidents from years 1969 through 2014 and transportation-related incidents from years 1971 through 2014.

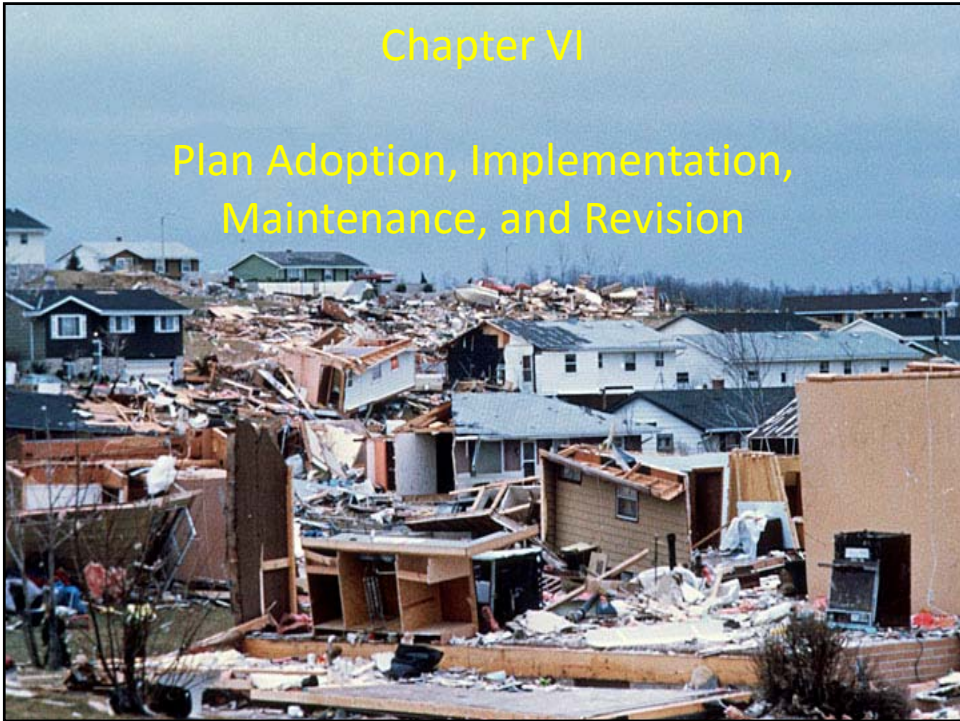
<sup>e</sup>Incidents have been reported, but no data are available to calculate damages or averages.

<sup>f</sup>No data available.

Source: National Climatic Data Center; U.S. Department of Agriculture Risk Management Agency; U.S. Department of Transportation, Office of Pipeline Safety; Wisconsin Department of Transportation; Washington County Division of Emergency Management; and SEWRPC.

**Table V-5  
COST-BENEFIT ANALYSIS SUMMARY OF MEASURES INCLUDED IN THE WASHINGTON COUNTY HAZARD MITIGATION PLAN**

Hazard	Mitigation Measure	Estimated Cost <sup>a</sup>		Costs of Implementation <sup>b</sup>			Estimated Benefits for a One Percent Annual Probability Flood Event (thousands of dollars) <sup>c</sup>	Direct Benefits				Indirect Benefits <sup>d</sup>	Community/Jurisdictions Affected
		Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High		Enhanced Preparedness/Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Flooding and Related Stormwater Drainage Problems	<b>Floodplain and Environmentally Sensitive Land Preservation Element</b>												
	• Floodplain and wetland zoning <sup>1</sup>	0.7	0.7	X	--	--	--	X	X	X	X	5	Washington County, Cities of Harford and West Bend, Villages of Germantown, Jackson, Kearsburg, Newburg, Rockfield, and Singer
	• Environmentally sensitive areas and open space preservation actions <sup>2</sup>	10,000.0 <sup>2</sup>	0	--	--	X	--	X	X	--	--	4	Washington County, Cities of Harford and West Bend, Villages of Germantown, Jackson, Kearsburg, Newburg, Rockfield, and Singer; Towns of Addison, Barton, Erin, Farmington, Germantown, Harford, Jackson, Kearsburg, Pull, Trenton, Wayne, and West Bend, MMSO
• Wetland restoration to reduce flood related cultural and property damages <sup>3</sup>	13,770.0	--	--	--	X	0.7	X	X	--	--	4	Washington County, Villages of Germantown and Rockfield, Towns of Addison, Barton, Erin, Farmington, Germantown, Pull, Trenton, Wayne, and West Bend	
Floodplain Management Plan Element	• Placement of low resistance backwater pipe/levee structures <sup>4</sup>	1,740.0	--	--	--	X	187.1	X	X	X	X	4	Washington County, City of Harford, Village of Rockfield
	• Surveys of up to 983 structures identified as potentially being in the floodplain <sup>5</sup>	1,180.0	--	--	--	X	--	X	X	--	--	3	Washington County, Cities of Germantown, Jackson, Kearsburg, Newburg, and Rockfield, Towns of Addison, Barton, Erin, Farmington, Germantown, Harford, Jackson, Kearsburg, Pull, Trenton, Wayne, and West Bend
	• Floodproofing up to 211 structures identified as potentially being in the floodplain <sup>6</sup>	10,060.0	--	--	--	X	7,000.0	X	X	X	X	5	Washington County, Cities of Harford and West Bend, Villages of Germantown, Jackson, Kearsburg, Newburg, and Rockfield, Towns of Addison, Barton, Erin, Farmington, Germantown, Harford, Jackson, Kearsburg, Pull, Trenton, Wayne, and West Bend





## Chapter VI Overview

- Plan refinement, review, and adoption
- Plan implementation strategies
- Funding sources
- Plan monitoring and reevaluation strategies
  - Annual review
  - Post-disaster review

Table VI-1

WASHINGTON COUNTY HAZARD MITIGATION PLAN SUMMARY AND IMPLEMENTATION STRATEGIES

Hazard	Mitigation Measures	Status	Priority	Implementation Timetable and Notes	Potential Funding Programs (see Appendix J)
Flooding and Related Problems	<b>Floodplain and Environmentally Sensitive Land Preservation Element</b>				
	• Floodplain and wetland zoning	Implemented	High	In place and ongoing	1,2,5,8,7,9,10,11,12,13,14,15,17,16,19,20,21,22,30,31,37,40,46,47,49,51,52,53,54,55,56,57,58,61,62,64,65,66,68,75,79,80,81,84,90
	• Environmentally sensitive areas and open space preservation actions <sup>10</sup>	Partially Implemented	High	As funding and opportunities become available	
	• Wetland regulation to reduce flood-related agricultural and property damages <sup>11</sup>	Not Implemented	Medium	As funding and opportunities become available	
	<b>Floodplain Mitigation/Reduction Element</b>				
	• Removal of four repetitive loss/severe repetitive loss structures <sup>8</sup>	Not Implemented	High	As funding and opportunities become available	1,2,5,6,9,10,11,12,14,30,21,32,48,49,57,62
	• Surveys of up to 993 structures identified as potentially being in the floodplain	Not Implemented	High	Implement following updating of floodplain maps	
	• Flooding of up to 211 non-residential structures identified as potentially being in the floodplain	Not Implemented	Medium	Implement after updating of floodplain maps and surveys of structures	
	• Removal of up to 635 structures identified as potentially being in the floodplain <sup>12</sup>	Not Implemented	Medium	Implement after updating of floodplain maps and surveys of structures	
	• Removal of up to 137 mobile homes identified as potentially being in the floodplain <sup>13</sup>	Not Implemented	Medium	Implement after updating of floodplain maps and surveys of structures	
	• National Flood Insurance Program and map updating	Partially Implemented	High	Ongoing, several map updating efforts are underway	
	• Lending institution and real estate agent policies	Partially Implemented	High	Ongoing	
	• Enforcement of floodplain regulations	Implemented	High	In place and ongoing	
	• Maintenance of U.S. Geological Survey stream gages	Implemented	High	Ongoing	
<b>Stormwater Management Plan Element</b>					
• Stormwater management plans	Partially Implemented	High	Ongoing	5,9,10,14,40,52,54	
• Stormwater-related regulations	Partially Implemented	High	Ongoing		
<b>Public Information and Education Element</b>					
• Public education activities	Partially Implemented	High	Ongoing	5,38,41,52,59,64,67,68	
• Public participation activities and coordination with other agencies and units of government	Partially Implemented	High	Ongoing		

Table VI-2

SUMMARY OF WASHINGTON COUNTY HAZARD MITIGATION MEASURES AND PRIMARY IMPLEMENTING GOVERNMENTAL UNITS AND AGENCIES

Mitigation Measure	Washington County	City of Hartford	City of West Bend	Village of Germantown	Village of Jackson	Village of Kaukaun	Village of Newburg	Village of Richfield	Village of Slinger	Town of Adair	Town of Barton
Floods											
Floodplain and wetland zoning	WCB, WCPD	HCC, CHPZ	WBCC, CWBDD	GVB, VGDD	JAB, VJPC	KVB, VWPC	NVB, VNPC	RVB, VRPZ	SVB, VSPZ	TAB, TAZP	TBB, TBPC
Environmentally sensitive area and open space preservation actions	WCPD	CHPK, CHPZ	CGSPK, CWBDD	VJPK, VGDD	JPK, VJPC	VWK, VWPC	VNPK	VWRK, VRPZ	VSPK, VSPZ	TAPK, TAPZ	TBPK
Wetland restoration to reduce flood-related agricultural and property damage	WGLC, NRCS	---	---	---	---	---	---	---	---	---	---
Removal of four repetitive structures/ repetitive loss structures	WCEM	CHPZ	---	---	---	---	---	VRPZ	---	---	---
Survey of up to 80 structures/ structures at greatest risk in the floodplain	PO, WCPD	PO, CHPZ	PO, CWBDD	PO, VGDD	PO, VJPC	PO, PKPC	---	PO, VRPZ	---	PO, TAZP	PO, TBPC
Resurveying of up to 271 structures/ identified as potentially being in the floodplain	WCEM	PO, CHPZ	PO, CWBDD	PO, VGDD	PO, VJPC	PO, PKPC	---	PO, VRPZ	---	PO, TAZP	PO, TBPC
Removal of up to 100 structures/ identified as potentially being in the floodplain	WCEM	PO, CHPZ	PO, CWBDD	PO, VGDD	PO, VJPC	PO, PKPC	---	PO, VRPZ	---	PO, TAZP	PO, TBPC
Removal of up to 100 mobile homes/ identified as potentially being in the floodplain	WCEM	---	---	---	---	---	---	---	---	---	---
National Flood Insurance Program and rate setting	FEMA	FEMA	FEMA	FEMA	FEMA	FEMA	FEMA	---	FEMA	---	---
Lending institution and real estate agent policies	LI	LI	LI	LI	LI	LI	LI	LI	LI	LI	LI
Enforcement of floodplain regulations	WCPD	CHPZ	CWBDD	VGDD	VJPC	VJPC	VNPK	VRPZ	VSPZ	TAZP	TBPC
Maintenance of 1:100 Floodplain Survey stream gages	USGS, MWRD, RPL, ACE, WDM, WKPL	---	---	---	---	---	---	---	---	---	---
Stormwater management plans	WCPD	CHPZ	CWBDD	VGDD	VJPC	VNPK	VNPK	VRPZ	VSPZ	TAZP	TBPC
Stormwater control regulations	WCPD	CHPZ	CWBDD	VGDD	VJPC	VNPK	VNPK	VRPZ	VSPZ	TAZP	TBPC

NOTE: Agency abbreviations in the table are as follows:

ACE	U.S. Army Corps of Engineers	HCC	Hartford City Council	RPC	Southwestern Wisconsin Regional Planning Commission	USGS	U.S. Geological Survey	WPL	Waubesa County Department of Parks and Recreation
ATB	Adair Town Board	JPK	Village and Town of Jackson Joint Parks and Recreation	RVB	Richfield Village Board	VGDD	Village of Germantown Community Development Department	WBCC	West Bend City Council
BTB	Barton Town Board	JVB	Jackson Village Board	VJPC	Village of Jackson Plan Commission	WCB	Washington County Board	WGLC	Washington County Land and Water Conservation Division
CHPZ	City of Hartford Planning, Zoning & Building Inspection	LI	Lending Institutions	NVB	Newburg Village Board	WCEM	Washington County Office of Emergency Management	WDR	Wisconsin Department of Natural Resources
CWBDD	City of West Bend Department of Development	MWRD	Missaukee Manufacturing Services District	OWH	Okauchee/Washington County Health Department	VNPK	Village of Newburg Plan Commission	WCPD	Washington County Planning and Land Use Department
FEMA	Federal Emergency Management Agency	PO	Property Owners	TBPC	Town of Barton Plan Commission	VRPZ	Village of Richfield Planning and Zoning	WDR	Wisconsin Department of Natural Resources
GVB	Germantown Village Board	RB	Real Estate Brokers	TBA	Town of Barton Zoning Administrator	VRPZ	Village of Slinger Planning and Zoning		

PRELIMINARY DRAFT

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SEWRPC Community Assistance Planning Report No. 326

WASHINGTON COUNTY HAZARD MITIGATION PLAN

Appendix J

POTENTIAL FUNDING PROGRAMS TO IMPLEMENT PLAN RECOMMENDATIONS

FUNDING PROGRAM DESCRIPTIONS

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
1	U.S. Federal Emergency Management Agency (FEMA)	Hazard Mitigator Grant Program	State agencies and participating National Flood Insurance Program (NFIP) communities, private nonprofit organizations	1. Acquisition and relocation or demolition of structures in flood hazard areas 2. Floodproofing 3. Construction or modification of dikes, levees, floodwalls, seawalls, groins, jetties, breakwaters, and stabilized sand dunes 4. Soil stabilization 5. Minor structural projects 6. Flood-related projects for critical facilities 7. Management costs 8. Informational activities 9. Dike preparation 10. Technical assistance 11. Safe room construction	75 percent Federal cost-share assistance, 12.5 percent State match and 12.5 percent local match required*	Within 60 days of a Presidential disaster declaration
2	FEMA	Flood Mitigation Assistance Grant Program	State agencies and participating NFIP communities	1. Elevation, relocation or demolition of critical structures 2. Acquisition 3. Dry floodproofing 4. Minor structural projects 5. Beach nourishment	Funding is appropriated by Congress annually; 75 percent Federal cost-share assistance; 25 percent local match required; two types of grants through grant and project grant**	Varies
3	FEMA	Homeland Security Preparedness Technical Assistance Program	State and local governments	1. Implementation of National Incident Response Plan 2. Strengthen chemical, biological, radiological, nuclear, and explosive detection, response, and decontamination capability	No statutory matching requirements; awards awarded vary based on the scope of the project	Varies

PRELIMINARY DRAFT

3

Appendix K

FUNDING PROGRAMS CONTACT INFORMATION<sup>a</sup>

Administrator of Grant Program	Name of Grant Program	Address	Phone Number	Internet Web Address
Federal Emergency Management Agency (FEMA)	Hazard Mitigation Grant Program Public Assistance Program	Federal Emergency Management Agency Region V 636 South Clark Street, 6th Floor Chicago, IL 60605	(312) 488-6500	<a href="https://www.fema.gov/hazard-mitigation-grant-program">https://www.fema.gov/hazard-mitigation-grant-program</a> <a href="https://www.fema.gov/public-assistance-local-state-tribe-and-non-profit">https://www.fema.gov/public-assistance-local-state-tribe-and-non-profit</a>
FEMA	Flood Mitigation Assistance Grant Program Pre-Disaster Mitigation Program	Headquarters: Federal Emergency Management Agency Federal Insurance & Mitigation Administration 500 C Street, SW Washington, DC 20472	(202) 646-2500	<a href="https://www.fema.gov/flood-mitigation-assistance-grant-program">https://www.fema.gov/flood-mitigation-assistance-grant-program</a> <a href="https://www.fema.gov/pre-disaster-mitigation-grant-program">https://www.fema.gov/pre-disaster-mitigation-grant-program</a>
U.S. Army Corps of Engineers (USACE)	Small Flood Damage Reduction Program Snagging and Clearing for Flood Control Emergency Bank Protection Program Water Resources Development and Flood Control Act Small Hurricane and Storm Damage Reduction Program Flood Hazard Mitigation and Restoration Program	U.S. Army Corps of Engineers 231 S. LaSalle Street, Suite 1500 Chicago, IL 60604 U.S. Army Corps of Engineers 477 Michigan Avenue, Room 617 Detroit, MI 48226	(312) 646-0330  (313) 226-6760	<a href="http://www.usace.army.mil">www.usace.army.mil</a>
National Oceanic and Atmospheric Administration (NOAA)	Coastal and Estuarine Land Conservation Program	Ms. Deborah Frank Taylor NOAA Ocean Service, OCM/TBG 307 W. Tenth Street Traverse City, MI	(617) 814-3483	<a href="mailto:rose@noaa.gov/interim/landconservation">rose@noaa.gov/interim/landconservation</a>
U.S. Department of Agriculture (USDA)	Watershed Protection and Flood Prevention Program	Headquarters: Department of Agriculture Natural Resources Conservation Service 1400 Independence Avenue SW Washington, DC 20118	(202) 720-3413	<a href="https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wfp/">https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wfp/</a>

PRELIMINARY DRAFT

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## Public Meeting on Hazard Mitigation Plan

- July 27, 2017
  - 5:30 – 6:30 pm
  - Public Agency Center, Rooms 1113A&B  
333 E. Washington Street, West Bend
- Review the plan update
- Seek public input
  - Summarize the draft plan
  - Answer questions
  - Comments on draft plan

## Remaining Effort on Plan Update

- Public Meeting
- Review by the Wisconsin Division of Emergency Management
  - Any necessary revisions
- Review by the Federal Emergency Management Agency
  - Any necessary revisions
- Formal adoption by the Washington County Board
  - Covers the Towns
- Formal adoption by the governing bodies of the incorporated municipalities of the County

## Project Web Site

- <http://www.sewrpc.org/HMP>
  - Agendas and other meeting materials
  - Summary notes from meetings
  - Presentations
  - Draft of the plan report
  - Comment screen
  - Other ways to send a comment
- Email to [jboxhorn@sewrpc.org](mailto:jboxhorn@sewrpc.org)

**From:** [Rob Schmid](#)  
**To:** [Boxhorn, Joseph E.](#)  
**Subject:** Washington Co. Hazard Mitigation LPT Meeting Follow Up  
**Date:** Tuesday, July 11, 2017 11:42:25 AM

---

Joe

Below are the other requested changes to Chapter V that I mentioned at yesterday's meeting.

**Page 71** currently reads like this:

As described in Chapter II, Washington County has developed a comprehensive emergency management plan and hazard analysis, which sets forth an all-hazards action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs that complement the County's plan and that also set forth procedures and actions to deal with a range of situations and events, including hazardous materials incidents.

In the event of a hazardous materials incident, Washington County can utilize its county-wide hazardous materials response team or utilize the regional hazardous material response system. In 1995, the nearby City of Racine Fire

Department signed a contract with the State of Wisconsin to be the regional hazardous materials response agency

for Southeastern Wisconsin. The City of Racine has a certified Hazardous Materials Team, made up of firefighters

who have been trained to respond to chemical-related emergencies throughout the region, and the Team has

specialized equipment and a state-of-the-art hazardous materials response vehicle to assist in responding to

regional hazardous materials incidents.

Please change it to read like this: **changes**

As described in Chapter II, Washington County has developed a comprehensive emergency management plan and hazard analysis, which sets forth an all-hazards action plan. **Washington County also utilizes a Hazardous Materials**

**Plan – adopted in 1998 and reviewed/updated annually.** In addition, many of the local units of government

have developed emergency operations plans and/or programs that complement the County's plan and that also set

forth procedures and actions to deal with a range of situations and events, including hazardous materials incidents.

In the event of a hazardous materials incident, Washington County can utilize its county-wide hazardous materials

response team **(also a Type III state contracted team)** or utilize the **state-wide** hazardous material **task force** response system. The nearby City of **Milwaukee** Fire

Department **(a Type I state contracted team)** has a certified Hazardous Materials Team, made up of firefighters

who have been trained to respond to chemical-related emergencies throughout the **SE WI** region, and the Team has

specialized equipment and a state-of-the-art hazardous materials response vehicle to assist in responding to

regional hazardous materials incidents – **including CBRN capabilities.**

**Page 74** currently reads like this:

**Local Programs**

As described in Chapter II, there are 14 fire departments; 14 rescue departments; 17 hospitals, major clinics, and health departments that serve communities in Washington County (see Appendices C and D). Six municipalities in the County provide for law enforcement through full-time local police departments. Three other municipalities provide for law enforcement through part-time police departments or town constable with limited hours and the Washington County Sheriff’s Department. In the remaining municipalities primary law enforcement is through

Please change it to read like this: changes

**Local Programs**

As described in Chapter II, there are 13 fire departments; 13 rescue departments; 17 hospitals, major clinics, and health departments that serve communities in Washington County (see Appendices C and D). Six municipalities in the County provide for law enforcement through full-time local police departments. Three other municipalities provide for law enforcement through part-time police departments or town constable with limited hours and the Washington County Sheriff’s Department. In the remaining municipalities primary law enforcement is through

While Appendix C (Table C-2) lists 14 fire/EMS agencies, Slinger FD is strictly fire and Lifestar EMS (serving the Slinger area) is strictly EMS.

In other words, while there are 14 total agencies, only 13 apply to each category listed above.

**Page 86** currently reads like this:

The Washington County Health Department conducts active surveillance, investigations, and follow up of incidents of reportable communicable diseases in the County. The Department conducts public education regarding communicable diseases, disease prevention, and immunization. In addition, the department provides immunizations for children not covered by health insurance. The Department also participates in the Tri-County Immunization Coalition with Ozaukee and Waukesha Counties, which focuses on increasing immunization rates and reducing the incidence of vaccine-preventable diseases.

Please change it to read like this: changes

The Washington Ozaukee Public Health Department conducts active surveillance, investigations, and follow up of incidents of reportable communicable diseases in the County. The Department conducts public education regarding communicable diseases, disease prevention, and immunization. In addition, the department provides immunizations for children not covered by health insurance. The Department also participates in the Tri-County Immunization Coalition with Ozaukee and Waukesha Counties, which focuses on increasing immunization rates and reducing the incidence of vaccine-preventable diseases.

Thanks and let me know if there are any questions.

Rob Schmid

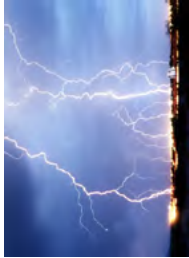
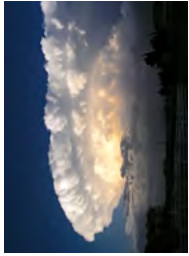
Coordinator,  
Washington Co.  
Office of Emergency Management  
500 N. Schmidt Rd.  
West Bend, WI 53095  
262-335-4399

The information in this email, and any attachments, may contain confidential information. Use and further disclosure must be consistent with applicable laws. However, if you believe you've received this email in error, delete it immediately and do not use, disclose or store the information it contains

**Figure A-3**

**PUBLIC MEETINGS HELD AS PART OF  
WASHINGTON COUNTY HAZARD MITIGATION PLAN DEVELOPMENT**





**Washington County All-Hazard Mitigation Planning  
Public Informational Meeting**

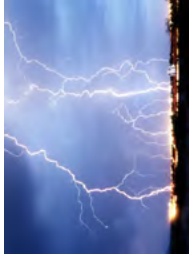
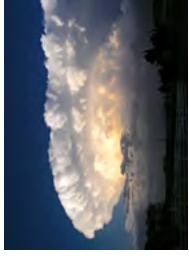
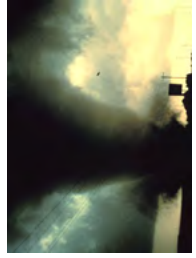
**Wednesday August 10, 2016  
6:00 pm—8:00 pm**

**Public Agency Center  
333 E. Washington Street, West Bend, WI 53095  
Rooms 1113A&B**

Join us for a public informational meeting regarding Washington County's All-Hazard Mitigation Planning. The meeting will address the purpose of the plan as well as review the work completed to date. The public is invited to ask questions and provide input and comments regarding the plan.

*For further information, please contact ...*

**Rob Schmid, Emergency Management Coordinator  
for Washington County—262.335.4399**



**Washington County All-Hazard Mitigation Planning  
Public Informational Meeting**

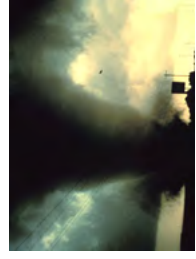
**Wednesday August 10, 2016  
6:00 pm—8:00 pm**

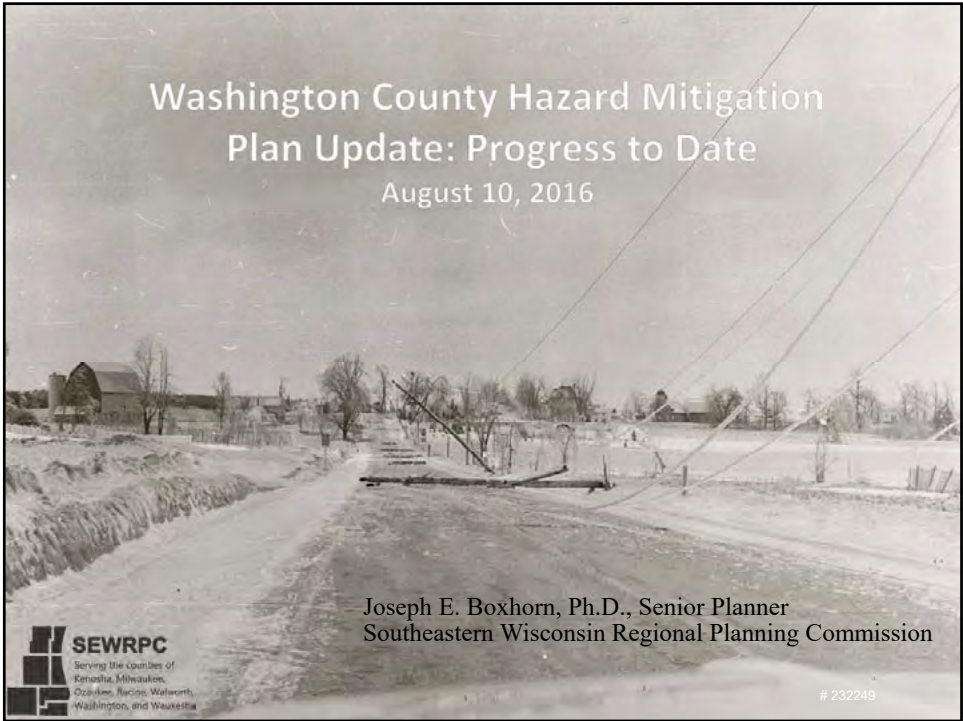
**Public Agency Center  
333 E. Washington Street, West Bend, WI 53095  
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*For further information, please contact ...*

**Rob Schmid, Emergency Management Coordinator  
for Washington County—262.335.4399**





## Agenda for Meeting

- Discuss purpose of plan
- Review the work completed to date
- Seek information
  - Problem areas related to hazards
  - Potential mitigation measures and projects
- Answer questions on the plan
- Take comments on plan

## What is Hazard Mitigation?

- “Mitigation is any sustained action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards” —FEMA
- Actions to reduce the damages that result when disasters occur



## What is Hazard Mitigation?

- Mitigation is not:
  - Emergency response
  - Crisis management
  - Disaster preparation and recovery
- Mitigation focuses on reducing the impacts from hazard events when they occur



## Why Do We Mitigate Hazards?



- Disasters are costly
- State and Federal assistance are insufficient
- We can prevent future damages
- Lesser impacts mean a quicker response and recovery process
- Can do this locally

## Washington County Hazard Mitigation Plan

- Includes all of the municipalities in the County
- Sets forth strategies for mitigating impacts of several natural and technological hazards
- Establishes eligibility for hazard mitigation funding from the Federal Emergency Management Agency (FEMA)
  - FEMA requires that local hazard mitigation plans be updated and revised every five years

## Washington County Hazard Mitigation Plan

- Plan development and updating is overseen by a Local Planning Team
  - Team includes elected officials, appointed officials, department and agency representatives, business representatives, knowledgeable citizens
  - Law enforcement, fire, and EMS departments; public works and engineering departments, planning departments, conservation departments, health department, private sector firms, nonprofit agencies, and educational institutions
- Staff include Washington County Office of Emergency Management, Washington County Planning and Parks Department, and SEWRPC

## Plan Components to Develop

- Develop inventories of natural and built features
- Identify hazards posing risks to the County
- Conduct risk and vulnerability analysis
- Develop hazard mitigation goals
- Develop hazard mitigation strategies
- Develop plan adoption, implementation, and maintenance strategies
  - Develop an inventory of potential funding sources

## Natural Hazards Profiled in the Plan

(Required by FEMA)



Drought



Flooding



Extreme  
Temperatures



Thunderstorms  
High Wind/Hail/Lightning



Tornado



Winter Storms

## Technological Hazards Profiled in the Plan

(Optional under FEMA rules)



Communicable  
Disease Outbreak



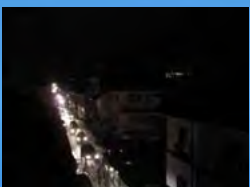
Contamination/Loss  
of Water Supply



Cyberattack on  
Local Government



Hazardous  
Material Incidents



Long-term  
Power Outages



Loss of  
Sewerage System

## Technological Hazards Profiled in the Plan

(Optional under FEMA rules)



Railway  
Accidents



Roadway  
Accidents



Terrorism

## Risk Analysis—Hazard Profiles

- Most profiles follow a similar format
  - Definition and description of the hazard
  - Description of notable historical events that affected the County
  - Description of some notable recent events that affected the County
  - Assessment of vulnerabilities to the hazard and community impacts from the hazard
  - Description of potential future changes in impacts
  - Discussion of any differences among communities in risks

## Average Annual Damages

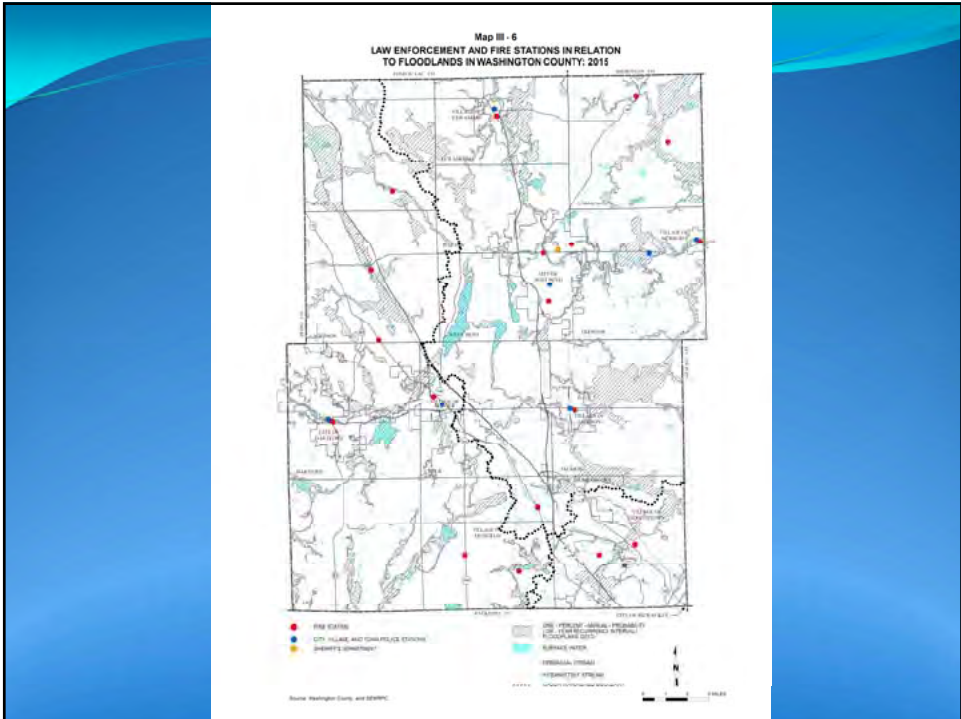
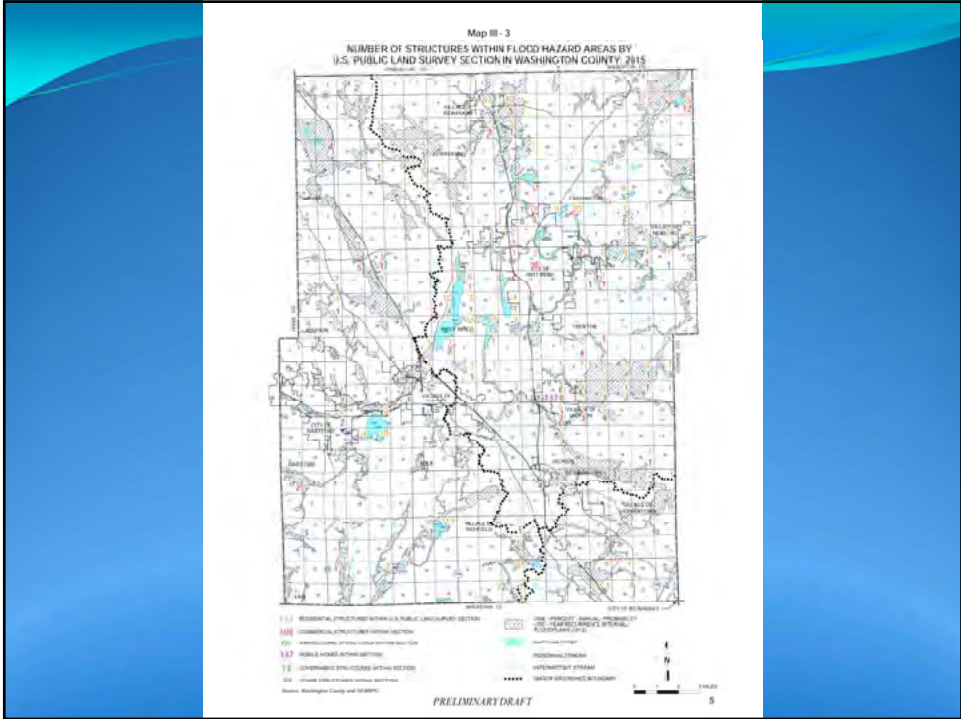
Hazard	Years	Incidents per Year	Annual Property Damages (\$)	Annual Crop Damages (\$)	Total Annual Damages (\$)
Automobile Accidents	15	2,607.13	24,245,183	0	24,245,133
Tornadoes	51	0.31	1,425,239	3,925	1,429,164
Winter Storms	55	2.80	1,363,062	3,000	1,366,062
Flood	34	0.50	614,408	567,662	1,082,070
Thunderstorms/Wind/Hail/Lightning	56	6.93	797,967	205,991	1,003,958
Drought	35	0.23	0	554,944	544,944
Pipeline Hazmat	46	0.15	535,720	0	535,720
Railway Accidents	40	3.58	210,122	0	210,122
Temperature Extremes	33	1.73	2,526	11,031	13,557
Transportation Hazmat	44	0.84	950	0	950

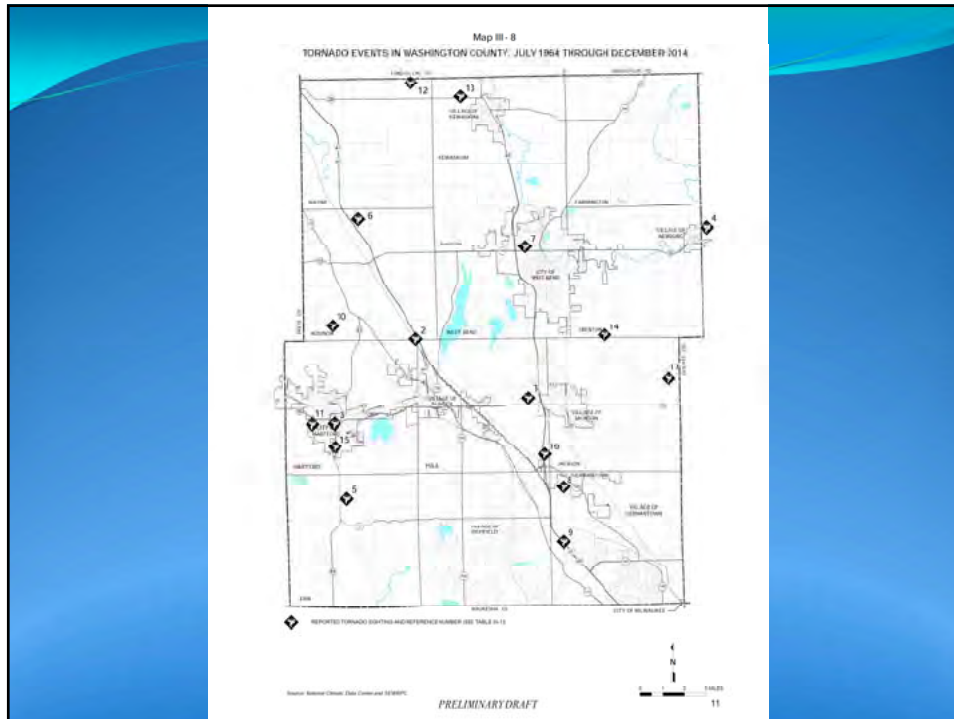
Note: All damages are expressed in 2014 dollars.

## Average Annual Fatalities and Injuries

Hazard	Years	Incidents per Year	Fatalities per Year	Injuries per year	Annual Total
Automobile Accidents	15	2,607.13	13.73	1,023.73	1,037.46
Communicable Diseases	9	253.81	0.00	253.81	253.81
Sexually-transmitted Diseases	9	216.06	0.00	216.06	216.06
Railway Accidents	40	3.56	0.35	1.15	1.50
Tornadoes	51	0.31	0.06	1.12	1.18
Thunderstorm/Wind/Hail/Lightning	56	6.93	0.02	0.18	0.20
Pipeline Hazmat Accidents	46	0.15	0.00	0.07	0.07
Transportation Hazmat Accidents	44	0.84	0.00	0.05	0.05
Temperature Extremes	33	1.73	0.00	0.02	0.02







## Hazard Mitigation Goals

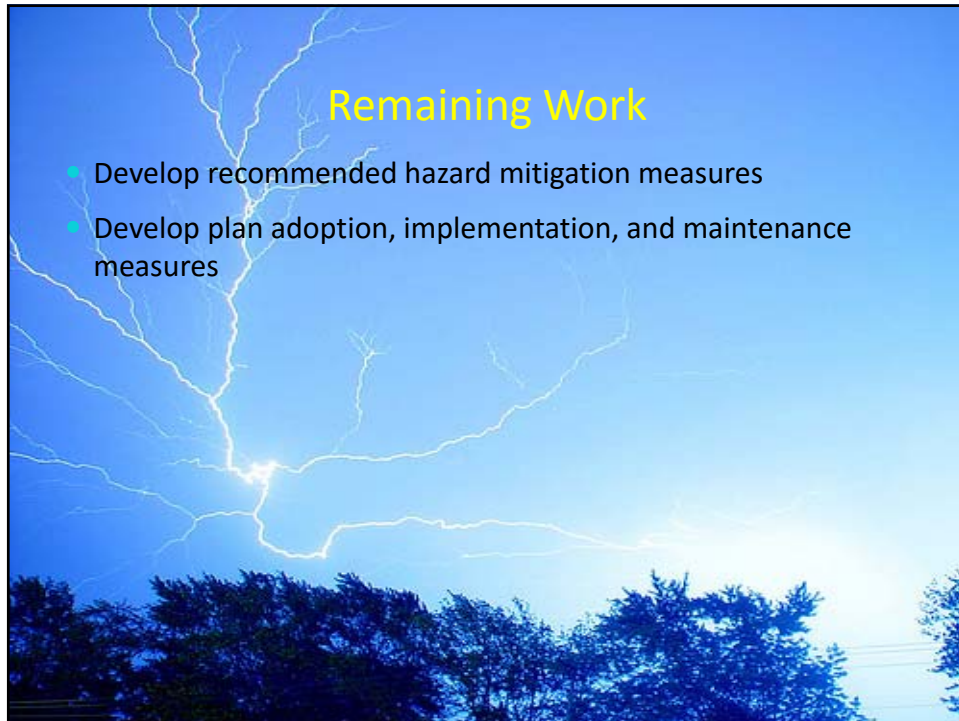
1. A spatial distribution of the various land uses that minimizes hazards and dangers to health, welfare, and safety as well as further enhancing the economic base of the County, and will result in a compatible arrangement of land uses properly related to the existing and proposed supporting transportation, utility, public safety, and public facility systems.
2. A spatial distribution of the various land uses that maintains biodiversity and will result in the protection and wise use of the natural resources of the County, including its soils, inland lakes and streams, groundwater, wetlands, woodlands, and natural areas and critical species habitats.

## Hazard Mitigation Goals

3. An **integrated transportation system** that, through its location, capacity, and design, will safely, economically, and **effectively serve** the existing and proposed land use pattern and promote the implementation of the land use plan, meeting the current and anticipated travel demand and **minimizing the potential for accidents and the associated toll on life and property damage.**
4. The provision of facilities necessary to maintain a **high quality of fire and police protection and emergency medical services** throughout the County.

## Hazard Mitigation Goals

5. The development of a stormwater and floodplain management system that **reduces the exposure of people to drainage- and flooding-related inconvenience and to health and safety hazards and that reduces the exposure of real and personal property to damage** through inundation resulting from flooding and inadequate stormwater drainage.
6. The identification and **development of programs that complement County and local emergency operations plans to mitigate the potential exposure to health and safety and the exposure of real and personal property** resulting from a broad range of hazards that are unpredictable and not geographically specific in nature.



## Remaining Work

- Develop recommended hazard mitigation measures
- Develop plan adoption, implementation, and maintenance measures



## Development of Hazard Mitigation Strategies

- Identify alternative hazard mitigation strategies
  - Structural—e.g. safe rooms, flood proofing
  - Nonstructural—e.g. ordinances, floodplain preservation
  - Public education
- Review current programs
  - Federal and State, local
- Evaluate alternatives
- Examine multi-jurisdictional considerations
- Select a set of priority mitigation measures

## Implementation Strategies

- Develop estimates of mitigation measure costs
- Summarize benefits of implementing mitigation measures
- Designate lead management agencies
- Identify potential sources of funding and technical assistance



## Approval and Adoption

- When a draft plan is complete
  - Host a second public meeting → Incorporate comments
  - Review by Wisconsin Division of Emergency Management → Incorporate comments
  - Review and approval by FEMA → Incorporate comments
  - The plan will need to be adopted by:
    - Washington County Board
    - Governing bodies of the Cities and Villages in the County

## Project Web Site

- <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>
  - Agendas and other meeting materials
  - Summary notes from meetings
  - Presentations
  - Draft chapters as they are completed
  - Comment screen
  - Other ways to send a comment
- Email to [jboxhorn@sewrpc.org](mailto:jboxhorn@sewrpc.org)

## SUMMARY OF THE AUGUST 10, 2016 PUBLIC INFORMATION MEETING FOR THE WASHINGTON COUNTY HAZARD MITIGATION PLAN

The August 10, 2016 public information meeting for the Washington County hazard mitigation plan was convened at the Washington County Public Agency Center at 6:00 p.m. The meeting was called to order by Rob Schmid, Emergency Management Coordinator of the Washington County Emergency Management Office. Attendance was taken by circulating a sign-in sheet.

In attendance at the meeting were the following individuals:

### Attendees

Jessi Balcom	Administrator, Village of Slinger
Mike Heili	Village President, Village of Newburg
Albert Schulteis	Chair, Town of Polk
Joe VanDelLaarschot	Reporter, West Bend Daily News

### Staff

Joseph E. Boxhorn	Senior Planner, Southeastern Wisconsin Regional Planning Commission
Laura K. Herrick	Chief Environmental Engineer, Southeastern Wisconsin Regional Planning Commission
Julia Orlowski	Engineer, Southeastern Wisconsin Regional Planning Commission
Aaron Owens	Planner, Southeastern Wisconsin Regional Planning Commission
Xylia Rueda	Planner, Southeastern Wisconsin Regional Planning Commission
Rob Schmid	Emergency Management Coordinator, Washington County Emergency Management Office

Mr. Schmid welcomed all attendees to the meeting. He noted that Washington County is developing a hazard mitigation plan. He noted that once the plan is finished and adopted, the Federal Emergency Management Agency requires that it be updated every five years. Mr. Schmid introduced Joseph Boxhorn of the Southeastern Wisconsin Regional Planning Commission (SEWRPC) staff.

Mr. Boxhorn gave a short presentation on the planning effort.

[Secretary's Note: Mr. Boxhorn's presentation is attached herein as Exhibit A.]

Mr. Boxhorn stated that hazard mitigation involves taking actions to reduce the impacts caused by hazard events. He explained that local units of government must have an approved hazard mitigation plan in order to be eligible for certain grant programs administered by the Federal Emergency Management Agency. He added that the current planning effort is updating the County's plan.

Mr. Boxhorn stated that the County hazard mitigation plan is a multi-jurisdictional plan. He noted that all of the cities, villages, and towns in the County are covered by the plan. He added that all of these local units of government are participating in plan development through the Local Planning Team.

Mr. Boxhorn reviewed the progress to date on updating the hazard mitigation plan. He indicated that at this point a number of tasks have been completed including: developing inventories of natural and built features in the County, identifying and selecting the hazards that the plan will address, conducting risk analyses related to these hazards, and developing the hazard mitigation goals and objectives of the plan. He noted that preliminary drafts

have been completed of four chapters of the plan report. He explained that these chapters document the tasks that have been completed. He added that based upon review by the Local Planning Team, revision will be made to these draft chapters.

Mr. Boxhorn stated that several tasks remain to be completed as part of the plan update. He explained that these include developing alternative mitigation measures for each hazard, selecting the recommended mitigation measures; estimating the cost of the recommended mitigation measures; developing recommended plan adoption, implementation, and maintenance measures; and developing an inventory of potential funding sources for implementing recommended mitigation measures. He added that these tasks will be documented in two chapters that have yet to be completed.

Mr. Boxhorn stated that materials related to the development of the Washington County hazard mitigation plan can be found on the hazard mitigation planning page on the SEWRPC website. He noted that meeting materials, draft chapters, and presentations from planning meetings are posted there. He indicated that the page also has a comment screen that members of the public can use to submit questions or comments on the plan.

[Secretary's Note: The hazard mitigation planning page can be found on the SEWRPC website at: <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>]

Following Mr. Boxhorn's presentation there was discussion among staff and members of the public about areas within the County experiencing problems from specific hazards and potential mitigation projects.

Mr. Schmid stated that there are large mobile home parks in the Villages of Germantown, Jackson, and Slinger that might be candidate sites for safe rooms. It was also noted that the locker room for the swimming pond at the Aquatic Center-Fireman's Park in the Village of Slinger might potentially be retrofitted to act as or serve as a site for a safe room.

Mr. Heili noted that the Steeple Hill Condominiums in the Village of Newburg lack basements and might be an additional site for a safe room.

[Secretary's Note: This complex is located at 931-993 Spring Court in the Village of Newburg and consists of about 40 condominium units.]

It was noted that Jay Road near the North Branch of the Milwaukee River in the Town of Farmington tends to flood during rainstorms. At least one automobile accident has been attributed to this flooding. It was also noted that Maple Road along the Menomonee River and Willow Creek in the Village of Germantown tends to flood during rainstorms.

Ms. Balcom stated that the Village of Slinger works with the City of Hartford to install and maintain warning sirens. She added that the Village may include funds in its budget for installing an additional siren.

There being no further business, the meeting was adjourned at 8:00 p.m.

CAPR-326 SUMMARY OF WASHINGTON CTY HMP PUBLIC MTG AUG 10 2016 (00233509).DOC

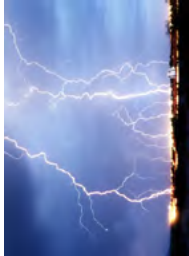
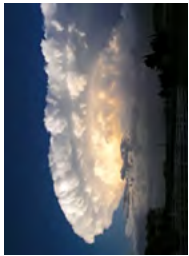
500-1110

JEB

8/16/16

Exhibit A: Boxhorn Presentation (#232249)





## Washington County All-Hazard Mitigation Planning

### Public Informational Meeting

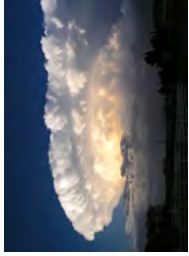
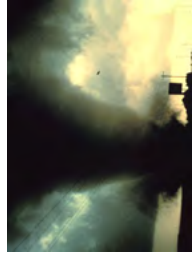
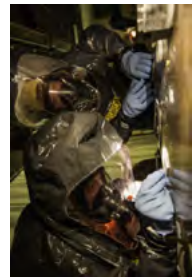
**Thursday July 27, 2017**  
**5:30 pm—6:30 pm**

**Public Agency Center**  
**333 E. Washington Street, West Bend, WI 53095**  
**Rooms 1113A&B**

Join us for a public informational meeting regarding Washington County's All-Hazard Mitigation Planning. The meeting will address the purpose of the plan as well as review the work completed to date. The public is invited to ask questions and provide input and comments regarding the plan.

*For further information, please contact ...*

**Rob Schmid, Emergency Management Coordinator**  
for Washington County—262.335.4399



## Washington County All-Hazard Mitigation Planning

### Public Informational Meeting

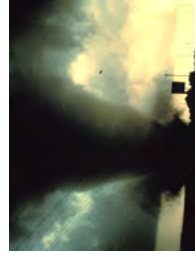
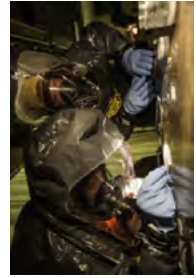
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**Rob Schmid, Emergency Management Coordinator**  
for Washington County—262.335.4399



Washington County Hazard Mitigation Plan  
July 27, 2017



1976 Washington County Ice Storm

Joseph E. Boxhorn, Ph.D., Senior Planner  
Southeastern Wisconsin Regional Planning Commission


**SEWRPC**  
 Serving the counties of  
 Kenosha, Milwaukee,  
 Calumet, Racine, Walworth,  
 Washington, and Waukesha

# 237316

Agenda for Meeting

- Discuss purpose of plan
- Review the draft plan
- Answer questions on the plan
- Take comments on plan



1940 Slinger Flooding

## Plan Documentation



SEWRPC Community Assistance Planning Report  
No. 326, *Washington County Hazard Mitigation Plan*

## Participating Jurisdictions

- City of Hartford
- City of West Bend
- Village of Germantown
- Village of Jackson
- Village of Kewaskum
- Village of Newburg
- Village of Richfield
- Village of Slinger
- Town of Addison
- Town of Barton
- Town of Erin
- Town of Farmington
- Town of Germantown
- Town of Hartford
- Town of Jackson
- Town of Kewaskum
- Town of Polk
- Town of Trenton
- Town of Wayne
- Town of West Bend

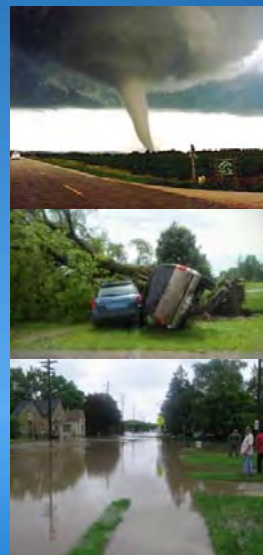
## What is Hazard Mitigation?

- “Mitigation is any sustained action taken to eliminate or reduce the long-term risk to human life and property from natural and technological hazards” —FEMA
- Actions to reduce the damages that result when disasters occur



## What is Hazard Mitigation?

- Mitigation is not:
  - Emergency response
  - Crisis management
  - Disaster preparation and recovery
- Mitigation focuses on reducing the impacts from hazard events when they occur



## Why Do We Mitigate Hazards?



1981 West Bend Tornado

- Disasters are costly
- State and Federal assistance are insufficient
- We can prevent future damages
- Lesser impacts mean a quicker response and recovery process
- Can do this locally

## Washington County Hazard Mitigation Plan

- Includes all of the municipalities in the County
- Sets forth strategies for mitigating impacts of several natural and technological hazards
- Establishes eligibility for hazard mitigation funding from the Federal Emergency Management Agency (FEMA)
  - FEMA requires that local hazard mitigation plans be updated and revised every five years
  - Hazard Mitigation Grant Program, Flood Mitigation Assistance Program, and the Pre-Disaster Mitigation Program

## Washington County Hazard Mitigation Plan

- Plan development and updating is overseen by a Local Planning Team
  - Team includes elected officials, appointed officials, department and agency representatives, business representatives, knowledgeable citizens
  - Law enforcement, fire, and EMS departments; public works and engineering departments, planning departments, conservation departments, health department, private sector firms, nonprofit agencies, and educational institutions
- Staff include Washington County Office of Emergency Management, Washington County Planning and Parks Department, the Wisconsin Division of Emergency Management, and SEWRPC

## Plan Components

(Described in Chapter I)

- Develop inventories of natural and built features
- Identify hazards posing risks to the County
- Conduct risk and vulnerability analysis
- Develop hazard mitigation goals
- Develop hazard mitigation strategies
- Develop plan adoption, implementation, and maintenance strategies
  - Develop an inventory of potential funding sources

## Inventory Data

(Chapter II)

- Demographic characteristics
- Existing and planned land use
- Surface water
  - One-percent-annual-probability floodplains
- Transportation and utility systems
- Critical community facilities
- Existing programs and regulations

## Hazard Identification

(Chapter III)

- Local Planning Team input
  - Hazard and Vulnerability Assessment tool
- Past hazard experience
  - Frequency of occurrence
  - Property and crop damages
  - Fatalities and injuries



1986 Slinger Flooding

## Natural Hazards Addressed in the Plan

(Required by FEMA)



Drought



Flooding



Extreme  
Temperatures



Thunderstorms  
High Wind/Hail/Lightning



Tornado



Winter Storms

## Technological Hazards Addressed in the Plan

(Optional under FEMA rules)



Communicable  
Disease Outbreak



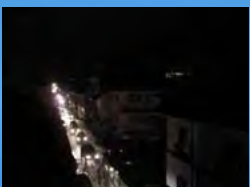
Contamination/Loss  
of Water Supply



Cyberattack on  
Local Government



Hazardous  
Material Incidents



Long-term  
Power Outages



Loss of  
Sewerage System



## Technological Hazards Profiled in the Plan

(Optional under FEMA rules)



Transportation Accidents

Terrorism

## Risk and Vulnerability Analysis

- Most profiles follow a similar format
  - Definition and description of the hazard
  - Description of notable recent and historical events that affected the County
  - Assessment of vulnerabilities to the hazard and community impacts from the hazard
  - Description of potential future changes in impacts
  - Discussion of any differences among communities in risks

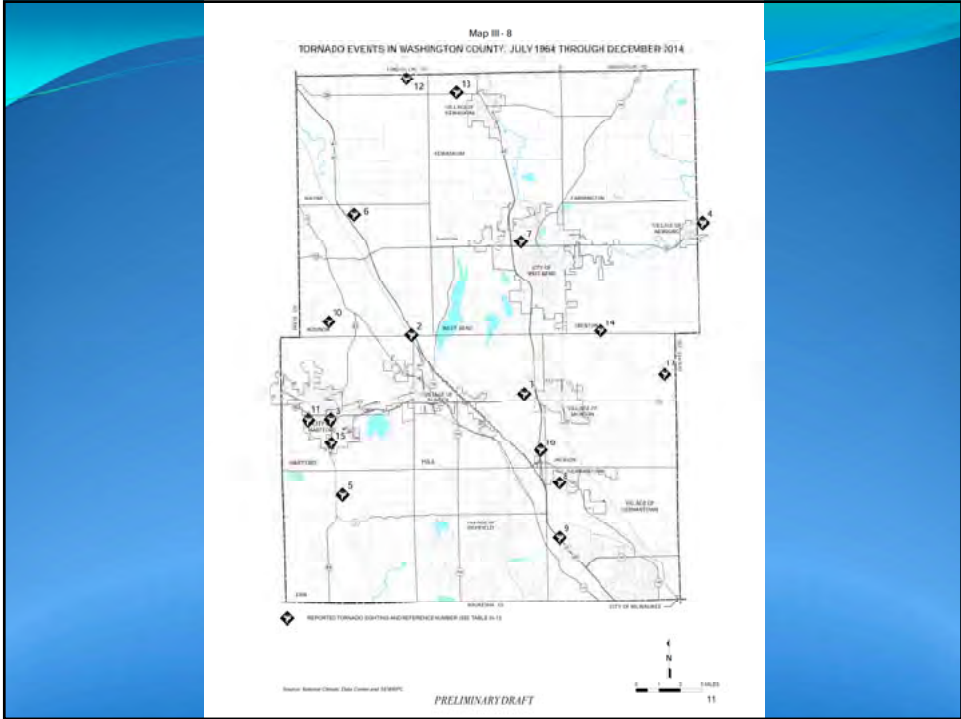
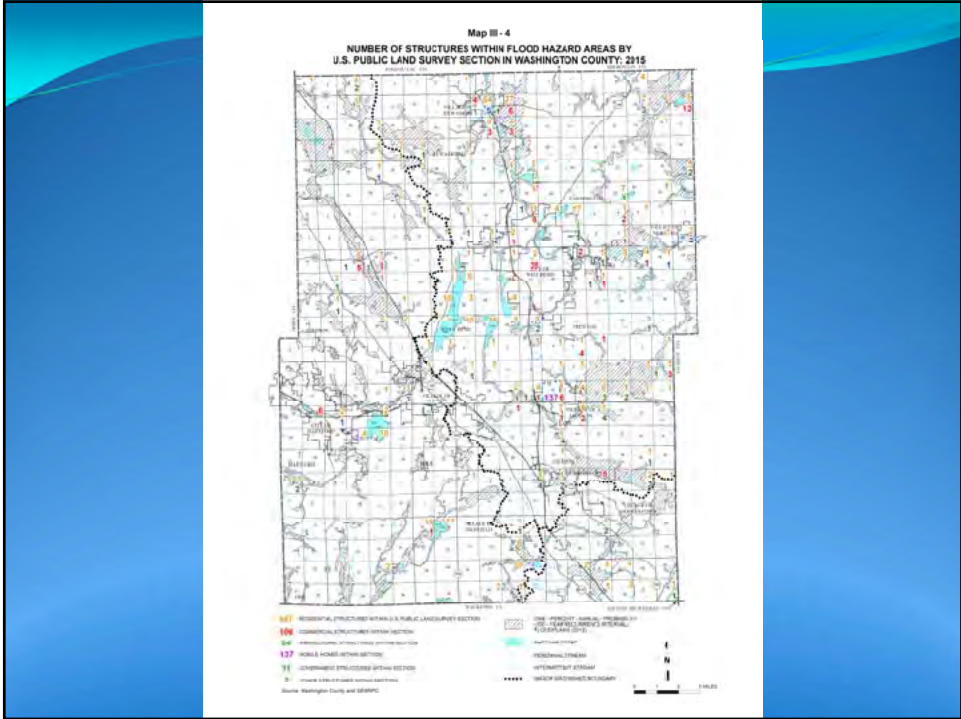
## Average Annual Damages

Hazard	Years	Incidents per Year	Annual Property Damages (\$)	Annual Crop Damages (\$)	Total Annual Damages (\$)
Automobile Accidents	15	2,607.13	24,245,183	0	24,245,133
Tornadoes	51	0.31	1,425,239	3,925	1,429,164
Winter Storms	55	2.80	1,363,062	3,000	1,366,062
Flood	34	0.50	614,408	567,662	1,082,070
Thunderstorms/Wind/Hail/Lightning	56	6.93	797,967	205,991	1,003,958
Drought	35	0.23	0	554,944	544,944
Pipeline Hazmat	46	0.15	535,720	0	535,720
Railway Accidents	40	3.58	210,122	0	210,122
Temperature Extremes	33	1.73	2,526	11,031	13,557
Transportation Hazmat	44	0.84	950	0	950

Note: All damages are expressed in 2014 dollars.

## Average Annual Fatalities and Injuries

Hazard	Years	Incidents per Year	Fatalities per Year	Injuries per year	Annual Total
Automobile Accidents	15	2,607.13	13.73	1,023.73	1,037.46
Communicable Diseases	9	253.81	0.00	253.81	253.81
Sexually-transmitted Diseases	9	216.06	0.00	216.06	216.06
Railway Accidents	40	3.56	0.35	1.15	1.50
Tornadoes	51	0.31	0.06	1.12	1.18
Thunderstorm/Wind/Hail/Lightning	56	6.93	0.02	0.18	0.20
Pipeline Hazmat Accidents	46	0.15	0.00	0.07	0.07
Transportation Hazmat Accidents	44	0.84	0.00	0.05	0.05
Temperature Extremes	33	1.73	0.00	0.02	0.02



## Hazard Mitigation Goals

1. A spatial distribution of the various land uses that minimizes hazards and dangers to health, welfare, and safety as well as further enhancing the economic base of the County, and will result in a compatible arrangement of land uses properly related to the existing and proposed supporting transportation, utility, public safety, and public facility systems.
2. A spatial distribution of the various land uses that maintains connectivity among and will result in the protection and wise use of the natural resources of the County, including its soils, inland lakes and streams, groundwater, wetlands, woodlands, and natural areas and critical species habitats.

## Hazard Mitigation Goals

3. An integrated transportation system that, through its location, capacity, and design, will safely, economically, and effectively serve the existing and proposed land use pattern and promote the implementation of the land use plan, meeting the current and anticipated travel demand and minimizing the potential for accidents and the associated toll on life and property damage.
4. The provision of facilities necessary to maintain a high quality of fire and police protection and emergency medical services throughout the County.

## Hazard Mitigation Goals

5. The development of a stormwater and floodplain management system that reduces the exposure of people to drainage- and flooding-related inconvenience and to health and safety hazards and that reduces the exposure of real and personal property to damage through inundation resulting from flooding and inadequate stormwater drainage.
6. The identification and development of programs that complement County and local emergency operations plans to mitigate the potential exposure to health and safety and the exposure of real and personal property resulting from a broad range of hazards that are unpredictable and not geographically specific in nature.

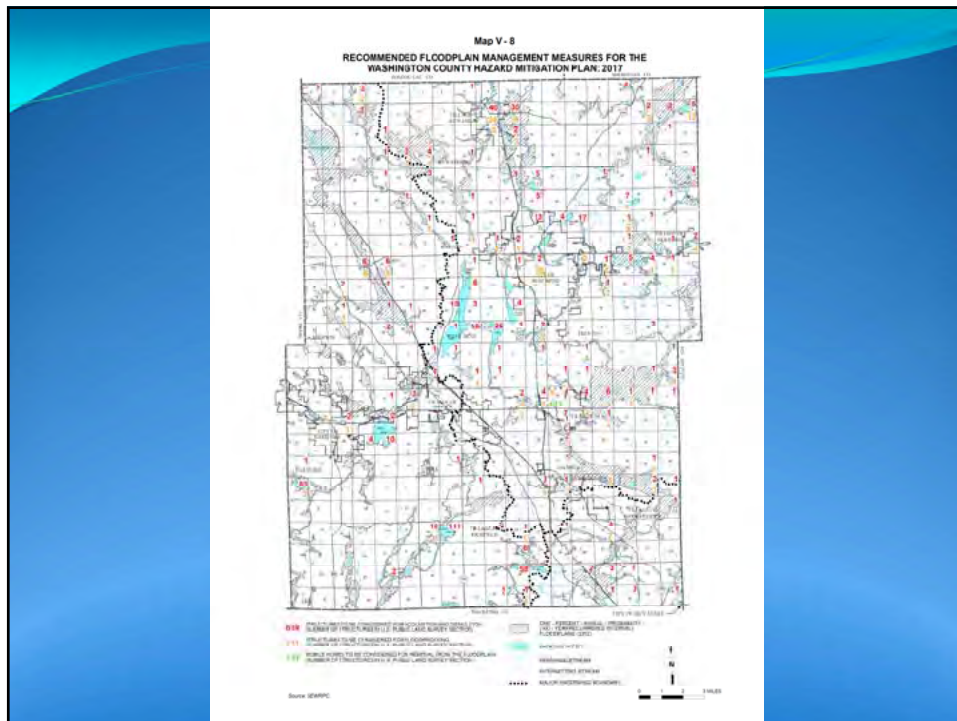
## Development of Hazard Mitigation Strategies

(Chapter V)

- Identification of alternative hazard mitigation strategies
  - Structural—e.g. safe rooms, flood proofing
  - Nonstructural—e.g. ordinances, floodplain preservation
  - Public education
- Review of current programs
  - Federal and State, local
- Evaluation of alternatives
- Examination of multi-jurisdictional considerations
- Selection of a set of priority mitigation measures

## Mitigation Strategies for Flooding

- Floodplain and Environmentally Sensitive Land Preservation
- Floodplain Management Element
  - Acquire and remove/demolish four repetitive loss properties
  - Complete ongoing floodplain mapping projects
  - Survey structures identified as potentially being located in the floodplain when mitigation projects are being considered
  - Consider floodproofing up to 211 structures identified as potentially being in floodplain
  - Consider acquiring and demolishing up to 635 structures identified as potentially being in floodplain
  - Consider removing up to 137 mobile homes identified as potentially being in floodplain



## Mitigation Strategies for Flooding

- Stormwater Management
  - Stormwater management plans
  - Continue enforcing stormwater management ordinances
- Public Information and Education
- Document extent of future floods
- Consider participating in the National Flood Insurance Program's Community Rating System
  - Leads to discounts on flood insurance premiums

## Mitigation Strategies for Weather-Related Hazards

- Maintain, update, and upgrade early warning systems
- Encourage the provision of community storm shelters
  - Especially at mobile home parks
- Encourage agricultural producers to purchase crop insurance
- Public information and education
- Continue weather spotter training
- Water conservation planning
- Protect groundwater recharge areas



1971 Slinger Train Derailment

## Mitigation Strategies for Human-Induced Hazards

- Emergency operations planning
- Site emergency planning for critical facilities
- Continued training and preparedness for first responders
- Public information and education programming
- Provision of backup power for critical facilities
- Continued traffic-related law enforcement
- Provision of bicycle accommodation on arterial roads
- Purchase of cyber-insurance by local governments

## Implementation Strategies

- Develop estimates of mitigation measure costs
- Summarize benefits of implementing mitigation measures
- Designate lead management agencies
- Identify potential sources of funding and technical assistance



Crop Damage



Anhydrous Ammonia Spill



## Approval and Adoption

- When a draft plan is complete
  - Assemble a complete draft of the plan
  - Review by Wisconsin Division of Emergency Management → Incorporate comments
  - Review and approval by FEMA → Incorporate comments
  - The plan will need to be adopted by:
    - Washington County Board
      - Adoption by the County covers the Towns
    - Governing bodies of the Cities and Villages in the County

## Project Web Site

- <http://www.sewrpc.org/HMP>
  - Agendas and other meeting materials
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  - Comments will be accepted through August 4, 2017
- Email to [jboxhorn@sewrpc.org](mailto:jboxhorn@sewrpc.org)

## SUMMARY OF THE JULY 27, 2017 PUBLIC INFORMATION MEETING FOR THE WASHINGTON COUNTY HAZARD MITIGATION PLAN

The July 27, 2017 public information meeting for the Washington County hazard mitigation plan was convened at the Washington County Public Agency Center at 5:30 p.m. The meeting was called to order by Rob Schmid, Emergency Management Coordinator of the Washington County Office of Emergency Management. Attendance was taken by circulating a sign-in sheet.

In attendance at the meeting were the following individuals:

### Attendees

None

### Staff

Rob Schmid	Coordinator, Washington County Division of Emergency Management
Joseph E. Boxhorn	Senior Planner, Southeastern Wisconsin Regional Planning Commission
Laura K. Herrick	Chief Environmental Engineer, Southeastern Wisconsin Regional Planning Commission

Mr. Boxhorn gave a short presentation on the plan update effort.

[Secretary's Note: Mr. Boxhorn's presentation is attached herein as Exhibit A.]

Mr. Boxhorn stated that materials related to the Washington County hazard mitigation plan can be found on the hazard mitigation planning page on the SEWRPC website. He noted that meeting materials, draft chapters, and presentations from planning meetings are posted there. He indicated that the page also has a comment screen that members of the public can use to submit questions or comments on the plan. He stated that comments will be accepted until 4:30 p.m. on August 4, 2017.

[Secretary's Note: The hazard mitigation planning page can be found on the SEWRPC website at:  
<http://www.sewrpc.org/HMP>]

There being no further business, the meeting was adjourned at 6:30 p.m.

CAPR-326 SUMMARY OF WASHINGTON CTY HMP PUBLIC MTG JULY 27 2017 (00238482).DOCX  
500-1110  
LKH/JEB  
07/28/17, 07/28/17

Exhibit A: Boxhorn Presentation (#237316)

**Appendix B**

**RELATIONSHIP BETWEEN LAND USE  
CATEGORIES USED ON LOCAL GOVERNMENT  
LAND USE PLAN MAPS IN WASHINGTON COUNTY**

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Table B-1

RELATIONSHIP BETWEEN LAND USE CATEGORIES USED ON LOCAL GOVERNMENT LAND USE PLAN MAPS IN WASHINGTON COUNTY TO STANDARDIZED URBAN RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL CATEGORIES USED TO PREPARE MAP 5

Community	Suburban Density Residential	Medium Density Residential	Medium-High Density Residential	High Density Residential and Housing for the Elderly	Mixed Use	General Commercial	Office and Professional Services	Business and Industrial	Industrial
Cities									
Hartford	Low Density Residential	Medium Density Residential, 1.1 to 2.9 units per acre and 3.0 to 5.81 units per acre	Medium Density Residential, 5.82 to 8.0 units per acre	High Density Residential, 8.0 to 11.0 units per acre and 11.0 to 14.0 units per acre	N/A	General Commercial	N/A	N/A	Industrial
West Bend	N/A	Single-Family Residential zoned RS-1 and RS-2	Two-Family Residential; Single-Family Residential zoned RS-3 and RS-4	Multi-Family Residential	Mixed Use	Commercial	Office Park	Business Park	Industrial
Villages									
Germantown	Rural Residential	Low Density Residential; Medium Density Residential	N/A	High Density Residential; Elderly Residential	Village Mixed Use; Mixed Use	Commercial	N/A	Industrial/Office	N/A
Jackson	N/A	One-Family Residential	Two-Family Residential	Multi-Family Residential	N/A	General Commercial	N/A	N/A	Industrial
Kewaskum	N/A	Medium-Low Density Residential; Low Density Residential	Medium-High Density Residential; Medium Density Residential	High Density Residential	N/A	Commercial	N/A	Business Park	Industrial
Newburg	Rural Residential	Village Residential zoned R-1, R-2, and R-3	Village Residential zoned R-4 and RD-1	Village Residential zoned RM-1	N/A	Village Commercial; Highway Commercial	N/A	N/A	Industrial
Slinger	N/A	Low Density Single Family Residential; Medium Density Single Family Residential	High Density Single Family Residential; Two Family Residential	Multiple Family Residential; Mobile Home Park; Potential Senior Housing	N/A	Neighborhood Commercial; Commercial	Office and Professional Services	Business Park; Light Industrial/Manufacturing and Service Business Park; Future Business/Industrial Park	N/A
Towns									
Addison	Residential--Unsewered	Residential--Sewered	N/A	N/A	Commercial/Residential--Sewered	Commercial	N/A	Mixed Commercial/Industrial	Industrial

<sup>a</sup> Includes only these land use categories within the portion of the Town proposed to be served by sanitary sewers in 2035.

Source: SEWRPC.

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## Appendix C

# SOLID WASTE DISPOSAL SITES IN WASHINGTON COUNTY: 2015

Identification Number <sup>a</sup>	Municipality	Location by U.S. Public Land Survey	Operator
Recycling Centers, Transfer Stations, and Storage Facilities			
1	Village of Germantown	NW NE S36 T9N, R20E	Advanced Disposal Services
2	City of West Bend	SW SW S07 T11N, R19E	Advanced Disposal Services
3	Village of Germantown	NE SE S36 T9N, R20E	Hyponex Corporation
4	Village of Germantown	SW SW S36 T9N, R20E	WM Healthcare Solutions, Inc.
5	Village of Germantown	SE NE S21 T09N, R20E	Village of Germantown Recycling Center
6	Town of West Bend	SW NW S16 T11N, R20E	Town of West Bend Recycling Center
Compost Sites			
7	Village of Germantown	E SW S36 T9N, R20E	Orchard Ridge RDF Organics Recycling Facility
8	Town of West Bend	SE SE S32 T11N, R19E	Town of West Bend Leaf and Yard Waste Site
9	Village of Germantown	SE NE S21 T09N, R20E	Village of Germantown Compost Facility
10	Village of Richfield	SW SE S16 T09N, R19E	Village of Richfield Compost Facility
Inactive Landfills			
11	Town of Addison	SW SW S14 T11N, R18E	Town of Addison Landfill
12	Town of Addison	NW NW S22 T11, R18E	Wisconsin Department of Natural Resources Deer Pit
13	Town of Barton	SE SE Sec 01 T11N, R19E	Albert Luff Property
14	Town of Barton	SW NW S04 T11N, R19E	Alden Belongia
14	Town of Barton	NE SE Sec 01 T11N, R19E	Len Dricken Property
16	City of West Bend	NW NE S12 T11N, R19E	Otten Property
17	Town of Barton	NW SE Sec 01 T11N, R19E	Walters Carpeting Store
18	City of West Bend	SE SW S03 T11N, R19E	City of West Bend Landfill
19	Town of Barton	SE NW S09 T11N, R19E	West Bend Sanitary Landfill
20	Town of Barton	NW SE S08 T11N, R19E	West Bend Sand and Gravel
21	Town of Erin	SW SW S09 T09N, R18E	Town of Erin Dump/Earl Matter Gravel Pit
22	Town of Farmington	NE NE S08 T12N, R20E	Town of Farmington Landfill
23	Town of Farmington	SW SE S33 T12N, R20E	Lazy Days Campground
24	Town of Farmington	NW SE S33 T12N, R20E	Lazy Days Campground, Inc.

**Appendix C (continued)**

Identification Number <sup>a</sup>	Municipality	Location by U.S. Public Land Survey	Operator
Inactive Landfills (continued)			
25	Village of Germantown	NW SW S23 T09N, R20E	Germantown Dump
26	Village of Germantown	NW SW S19 T09N, R20E	Leroy Schmidt Hole No. 2 (Merqt Pit)
27	Village of Germantown	NW SW S19 T09N, R20E	Merget Sand and Gravel
28	Village of Germantown	SE SE S29 T09N, R20E	Richard Brandt Property
29	Village of Germantown	SW NE S36 T09N, R20E	Schreiner Landfill
30	Village of Germantown	NE NE S22 T09N, R20E	Walterlin Construction Company
31	Village of Germantown	S S36 T09N, R20E	Omega Hills North Landfill/Waste Management of WI
32	Village of Slinger	SE SE S13 T10N, R18E	Earl Indermuehle
33	Town of Hartford	SW SE S18 T10N, R18E	George Strobel Farm
34	City of Hartford	SW NE S28 T10N, R18E	City of Hartford Landfill
35	Town of Hartford	SW SW S28 T10N, R18E	Leo Guelig Landfill
36	City of Hartford	SW SE S21 T10N, R18E	Maurice Gahlman, Jr.
37	City of Hartford	NW SE S20 T10N, R18E	Walter Ise Property
38	Town of Hartford	SE SE S23 T10N, R18E	Pike Lake State Park
39	Town of Jackson	SW NW S05 T10N, R20E	Bales Dump
40	Town of Jackson	SW SW S07 T10N, R20E	Friedens Church Landfill
41	Town of Jackson	SW NW S15 T10N, R20E	Town of Jackson Landfill
42	Town of Jackson	SE SE S09 T10N, R20E	Wisconsin DNR
43	Town of Kewaskum	NW SE S01 T12N, R19E	Town of Kewaskum Landfill
44	Village of Kewaskum	NW NE S09 T12N, R19E	Village of Kewaskum Landfill
45	Village of Newburg	NW NW S12 T11N, R20E	Village of Newburg
46	Town of Polk	NW SE S20 T10N, R19E	Acme Disposal-Waste Management #307
47	Town of Polk	SW SW S16 T10N, R19E	Ferdinand Andes Landfill
48	Town of Polk	NE NE S34 T10N, R19E	Leroy Schmidt Dump
49	Town of Polk	NE SW S21 T10N, R19E	Miller Brewery-Kratz Property
50	Town of Polk	SW SE S20 T10N, R19E	Town of Polk (Lewis Property) #951
51	Town of Polk	SW NW S01 T10N, R19E	Roland Koester Landfill
52	Village of Slinger	SW SE S07 T10N R19E	Washington County Highway Department Landfill
53	Village of Richfield	SE SE S02 T09N, R19E	Baumgartner Dump
54	Village of Richfield	SE SW S26 T09N R19E	Chris Beimel Landfill
55	Village of Richfield	NW NE S17 T09N, R19E	Licitar Excavating Landfill
56	Village of Richfield	SE SW S07 T09N, R19E	Loosen Farm
57	Village of Richfield	SW NW S13 T09N, R19E	Town of Richfield Landfill
58	Village of Slinger	SE NW S18 T10N, R19E	Slinger Foundry
59	Village of Slinger	SE NW S18 T10N, R19E	Slinger Foundry (Fillman Property)
60	Town of Trenton	NE SEW S19 T10N, R19E	Jeff Schneiss Property
61	Town of Trenton	NW SE S64 T01N, R19E	McGraw Edison Company (Permaline)
62	Town of Trenton	NW SE S02 T10N, R20E	Town of Trenton
63	Town of Trenton	NW NW S02 T10N, R20E	Town of Trenton
64	Town of Wayne	SW S06 T12N, R18E	Freeman Chemical (Holzman Property)
65	Town of Wayne	SE NE S22 T12N, R18E	Freeman Chemical (Martin Property)



**Appendix C (continued)**

Identification Number <sup>a</sup>	Municipality	Location by U.S. Public Land Survey	Operator
Inactive Landfills (continued)			
66	Town of Wayne	SE NE S22 T12N, R18E	Town of Wayne
67	Town of Wayne	SE NW S09 T12, R18E	Town of Wayne
68	Town of West Bend	NE NW S22 T11N, R19E	Clark's Tree Service
69	City of West Bend	SE SE S16 T11N, R19E	David Bohn Landfill
70	Town of West Bend	NE NW S18 T11N, R19E	Edward Martinson Property
71	City of West Bend	SW NW S13 T11N, R19E	Gehl Company
72	City of West Bend	SW SE S23 T11N, R19E	Glen Peters Landfill
73	City of West Bend	NW SW S25 T11N, R19E	Joseph Mrazek Property
74	City of West Bend	SE NE S11 T11N, R19E	Peter Pirsch & Sons (Groth Property)
75	City of West Bend	SE NE S15 T11N, R19E	Richard Sander Property
76	Town of West Bend	SE NW S34 T11N, R19E	Town of West Bend

NOTE: The inventory data on this table is subject to periodic change due to the nature of the facilities. For the most recent data, the Wisconsin Department of Natural Resources should be contacted.

<sup>a</sup>See Map 16 in Chapter II of this report.

Source: Wisconsin Department of Natural Resources and SEWRPC.

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## Appendix D

# POLICE STATIONS, COUNTY SHERIFF OFFICES, AND FIRE STATIONS IN WASHINGTON COUNTY: 2015

Table D-1

### POLICE STATIONS AND COUNTY SHERIFF OFFICES

Identification Number <sup>a</sup>	Facility Name	Municipality	Address
1	City of Hartford Police Department	City of Hartford	109 N. Main Street, 53027
2	City of West Bend Police Department	City of West Bend	350 Vine Street, 53095
3	Trenton Police Department	Town of Trenton	1071 STH 33, West Bend, 53095
4	Germantown Police Department	Village of Germantown	N112 W16877 Mequon Road, 53022
5	Jackson Police Department	Village of Jackson	N168, W20733 Main Street, 53037
6	Kewaskum Police Department	Village of Kewaskum	204 First Street, 53040
7	Newburg Police Department	Village of Newburg	614 Main Street, 53060
8	Village of Slinger Police Department	Village of Slinger	300 Slinger Road, 53086
9	Washington County Sheriff's Department	Washington County	500 Schmidt Road, West Bend, 53090

<sup>a</sup>Identification number corresponds to digital file data for Map 19 in Chapter II of this report.

Source: Washington County Emergency Management Office and SEWRPC.

**Table D-2**

**FIRE STATIONS AND EMERGENCY MEDICAL RESCUE DEPARTMENTS**

Facility Name	Municipality	Address
Allenton Volunteer Fire Department	Town of Addison	431 Railroad Street, Allenton, 53002
Boltonville Fire Department	Town of Farmington	9336 Bolton Drive, Kewaskum 53040
Fillmore Fire Department	Town of Farmington	8485 Trading Post Trail, West Bend, 53090
Germantown Fire Department – Station 1	Village of Germantown	W162 N11862 Park Avenue, 53022
Germantown Fire Department – Station 2	Village of Germantown	N115 W18752 Edison Drive, 53022
Hartford Fire and Rescue	City of Hartford	111 W. Wisconsin Street, 53027
Jackson Fire Department	Village of Jackson	W204 N 16722 Jackson Drive, 53037
Kewaskum Fire Department	Village of Kewaskum	1106 Fond du Lac Avenue, 53040
Kohlsville Fire Department	Town of Wayne	7678 County Road WW, West Bend, 53090
Lifestar EMS, LLC.	Village of Slinger	123 Weil Drive, 53086
Lifestar EMS, LLC.	City of West Bend	108 W. Decorah Road, 53095
Newburg Fire Department	Village of Newburg	508 Main Street, West Bend, 53090
Richfield Volunteer Fire Department – Station 1	Village of Richfield	2008 Highway 175, 53076
Richfield Volunteer Fire Department – Station 2	Village of Richfield	1101 Highway 164, Hubertus, 53033
Richfield Volunteer Fire Department – Station 3	Village of Richfield	790 N. Lakeview Road, Hubertus, 53033
Slinger Fire Department	Village of Slinger	201 Oak Street, 53086
St. Lawrence Volunteer	Town of Addison	4955 Highway 175, Hartford, 53027
West Bend Fire Department – Station 1	City of West Bend	325 N. 8th Avenue, 53095
West Bend Fire Department – Station 2	City of West Bend	901 N. River Road, 53095
West Bend Fire Department – Station 3	City of West Bend	2100 S. Main Street, 53095

Source: Washington County Emergency Management Office and SEWRPC.

## Appendix E

# CRITICAL COMMUNITY FACILITIES IN WASHINGTON COUNTY

**Table E-1**

### SCHOOLS

Number on Map 20	Facility Name	Community	Address
Erin School District			
1	Erin Elementary School	Town of Erin	6901 CTH O, Hartford, 53027
Friess Lake School District			
2	Friess Lake School	Village of Richfield	1750 STH 164, Hubertus, 53033
Germantown School District			
3	Amy Belle Elementary School	Village of Richfield	3294 Willow Creek Road, Colgate, 53017
4	County Line Elementary School	Village of Germantown	W159 N9939 Butternut Road, Germantown, 53022
5	Germantown High School	Village of Germantown	W180 N11501 River Lane, Germantown, 53022
6	Kennedy Middle School	Village of Germantown	W160 N11836 Crusader Court, Germantown, 53022
7	MacArthur Elementary School	Village of Germantown	W154 N11492 Fond du Lac Avenue, Germantown, 53022
8	Rockfield Elementary School	Village of Germantown	N132 W18473 Rockfield Road, Germantown, 53022
Hartford Joint School District No. 1			
9	Central Middle School	City of Hartford	1100 Cedar Street, Hartford, 53027
10	Lincoln Elementary School	City of Hartford	755 S. Rural Street, Hartford, 53027
11	Rossman Elementary School	City of Hartford	600 Highland Avenue, Hartford, 53027
Hartford Union High School District			
12	Hartford High School	City of Hartford	805 Cedar Street, Hartford, 53027
Kewaskum School District			
13	Farmington Elementary School	Town of Farmington	8736 Boltonville Road, Kewaskum, 53040
14	Kewaskum Elementary School	Village of Kewaskum	1415 Bilgo Lane, Kewaskum, 53040
15	Kewaskum High School	Village of Kewaskum	1510 Bilgo Lane, Kewaskum, 53040
16	Kewaskum Middle School	Village of Kewaskum	1656 Reigle Drive, Kewaskum, 53040
17	i4Learning Community School	Town of Wayne	5760 Mohawk Road, Campbellsport, 53010
Richfield Joint School District No. 1			
18	Plat Elementary School	Village of Richfield	4908 Monches Drive, Colgate, 53017
19	Richfield Elementary School	Village of Richfield	3117 Holy Hill Road, Richfield, 53076
Slinger School District			
20	Addison Elementary School	Town of Addison	5050 Indian Road, Hartford, 53027
21	Allenton Elementary School	Town of Addison	228 Weis Street, Allenton, 53002
22	Slinger Elementary School	Village of Slinger	203 Polk Street, Slinger, 53086
23	Slinger High School	Village of Slinger	209 Polk Street, Slinger, 53086
24	Slinger Middle School	Village of Slinger	521 Olympic Drive, Slinger, 53086

**Table E-1 (continued)**

Number on Map 20	Facility Name	Community	Address
West Bend School District			
25	Badger Middle School	City of West Bend	727 S. 6th Avenue, West Bend, 53095
26	Decorah Elementary School	City of West Bend	1225 Sylvan Way, West Bend, 53095
27	East High School	City of West Bend	1305 E. Decorah Road, West Bend, 53095
28	Fair Park Elementary School	City of West Bend	519 N. Indiana Avenue, West Bend, 53090
29	Green Tree Elementary School	City of West Bend	1330 Green Tree Road, West Bend, 53090
30	Jackson Elementary School	Village of Jackson	W204 N16850 Jackson Drive, Jackson, 53037
31	McLane Elementary School	City of West Bend	833 Chestnut Street, West Bend, 53095
32	Pathways Charter School	City of West Bend	1043 S. Main Street, West Bend, 53095
33	Rolf's Early Childhood Center	City of West Bend	737 S. 3rd Avenue, West Bend, 53095
34	Silverbrook Middle School	Town of West Bend	120 N. Silverbrook Drive, West Bend, 53095
35	Washington Street School	City of West Bend	735 N. Main Street, West Bend, 53090
36	West High School	City of West Bend	1305 E. Decorah Road, West Bend, 53095
Private Schools			
37	Bethlehem Evangelical Lutheran School	Village of Germantown	N108 W14290 Bel Aire Lane, Germantown, 53022
38	Crown of Life Evangelical Lutheran School	Village of Richfield	1292 Tally Ho Trail, Hubertus, 53033
39	David's Star Evangelical Lutheran School	Town of Jackson	2750 David's Star Drive, Jackson, 53037
40	Good Shepherd Lutheran School	City of West Bend	777 S. Indiana Avenue, West Bend, 53095
41	Holy Angel's Grade School	City of West Bend	230 N. 8th Avenue, West Bend, 53095
42	Holy Trinity Catholic School	Village of Kewaskum	305 Main Street, Kewaskum, 53040
43	Kettle Moraine Lutheran High School	Town of Jackson	3399 Division Road, Jackson, 53037
44	Living Word Lutheran High School	Village of Jackson	2230 Living Word Lane, Jackson, 53037
45	Montessori Children's House	City of West Bend	1701 Vogt Drive, West Bend, 53095
46	Morning Star Lutheran School	Village of Jackson	N171 W20131 Highland Road, Jackson, 53037
47	Peace Lutheran Elementary School	City of Hartford	1025 Peace Lutheran Drive, Hartford, 53027
48	St. Augustine School, Inc.	Village of Richfield	1810 Highway CC, Hartford, 53027
49	St. Boniface Elementary School	Village of Germantown	W204 N11968 Goldendale Road, Germantown, 53022
50	St. Frances Cabrini School	City of West Bend	529 Hawthorn Drive, West Bend, 53095
51	St. Gabriel Elementary School	Village of Richfield	3733 Hubertus Road, Hubertus, 53033
52	St. John's Lutheran School	City of West Bend	899 S. 6th Avenue, West Bend, 53095
53	St. John's Lutheran School	Village of Newburg	623 Congress Drive, Newburg, 53060
54	St. Kilian Elementary School	City of Hartford	245 High Street, Hartford, 53027
55	St. Lucas Grade School	Village of Kewaskum	1410 Parkview Drive, Kewaskum, 53040
56	St. Mary's Immaculate Conception School	City of West Bend	415 Roosevelt Drive, West Bend, 53095
57	St. Peter Catholic Grade School	Village of Slinger	206 E. Washington Street, Slinger, 53086
58	Tri-Center Alternative School	City of West Bend	515 E. Washington Street, West Bend, 53095
59	Trinity Lutheran School	Town of Jackson	1268 Pleasant Valley Road, West Bend, 53095
Colleges and Universities			
60	Moraine Park Technical College – Hartford	City of Hartford	805 Cedar Street, Hartford, 53027
61	Moraine Park Technical College – West Bend	City of West Bend	2151 N. Main Street, West Bend, 53095
62	University of Wisconsin-Washington County	City of West Bend	400 University Drive, West Bend, 53095

Source: Wisconsin Department of Public Instruction, Washington County Emergency Management Office, and SEWRPC.

Table E-2

## SELECTED GOVERNMENT ADMINISTRATION BUILDINGS

Number on Map 21	Building/Office	Municipality	Address
Regional or County			
1	Social Security Administration	City of West Bend	1145 Vern Street, West Bend, 53090
2	Washington County Courthouse	City of West Bend	432 E. Washington Street, West Bend, 53095
3	Washington County Public Agency Center	City of West Bend	333 E. Washington Street, West Bend, 53095
4	County Building-Annex II	City of West Bend	515 E. Washington Street, West Bend, 53095
5	Washington County Fair Park	Town of Polk	3000 CTH PV, West Bend, 53095
6	Washington County Historical Museum	City of West Bend	320 S. Fifth Street, West Bend, 53095
7	Washington County Law Enforcement/Corrections Building	City of West Bend	500 N. Schmidt Road, West Bend, 53090
8	Samaritan Health Center	City of West Bend	531 E. Washington Street, West Bend, 53095
9	Senior Citizen Center	City of West Bend	401 E. Washington Street, West Bend, 53095
10	Washington County Vehicle Maintenance and Storage Facility	City of West Bend	900 Lang Street, West Bend, 53090
11	Youth Treatment Center	City of West Bend	801 E. Washington Street, West Bend, 53095
12	Wisconsin Department of Corrections Division of Community Corrections	City of West Bend	273 S. 17th Avenue, West Bend, 53095
13	Wisconsin Department of Transportation Division of Motor Vehicles	City of West Bend	1516 Paradise Drive, West Bend, 53095
14	Office of State Public Defender	City of West Bend	155 N. Main Street, West Bend, 53095
15	Workforce Development Center	City of West Bend	2200 Green Tree Road, West Bend, 53090
16	U.S. Department of Agriculture	City of West Bend	333 E. Washington Street, 53095
53	Wisconsin National Guard Armory	City of Hartford	880 W. State Street, 53027
54	Wisconsin National Guard Armory	City of West Bend	125 Chopper Drive, 53095
55	Army Aviation Support Facility	City of West Bend	105 Trenton Road, 53095
City, Village, and Town Halls			
17	Addison Town Hall	Town of Addison	127 1st Street, Allenton, 53002
18	Barton Town Hall	Town of Barton	3482 Town Hall Road, Kewaskum, 53040
19	Erin Town Hall	Town of Erin	1846 STH 83, Hartford, 53027
20	Farmington Town Hall	Town of Farmington	9422 STH 144 Kewaskum, 53040
21	Germantown Town Office	Town of Germantown	N128 W17714 Holy Hill Road, Germantown, 53022 <sup>a</sup>
22	Germantown Village Hall	Village of Germantown	N112 W17001 Mequon Road, Germantown, 53022
23	Hartford City Hall	City of Hartford	109 N. Main Street, Hartford, 53027
24	Hartford Town Hall	Town of Hartford	3360 CTH K, Hartford, 53027
25	Jackson Town Hall	Town of Jackson	3146 Division Road, Jackson, 53037
26	Jackson Village Hall	Village of Jackson	N168 W20733 Main Street, Jackson, 53037
27	Kewaskum Town Hall	Town of Kewaskum	9019 Kettle Moraine Drive, Kewaskum, 53040
28	Kewaskum Village Hall	Village of Kewaskum	204 S, 1st Street, Kewaskum, 53040
29	Newburg Village Hall	Village of Newburg	614 Main Street, Newburg, 53060
30	Polk Town Hall	Town of Polk	3680 STH 60, Slinger, 53086
31	Richfield Village Hall	Village of Richfield	4128 Hubertus Road, Hubertus, 53076
32	Slinger Village Hall	Village of Slinger	300 Slinger Road, Slinger, 53086
33	Trenton Town Hall	Town of Trenton	1071 STH 33E, West Bend, 53095
34	Wayne Town Hall	Town of Wayne	6030 Mohawk Road, Campbellsport, 53010
35	West Bend City Hall	City of West Bend	1115 S. Main Street, West Bend, 53095
36	West Bend Town Hall	Town of West Bend	6355 CTH Z, West Bend, 53095
Libraries			
37	Germantown Community Library	Village of Germantown	N112 W16879 Mequon Road, Germantown, 53022
38	Hartford Jack Russell Library	City of Hartford	100 Park Avenue, Hartford, 53027
39	Kewaskum Public Library	Village of Kewaskum	204 1st Street, Kewaskum, 53040
40	Slinger Public Library	Village of Slinger	220 Slinger Road, Slinger, 53086
41	West Bend Community Memorial Library	City of West Bend	630 Poplar Street, West Bend, 53095

**Table E-2 (continued)**

Number on Map 21	Facility Name	Municipality	Address
U.S. Post Offices			
42	Allenton	Town of Addison	301 1st Street, Allenton, 53002
43	Colgate	Village of Richfield	3392 CTH Q, Colgate, 53017
44	Germantown	Village of Germantown	W156 N11301 Pilgrim Road, Germantown, 53022
45	Hartford	Village of Hartford	45 E. Wisconsin , Hartford, 53027
46	Hubertus	Village of Richfield	3695 Hubertus Road, Hubertus, 53033
47	Jackson	Village of Jackson	W225 N16702 Cedar Park Court, Jackson, 53037
48	Kewaskum	Village of Kewaskum	347 Main Street, Kewaskum, 53040
49	Newburg	Village of Newburg	440 Main Street, Newburg, 53060
50	Richfield	Village of Richfield	1925 STH 175, Richfield, 53076
51	Slinger	Village of Slinger	350 E. Washington Street, Slinger, 53086
52	West Bend	City of West Bend	607 Elm Street, West Bend, 53095

<sup>a</sup>The Town of Germantown office is the home of the Town Clerk. Town meetings are held at the Riteway Bus Company at the intersection of Cedar Lane and State Trunk Highway 145. The Riteway Bus Company location is shown on Map II-19.

Source: Washington County Emergency Management Office and SEWRPC.



**Table E-3**

**HOSPITALS, MAJOR CLINICS, AND HEALTH DEPARTMENTS**

Number on Map 22	Facility Name	Municipality	Address
Hospitals <sup>a</sup>			
1	Aurora Medical Center of Washington County	City of Hartford	1032 E. Sumner Street, Hartford, 53027
2	St. Joseph's Hospital	Town of Polk	3200 Pleasant Valley Road, West Bend, 53095
Clinics <sup>b</sup>			
3	Albrecht Free Clinic of Washington County	City of West Bend	1110 Oak Street, West Bend, 53095
4	Aurora Advanced Healthcare—Germantown	Village of Germantown	N112 W17975 Mequon Road, Germantown, 53022
5	Aurora Advanced Healthcare--Hartford	City of Hartford	1640 E. Sumner Street, Hartford, 53027
6	Aurora Advanced Healthcare—Hubertus	Village of Richfield	3055 Hubertus Road, Hubertus, 53033
7	Aurora Advanced Healthcare—Slinger	Village of Slinger	1061 E. Commerce Boulevard, Slinger, 53086
8	Aurora Advanced Healthcare—West Bend	City of West Bend	205 Valley Avenue, West Bend, 53095
9	Aurora Advanced Healthcare—West Bend	Town of West Bend	5595 CTH Z, West Bend, 53095
10	Columbia St. Mary's—Germantown Express Care	Village of Germantown	N112 W15415 Mequon Road, Germantown, 53022
11	Froedtert Health Medical Group—Germantown Health Center	Village of Germantown	W168 N11237 Western Avenue, 53022
12	Froedtert Health Medical Group—Hartford Health Center	City of Hartford	110 Loan Oak Lane, Hartford, 53027
13	Froedtert Health Medical Group—Jackson Health Center	Village of Jackson	W225 N16711 Cedar Park Court, Jackson, 53037
14	Froedtert Health Medical Group—Kewaskum Health Center	Village of Kewaskum	1701 Fond du Lac Avenue, Kewaskum, 53040
15	Froedtert Health Medical Group—St. Joseph's Health Center	Town of Polk	3200 Pleasant Valley Road, West Bend, 53095
16	Froedtert Health Medical Group—West Bend Health Center	City of West Bend	1700 W. Paradise Drive, West Bend, 53095
Health Departments			
17	Washington County Health Department	City of West Bend	333E. Washington Street, West Bend, 53095

<sup>a</sup>A hospital is defined as a place that provides 24-hour nursing/medical care to diagnose and treat short-term illnesses and/or injuries

<sup>b</sup>A clinic is defined as an establishment that provides a variety of medical services by more than one physician and/or other medical personnel on an out-patient basis. Clinics limited to treating a specific type of illness are not listed.

Source: Washington County Emergency Management Office and SEWRPC.

Table E-4

## CHILD CARE CENTERS IN WASHINGTON COUNTY: 2015

Number on Map 23	Facility Name	Municipality	Address	Class <sup>a</sup>	Capacity
1	Ahlers Family Child Care	City of West Bend	1607 Williams Court	Family	8
2	Aleah Briedenbach	Village of Jackson	W201 N16510 Hemlock Street	Family	6
3	Amy's Family Learning Center	Village of Jackson	N170 W20658 Parkview Drive	Family	8
4	Briar Patch Child Care Center	City of Hartford	337 S. Rural Street	Family	8
5	Busy Bee Learning Tree, LLC	Village of Slinger	204 Slinger Road	Group	97
6	Candace C. Helland	Village of Slinger	791 Valley Forge Drive	Family	6
7	Country Corner Child Care	Town of Addison	6912 CTH W, West Bend	Group	40
8	Dreams Learning Center, LLC	City of Hartford	1190 Western Drive	Group	15
9	Elena's Family Learning Center	City of Hartford	1128 Durango Road	Family	8
10	Faith Lutheran Preschool	Village of Germantown	W172 N11187 Division Road	Group	24
11	Family Ties Child Care Center	City of West Bend	1116 N. Main Street	Group	24
12	Germantown Learning Center Child Care	Village of Germantown	W205 N11855 Deppert Road	Group	62
13	Good Buddies	City of Hartford	617 S. Main Street	Family	8
14	Growing oaks Child Development Home	City of West Bend	614 Polaris Street	Family	8
15	Happy Hollow Learning Center	City of Hartford	1396 Patton Drive	Group	87
16	Holly Scannel	City of West Bend	1056 Chestnut Street	Family	6
17	Jodi Klepp	Village of Slinger	608 Ellys Way	Family	6
18	Kare Bear Kare	City of West Bend	768 Eastern Avenue	Family	8
19	Kari's Korner Family Child Care Center	City of West Bend	602 Hillcrest Street	Family	8
20	Kettle Moraine YMCA Child Care Center	City of West Bend	1111 W. Washington Street	Group	146
21	Kettle Moraine YMCA-Decorah	City of West Bend	1225 Sylvan Way	Group	67
22	Kettle Moraine YMCA Discovery Center	City of West Bend	1113 W. Washington Street	Group	36
23	Kettle Moraine YMCA Holy Angels	City of West Bend	230 N. 8th Street	Group	30
24	Kettle Moraine YMCA McLane	City of West Bend	833 Chestnut Street	Group	50
25	Kettle Moraine YMCA Our Savior	City of West Bend	1044 S. Silverbrook Drive	Group	64
26	Kettle Moraine YMCA Silverbrook	City of West Bend	120 N. Silverbrook Drive	Group	50
27	Kiddie Kampus	Village of Jackson	N168 W22224 Main Street	Group	103
28	Kinder Haus, LLC	Village of Germantown	N116 W16326 Main Street	Group	50
29	KLC dba Champions-Fair Park	City of West Bend	519 N. Indiana Avenue	Group	50
30	KLC dba Champions-McLane	City of West Bend	833 Chestnut Street	Group	50
31	Kool Kids Club-Addison	Town of Addison	5050 Indian Drive, Hartford	Group	49
32	Kool Kids Club-Allenton	Town of Addison	228 Weis Drive, Allenton	Group	32
33	Kool Kids Club-Green Tree	City of West Bend	1330 Green Tree Road	Group	60
34	Kool Kids Club-Jackson	Village of Jackson	W204 N16850 Jackson Drive	Group	120
35	Kool Kids Club-Slinger	Village of Slinger	203 Polk Street	Group	96
36	The Learning Center Preschool, LLC	City of West Bend	148 S. 8th Avenue	Group	16
37	Little Folks School Club	Village of Kewaskum	1415 Bilgo Lane	Group	46
38	Little Folks School House	Village of Kewaskum	1040 Milan Drive	Group	82
39	Little Friends Learning Center, LLC	City of West Bend	7019 State Road 144	Group	27
40	Little Friends Learning Center One and a Half	City of West Bend	929C N. River Road	Group	60
41	Little Hands Child Care	Village of Richfield	1274 STH 175, Hubertus	Group	60
42	Little Lambs Preschool of First United Methodist Church	City of Hartford	738 W. Monroe Avenue	Group	10
43	Little Red Schoolhouse, Inc.	Village of Richfield	285 Hillside Drive Colgate	Group	88
44	Living Word Child Development Center	Town of Jackson	2240 Living Word Lane	Group	144
45	Miss Gayle's Home Day Care	Village of Germantown	N98 W15781 School Road	Family	8
46	Montessori Childrens HSE West Bend	City of West Bend	1701 Vogt Street	Group	140
47	Penelope-Ann Baier	Village of Germantown	N108 W17504 Lilac Lane	Family	6
48	Place for Kids	Village of Germantown	W188 N11927 Maple Road	Group	50
49	Playful Hearts Child Care	City of West Bend	2361 W. Washington Street	Group	68
50	Precious One's Learning Center, Inc.	City of West Bend	3022 W. Washington Street	Group	35

**Table E-4 (continued)**

Number on Map 23	Facility Name	Municipality	Address	Class <sup>a</sup>	Capacity
51	Riverside Day Care Center	City of West Bend	2110 River Drive N	Family	8
52	Silver Maple Daycare, LLC	City of West Bend	5190 S. 18th Street	Group	50
53	St Andrew Lutheran E C Campus	Town of Farmington	7750 STH 144, West Bend	Group	37
45	St. Paul Little Learners	Village of Slinger	799 Saint Paul Drive	Group	70
55	Starlight Learning Center	City of West Bend	140 N. 7th Avenue	Group	50
56	Sycamore Tree Child Care Center	City of Hartford	310 N. Wilson Avenue	Group	190
57	Tiny Tots Treehouse Child Care Center	City of West Bend	684 S. Indiana Avenue	Group	30
58	Tuttle Creek Learning Center, Inc.	Village of Kewaskum	1623 Fond du Lac Avenue	Group	52
59	Tuttle Creek's Club Cool	Village of Kewaskum	8736 Boltonville Road	Group	24
60	Tuttle Creek's Club Cool	Village of Kewaskum	1415 Bilgo Lane	Group	35
61	Wee Ones Child Care	Village of Richfield	W212 N14393 Fond du Lac Avenue	Family	8
62	Willow Creek Child Care	Village of Germantown	W164 N11310 Squire Drive	Group	160
63	The Y at Holy Trinity Newburg	Village of Newburg	513 Congress Street	Group	20
64	YMCA Camp Minikani Minicamp	Village of Richfield	875 Amy Bell Lane	Camp	35
65	YMCA Sacc at Plat Elementary	Village of Richfield	4908 Monches Road, Colgate	Group	34
66	Young Cubs Day Care	Town of Addison	7143 Hillcrest Drive, Hartford	Family	8

<sup>a</sup>Licensing rules create separate requirements for three categories of licensed child care. Group child care centers serve nine or more children. Family childcare centers serve four to eight children. Camps include whole-day and part-day camps and activity programs offered by traditional camps, colleges, and sports programs. Some camp activity programs are intended for young children as theme-focused day care, while others constitute nonresidential options for older campers pursuing special interests.

Source: Wisconsin Department of Children and Families and SEWRPC.

Table E-5

## ASSISTED LIVING FACILITIES AND INDEPENDENT HOUSING IN WASHINGTON COUNTY: 2014

Number on Map 24	Facility Name	Municipality	Address
Apartments for Seniors or Persons With Disabilities			
1	Arbor Ridge Apartments	City of West Bend	1421 Gatewood Drive
2	Auxiliary Court Senior Apartments	City of West Bend	201 Auxiliary Court
3	Cedar Ridge Apartments	City of West Bend	113 Cedar Ridge Drive
4	The Cove	Village of Germantown	N120 W17635 Friestadt Road
5	Hawthorn Manor Apartments	City of West Bend	275 W. Decorah Road
6	Himmel Haus at the Gables of Germantown	Village of Germantown	N109 W17075 Ava Circle
7	Jackson Bay Apartments	Village of Jackson	N168 W21920 Main Street
8	The Lakeshore at Jackson Crossings	Village of Jackson	N168 W22022 Main Street
9	The Lighthouse of West Bend	City of West Bend	2130 Continental Drive
10	Parkside Senior Village	City of Hartford	325 Park Avenue
11	Prairie Meadows Senior Apartments	Village of Germantown	W168 N11278 Western Avenue
12	Prairie Meadows II	Village of Germantown	W168 N11328 Western Avenue
13	Prairie Meadows III	Village of Germantown	W168 N11374 Western Avenue
14	River Bend Senior Village	City of West Bend	151 Wisconsin Street
15	River Shores Regency	City of West Bend	555 Veterans Avenue
16	Stonefield Apartments	City of West Bend	840 Weinert Road
17	Washington Heights	City of Hartford	525 N. Main Street
Affordable Housing for Older Adults			
18	Harthaven	City of Hartford	33 High Street
19	Meadowbrook Manor	City of West Bend	475 Meadowbrook Drive
20	Meadow Creek Apartments	Village of Kewaskum	1119 Roseland Drive
21	Millpond Apartments	City of Hartford	1533 Honeysuckle Road
22	Regency Manor Apartments	Village of Newburg	6785 Diane Drive, West Bend
23	Scenic View Apartments	Village of Slinger	205 Slinger Road
Nursing Homes			
24	Cedar Lake Health and Rehabilitation Center	City of West Bend	5595 County Road Z
25	Pavilion at Glacier Valley	Village of Slinger	1900 American Eagle Way
26	Samaritan's Cedar Crossing Subacute Unit	City of West Bend	3200 W. Pleasant Valley Road
27	Samaritan Health Center	City of West Bend	531 E. Washington Street
28	Virginia Highlands Health and Rehabilitation Center	Village of Germantown	W173 N10915 Bernies Way
Community Based Residential Facilities			
29	Autumn Oaks	Village of Slinger	227 E. Washington Street
30	Bridges of Wisconsin New Chestnut Community Based Residential Facility	City of West Bend	346 S. Main Street
31	Bridges of Wisconsin River Road Magnolia Community Based Residential Facility	City of West Bend	230 – 232 Arbor Point Avenue
32	Bridges of Wisconsin River Road Mulberry Community Based Residential Facility	City of West Bend	238 Arbor Point Avenue
33	Calm Harbor	City of West Bend	141 S. 8th Avenue
34	Carrie Lane House	City of West Bend	1707 Carrie Lane
35	Celias Home	City of West Bend	330 Arbor Point Avenue
36	Cottages at Cedar Run	City of West Bend	6090 Scenic Drive
37	Countryview Group Home	Village of Germantown	N442 W12850 Mequon Road
38	Deerview Meadows Assisted Living I	City of Hartford	109 Lone Oak Lane
39	Deerview Meadows Assisted Living II	City of Hartford	111 Lone Oak Lane
40	Ellen's Home Germantown	Village of Germantown	N113 W16358 Sylvan Circle
41	Ellen's Home South	Village of Germantown	W150 N11127 Fond du Lac Avenue
42	Emerald Ridge Assisted Living LLC	City of Hartford	1025 Bell Avenue
43	Emerald Way Assisted Living	City of West Bend	831 E. Washington Street
44	Exodus Transitional Living Facility	Village of Kewaskum	1421 Fond du Lac Avenue
45	Fields of Washington County	City of West Bend	531 E. Washington Street
46	Germantown Home	Village of Germantown	W164 N10502 Timberline Court

**Table E-5 (continued)**

Number on Map 24	Facility Name	Municipality	Address
Community Based Residential Facilities (continued)			
47	Hawthorn Manor	City of West Bend	321 Hawthorn Drive
48	HIL Columbus House	City of West Bend	5096 Valley Trail
49	Ivy Manor of Jackson	Village of Jackson	W194 N16744 Eagle Drive
50	Ivy Manor of West Bend	City of West Bend	370 S. Forest Avenue
51	Ivy Manor of West Bend Building 2	City of West Bend	350 S. Forest Avenue
52	Kettle Moraine Gardens	Village of Kewaskum	1038 Fond du Lac Avenue
53	Kettle Moraine Gardens Memory Unit	Village of Kewaskum	1042 Fond du Lac Avenue
54	Landmark at Jackson Crossings	Village of Jackson	N168 W22022 Main Street
55	Majestic Heights Assisted Living	City of Hartford	85 S. Wacker Drive
56	Matterhaus	Village of Germantown	N109 W17000 Ava Circle
57	Serenity Villa	Village of Slinger	1650 American Eagle Drive
58	Serenity Villa Assisted Living	Village of Slinger	1707 American Eagle Drive
59	Serenity Villa II	Village of Slinger	1600 American Eagle Drive
60	TRI Manor Ltd.	City of West Bend	1937 N. Main Street
61	Wellington Place of Hartford	City of Hartford	615 Hilldale Drive
62	West Bend OPS LLC doing business as Lighthouse of West Bend	City of West Bend	2130 Continental Drive
Residential Care Apartment Complexes			
63	Cedar Bay East	City of West Bend	5577 Home Drive
64	Cedar Bay West	City of West Bend	5555 Cedar Bay Drive
65	Emerald Ridge Assisted Living LLC	City of Hartford	1025 Bell Avenue
66	Engel Haus at the Gables of Germantown	Village of Germantown	N109 W17110 Ava Circle
67	Fields of Washington County	City of West Bend	675 E. Washington Street
68	Gardens of Hartford	City of Hartford	112 Peace Lutheran Parkway
69	Kettle Moraine Gardens Residential Care Apartment Complex	Village of Kewaskum	1038 Fond du Lac Avenue
70	Lakeshore at Jackson Crossings	Village of Jackson	N168 W22026 Main Street
71	West Bend OPS LLC doing business as Lighthouse of West Bend	City of West Bend	2130 Continental Drive
Adult Day Care Facilities			
72	Aurora Medical Center Adult Day Care Services	City of Hartford	1002 E. Sell Drive
73	Young at Heart	Village of Slinger	415 E. Washington Street
Adult Family Homes			
74	17th Avenue Adult Family Home	City of West Bend	233 S. 17th Avenue
75	A Home Around the Corner	City of West Bend	1100A W. Washington Avenue
76	Bobolink Home	City of West Bend	834 Bobolink Lane
77	CLA Slinger Adult Family Home	Village of Slinger	3941 Elaine's Way
78	Dennis Path Adult Family Home	City of West Bend	6874 Dennis Path
79	Ellenbecker Adult Family Home	City of West Bend	7463 Brookhaven Drive
80	Hans Street	City of West Bend	1507 Hans Street
81	HIL Carrie Lane	City of West Bend	1628 Carrie Lane
82	HIL Drake House	City of West Bend	1630 Carrie Lane
83	HIL Magellan House	City of West Bend	212 S. 16th Avenue
84	Jackson Manor, LLC	Village of Jackson	N168 W21041 Main Street
85	Lee Avenue Adult Family Home	City of West Bend	1231 Lee Avenue
86	Legate Adult Family Home	City of West Bend	299 W. Paradise Drive
87	Meadowbrook Home	City of West Bend	818 Meadowbrook Drive
88	Next Step in Residential Services 7th Avenue Home	City of West Bend	659 S. 7th Avenue
89	Pamme Court Adult Family Home	City of West Bend	1454 Pamme Court
90	Parkview Manor Adult Family Home, LLC	Village of Jackson	W207 N17091 Parkview Drive
91	Peopleserve LLC 5th Avenue	City of West Bend	443 S. 5th Avenue
92	Peopleserve LLC Eder Lane	City of West Bend	1620/1622 Eder Lane
93	Peopleserve LLC Hillcrest	City of West Bend	1017 Hillcrest Street
94	Regner Home	City of West Bend	523 N. 10th Avenue
95	REM James Court	City of Hartford	908 James Court

**Table E-5 (continued)**

Number on Map 24	Facility Name	Municipality	Address
Adult Family Homes (continued)			
96	REM Jefferson	City of West Bend	1500 Jefferson Street
97	REM Polaris	City of West Bend	618 Polaris Street
98	REM Wisconsin II Germantown	Village of Germantown	N116 W16105 Main Street
99	REM Wisconsin II Judith Court	City of West Bend	706 Judith Court
100	Respectful Living LLC Diane Drive	City of West Bend	6799 Diane Drive
101	Respectful Living LLC Tower Lane	City of West Bend	932 Tower Lane
102	Respectful Living LLC Sunset Ridge	City of West Bend	1825 Sunset Ridge
103	Richfield Adult Family Home	Village of Richfield	2425 State Road 175
104	Silver Springs of Germantown	Village of Germantown	N120 W12431 Freistadt Road
105	South Hartford Adult Family Home	City of Hartford	3088 State Highway 83
106	Symicek Adult Family Home	City of Hartford	834 Center Street
107	Tessar Adult Family Home	City of West Bend	1613 Jefferson Street
108	Washington Home	City of West Bend	2030 E. Washington Street
109	Wink Home LLC	City of Hartford	1354 – 1356 Patton Drive

Source: Wisconsin Department of Health Services, Washington County Aging and Disability Resource Center, and SEWRPC.

## Appendix F

# PLANS WITH OPEN SPACE ELEMENTS CONSISTENT WITH REGIONAL PLAN RECOMMENDATIONS: WASHINGTON COUNTY

Land Use and Comprehensive Plans		
Community	Plans Prepared by	Date
City of Hartford	City of Hartford	January 2010
City of West Bend	City of West Bend	March 2004 <sup>a</sup>
Village of Germantown	JJR	October 2004
Village of Jackson	Village and Town of Jackson	August 2009
Village of Kewaskum	SEWRPC	November 2009
Village of Newburg	Village of Newburg	May 2014
Village of Slinger	Ommni Associates	August 2007
Village of Richfield	Village of Richfield	August 2008
Town of Addison	SEWRPC	June 2009
Town of Barton	SEWRPC	April 2008
Town of Erin	SEWRPC	December 2009
Town of Farmington	SEWRPC	January 2010
Town of Hartford	SEWRPC	April 2009
Town of Jackson	Village and Town of Jackson	August 2009
Town of Kewaskum	SEWRPC	October 2009
Town of Polk	SEWRPC	September 2009
Town of Trenton	SEWRPC	April 2009
Town of Wayne	SEWRPC	March 2009
Town of West Bend	Town of West Bend with assistance from Planning and Design Institute, Inc.	October 2005
Park and Open Space Plans		
Community	Plans Prepared by	Date
City of Hartford	City of Hartford	May 2005
City of West Bend	SEWRPC	March 2008
Village of Germantown	Village of Germantown	April 1999
Village of Jackson	Village and Town of Jackson	March 2009
Village of Newburg	Bonestroo, Rosene, Aderlik & Associates	January 2003
Village of Richfield	Village of Richfield	August 2008

**Appendix F (continued)**

Land Use and Comprehensive Plans		
Community	Plans Prepared by	Date
Village of Slinger	Village of Slinger	1993
Town of Erin	Planning and Design Institute, Inc.	February 1999
Town of Jackson	Village and Town of Jackson	March 2009

<sup>a</sup>Amended May 2012, December 2012, February 2013, and February 2014..

Source: SEWRPC.



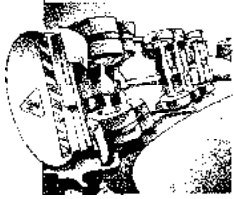
**Appendix G**

**HOMEOWNER DISASTER  
PREPARATION INFORMATION**

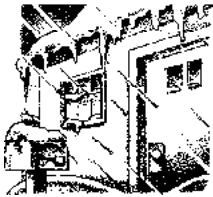
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# Your Family Disaster Supplies Kit

**D**isasters happen anytime and anywhere. And when disaster strikes, you may not have much time to respond.

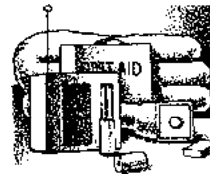


A highway spill of hazardous material could mean instant evacuation.



A winter storm could confine your family at home. An earthquake, flood, tornado or any other disaster could cut off basic services—gas, water, electricity and telephones—for days.

After a disaster, local officials and relief workers will be on the scene, but they cannot reach everyone immediately. You could get help in hours, or it may take days. Would your family be prepared to cope with the emergency until help arrives?



Your family will cope best by preparing for disaster *before* it strikes. One way to prepare is by assembling a Disaster Supplies Kit. Once disaster hits, you won't have time to shop or search for supplies. But if you've gathered supplies in advance, your family can endure an evacuation or home confinement.



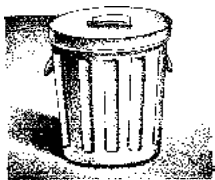
## To prepare your kit

- Review the checklist in this brochure.
- Gather the supplies that are listed. You may need them if your family is confined at home.
- Place the supplies you'd most likely need for an evacuation in an easy-to-carry container. These supplies are listed with an asterisk (\*).

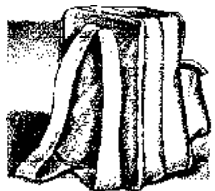


## SUPPLIES

**T**here are six basics you should stock in your home: water, food, first aid supplies, clothing and bedding, tools and emergency supplies and special items. Keep the items that you would most likely need during an evacuation in an easy-to-carry container—suggested items are marked with an asterisk (\*). Possible containers include



a large, covered trash container,



camping backpack,



or a duffle bag.

## Water

Store water in plastic containers such as soft drink bottles. Avoid using containers that will decompose or break, such as milk cartons or glass bottles. A normally active person needs to drink at least two quarts of water each day. Hot environments and intense physical activity can double that amount. Children, nursing mothers and ill people will need more.

- Store one gallon of water per person per day (two quarts for drinking, two quarts for food preparation/sanitation)\*
- Keep at least a three-day supply of water for each person in your household.



## Food

Store at least a three-day supply of non-perishable food. Select foods that require no refrigeration, preparation or cooking and little or no water. If you must heat food, pack a can of sterno. Select food items that are compact and lightweight.

\*Include a selection of the following foods in your Disaster Supplies Kit:

- Ready-to-eat canned meats, fruits and vegetables
- Canned juices, milk, soup (if powdered, store extra water)
- Staples — sugar, salt, pepper
- High energy foods — peanut butter, jelly, crackers, granola bars, trail mix
- Vitamins
- Foods for infants, elderly persons or persons on special diets
- Comfort/stress foods — cookies, hard candy, sweetened cereals, lollipops, instant coffee, tea bags



## First Aid Kit

Assemble a first aid kit for your home and one for each car. A first aid kit\* should include:

- Sterile adhesive bandages in assorted sizes
  - 2-inch sterile gauze pads (4-6)
  - 4-inch sterile gauze pads (4-6)
  - Hypoallergenic adhesive tape
  - Triangular bandages (3)
  - 2-inch sterile roller bandages (3 rolls)
  - 3-inch sterile roller bandages (3 rolls)
  - Scissors
  - Tweezers
  - Needle
  - Moistened towelettes
  - Antiseptic
  - Thermometer
  - Tongue blades (2)
  - Tube of petroleum jelly or other lubricant
  - Assorted sizes of safety pins
  - Cleansing agent/soap
  - Latex gloves (2 pair)
  - Sunscreen
- Non-prescription drugs
- Aspirin or nonaspirin pain reliever
  - Anti-diarrhea medication
  - Antacid (for stomach upset)
  - Syrup of Ipecac (use to induce vomiting if advised by the Poison Control Center)
  - Laxative
  - Activated charcoal (use if advised by the Poison Control Center)

Contact your local American Red Cross chapter to obtain a basic first aid manual.

## Tools and Supplies

- |   |  |
|---|--|
| <input type="checkbox"/> Mess kits, or paper cups, plates and plastic utensils* | <input type="checkbox"/> Needles, thread   |
| <input type="checkbox"/> Emergency preparedness manual*                         | <input type="checkbox"/> Medicine dropper  |
| <input type="checkbox"/> Battery operated radio and extra batteries*            | <input type="checkbox"/> Shut-off wrench, to turn off household gas and water      |
| <input type="checkbox"/> Flashlight and extra batteries*                        | <input type="checkbox"/> Whistle   |
| <input type="checkbox"/> Cash or traveler's checks, change*                     | <input type="checkbox"/> Plastic sheeting  |
| <input type="checkbox"/> Non-electric can opener, utility knife*                | <input type="checkbox"/> Map of the area (for locating shelters)                   |
| <input type="checkbox"/> Fire extinguisher: small canister, ABC type            |  |
| <input type="checkbox"/> Tube tent  | Sanitation   |
| <input type="checkbox"/> Pliers   | <input type="checkbox"/> Toilet paper, towelettes*                                 |
| <input type="checkbox"/> Tape   | <input type="checkbox"/> Soap, liquid detergent*                                   |
| <input type="checkbox"/> Compass  | <input type="checkbox"/> Feminine supplies*  |
| <input type="checkbox"/> Matches in a waterproof container                      | <input type="checkbox"/> Personal hygiene items*                                   |
| <input type="checkbox"/> Aluminum foil  | <input type="checkbox"/> Plastic garbage bags, ties (for personal sanitation uses) |
| <input type="checkbox"/> Plastic storage containers                             | <input type="checkbox"/> Plastic bucket with tight lid                             |
| <input type="checkbox"/> Signal flare   | <input type="checkbox"/> Disinfectant  |
| <input type="checkbox"/> Paper, pencil  | <input type="checkbox"/> Household chlorine bleach                                 |

## Clothing and Bedding

\*Include at least one complete change of clothing and footwear per person.

- |  |  |
|--|--|
| <input type="checkbox"/> Sturdy shoes or work boots* | <input type="checkbox"/> Hat and gloves    |
| <input type="checkbox"/> Rain gear*                  | <input type="checkbox"/> Thermal underwear |
| <input type="checkbox"/> Blankets or sleeping bags*  | <input type="checkbox"/> Sunglasses        |

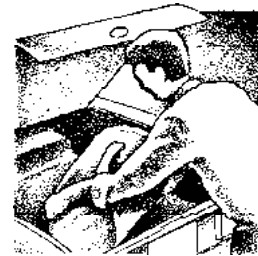
## Special Items

Remember family members with special needs, such as infants and elderly or disabled persons.

- |   |  |
|---|--|
| For Baby*   | <input type="checkbox"/> <b>Entertainment</b> - games and books      |
| <input type="checkbox"/> Formula                                  | <input type="checkbox"/> <b>Important Family Documents</b>           |
| <input type="checkbox"/> Diapers                                  | Keep these records in a waterproof, portable container.              |
| <input type="checkbox"/> Bottles                                  | • Will, insurance policies, contracts, deeds, stocks and bonds       |
| <input type="checkbox"/> Powdered milk                            | • Passports, social security cards, immunization records             |
| <input type="checkbox"/> Medications                              | • Bank account numbers   |
| For Adults*   | • Credit card account numbers and companies                          |
| <input type="checkbox"/> Heart and high blood pressure medication | • Inventory of valuable household goods, important telephone numbers |
| <input type="checkbox"/> Insulin                                  | • Family records (birth, marriage, death certificates)               |
| <input type="checkbox"/> Prescription drugs                       |  |
| <input type="checkbox"/> Denture needs                            |  |
| <input type="checkbox"/> Contact lenses and supplies              |  |
| <input type="checkbox"/> Extra eye glasses                        |  |

## SUGGESTIONS AND REMINDERS

- Store your kit in a convenient place known to all family members. Keep a smaller version of the Disaster Supplies Kit in the trunk of your car.



- Keep items in air tight plastic bags.
- Change your stored water supply every six months so it stays fresh.
- Rotate your stored food every six months.
- Re-think your kit and family needs at least once a year. Replace batteries, update clothes, etc.
- Ask your physician or pharmacist about storing prescription medications.



# CREATE A FAMILY DISASTER PLAN

To get started...

Contact your local emergency management or civil defense office and your local American Red Cross chapter.

- Find out which disasters are most likely to happen in your community.
- Ask how you would be warned
- Find out how to prepare for each.

Meet with your family.

- Discuss the types of disasters that could occur.
- Explain how to prepare and respond.
- Discuss what to do if advised to evacuate.
- Practice what you have discussed.

Plan how your family will stay in contact if separated by disaster.

- Pick two meeting places:
  - 1) a location a safe distance from your home in case of fire.
  - 2) a place outside your neighborhood in case you can't return home.
- Choose an **out-of-state** friend as a "check-in-contact" for everyone to call.

Complete these steps.

- Post emergency telephone numbers by every phone.
- Show responsible family members how and when to shut off water, gas and electricity at main switches.

- Install a smoke detector on each level of your home, especially near bedrooms; test monthly and change the batteries two times each year.
- Contact your local fire department to learn about home fire hazards.
- Learn first aid and CPR. Contact your local American Red Cross chapter for information and training

Meet with your neighbors.

Plan how the neighborhood could work together after a disaster. Know your neighbor's skills (medical, technical). Consider how you could help neighbors who have special needs, such as elderly or disabled persons. Make plans for child care in case parents can't get home.

Remember to practice and maintain your plan.

The Federal Emergency Management Agency's Community and Family Preparedness Program and the American Red Cross Community Disaster Education Program are nationwide efforts to help people prepare for disasters of all types. For more information, please contact your local emergency management office and American Red Cross chapter. This brochure and other preparedness materials are available by calling FEMA at 1-800-480-2520, or writing: FEMA, P.O. Box 2012, Jessup, MD 20794-2012. Publications are also available on the World Wide Web at:

FEMA's Web site: <http://www.fema.gov>

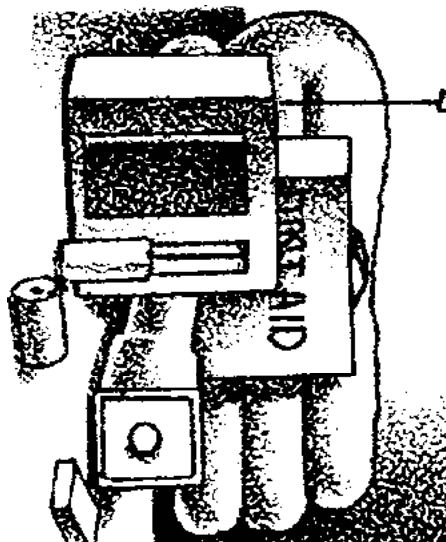
American Red Cross Web site: <http://www.redcross.org>

Local sponsorship provided by:

FEMA L- 189  
ARC 4463

EARTHQUAKE • TORNADO • WINTER STORM • FIRE

Federal Emergency  
Management Agency



YOUR  
Family Disaster Supplies Kit

HURRICANE • FLASH FLOOD • HAZARDOUS MATERIALS SPILL

**Appendix H**

**COMMUNITY-SPECIFIC  
RECOMMENDATION SUMMARIES**

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# Recommendations from the Washington County Hazard Mitigation Plan for the City of Hartford

## **Recommendations addressing multiple hazards**

- Maintain, update, and upgrade public early warning systems. Consider expanding these as necessary
- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply, sewerage systems, and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

## **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 10 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to eight structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to two structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels
  - Conduct regular inspections and maintenance of Hartford Dam
  - Consider developing, maintaining, and periodically updating an emergency action plan for Hartford Dam
  - Consider regulating the hydraulic shadow from the dam failure analysis for Hartford Dam as floodway

## **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

## **Recommendations addressing drought**

- Develop a drought emergency plan
- Develop a water conservation program
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development
- Develop interconnections with adjacent water utilities

**Recommendations addressing transportation accidents**

- Continue enforcing traffic laws
- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

**Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply
- Prepare a public water supply system emergency operation plan
- Identify priority water customers and develop plans for restoring their service first
- Evaluate the condition of water utility electrical equipment to accept generators and repair or upgrade as necessary
- Develop interconnections with adjacent water utilities
- Continue education and outreach programs related to backflow prevention

**Recommendations addressing loss of sewerage system**

- Prepare a sewerage system emergency operation plan
- Initiate facility planning when flows into the wastewater treatment plant reach 80 percent of the plant's design capacity
- Provide backup power for vital system components

**Recommendations addressing hazardous material incidents**

- Continued participation in the Wisconsin Hazardous Materials Response System
- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

## Recommendations from the Washington County Hazard Mitigation Plan for the City of West Bend

### Recommendations addressing multiple hazards

- Maintain, update, and upgrade public early warning systems. Consider expanding these as necessary
- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new mobile home parks
- Develop thorough risk and threat assessments for water supply, sewerage systems, and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### Recommendations addressing flooding

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 41 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to 35 structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to six structures identified as potentially being located in the floodplain
- Stormwater management element
  - Maintain and update the City's stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels
  - Conduct regular inspections and maintenance of dams owned by the City
  - Consider developing, maintaining, and periodically updating emergency action plans for dams owned by the City
  - Consider regulating the hydraulic shadow from the dam failure analyses for dams owned by the City as floodway

### Recommendations addressing drought

- Develop a drought emergency plan
- Develop a water conservation program
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

**Recommendations addressing transportation accidents**

- Continue enforcing traffic laws
- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

**Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply
- Prepare a public water supply system emergency operation plan
- Identify priority water customers and develop plans for restoring their service first
- Evaluate the condition of water utility electrical equipment to accept generators and repair or upgrade as necessary
- Continue education and outreach programs related to backflow prevention

**Recommendations addressing loss of sewerage system**

- Prepare a sewerage system emergency operation plan
- Initiate facility planning when flows into the wastewater treatment plant reach 80 percent of the plant's design capacity
- Provide backup power for vital system components

**Recommendations addressing hazardous material incidents**

- Continued participation in the Wisconsin Hazardous Materials Response System
- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

## Recommendations from the Washington County Hazard Mitigation Plan for the Village of Germantown

### Recommendations addressing multiple hazards

- Maintain, update, and upgrade public early warning systems. Consider expanding these as necessary
- Encourage the installation of safe rooms in community facilities, businesses, manufacturing facilities, and mobile home parks
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply, sewerage systems, and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### Recommendations addressing flooding

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 27 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to six structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 21 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

### Recommendations addressing drought

- Develop a drought emergency plan
- Develop a water conservation program
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development
- Develop interconnections with adjacent water utilities

### Recommendations addressing transportation accidents

- Continue enforcing traffic laws
- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

**Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply
- Prepare a public water supply system emergency operation plan
- Identify priority water customers and develop plans for restoring their service first
- Evaluate the condition of water utility electrical equipment to accept generators and repair or upgrade as necessary
- Develop interconnections with adjacent water utilities
- Continue education and outreach programs related to backflow prevention

**Recommendations addressing loss of sewerage system**

- Prepare a sewerage system emergency operation plan
- Initiate facility planning when flows into the wastewater treatment plant reach 80 percent of the plant's design capacity
- Provide backup power for vital system components

**Recommendations addressing hazardous material incidents**

- Continued participation in the Wisconsin Hazardous Materials Response System
- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

## Recommendations from the Washington County Hazard Mitigation Plan for the Village of Jackson

### Recommendations addressing multiple hazards

- Maintain, update, and upgrade public early warning systems. Consider expanding these as necessary
- Encourage the installation of safe rooms in community facilities, businesses, manufacturing facilities, and mobile home parks
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply, sewerage systems, and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### Recommendations addressing flooding

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 165 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to 15 structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 13 structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 137 mobile homes identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

### Recommendations addressing drought

- Develop a drought emergency plan
- Develop a water conservation program
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

### Recommendations addressing transportation accidents

- Continue enforcing traffic laws
- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

**Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply
- Prepare a public water supply system emergency operation plan
- Identify priority water customers and develop plans for restoring their service first
- Evaluate the condition of water utility electrical equipment to accept generators and repair or upgrade as necessary
- Continue education and outreach programs related to backflow prevention

**Recommendations addressing loss of sewerage system**

- Prepare a sewerage system emergency operation plan
- Initiate facility planning when flows into the wastewater treatment plant reach 80 percent of the plant's design capacity
- Provide backup power for vital system components

**Recommendations addressing hazardous material incidents**

- Continued participation in the Wisconsin Hazardous Materials Response System
- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages



## Recommendations from the Washington County Hazard Mitigation Plan for the Village of Kewaskum

### Recommendations addressing multiple hazards

- Maintain, update, and upgrade public early warning systems. Consider expanding these as necessary
- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply, sewerage systems, and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### Recommendations addressing flooding

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 112 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to 43 structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 69 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels
  - Conduct regular inspections and maintenance of Kewaskum Dam
  - Consider developing, maintaining, and periodically updating an emergency action plan for Kewaskum Dam
  - Consider regulating the hydraulic shadow from the dam failure analysis for Kewaskum Dam as floodway

### Recommendations addressing drought

- Develop a drought emergency plan
- Develop a water conservation program
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

**Recommendations addressing transportation accidents**

- Continue enforcing traffic laws
- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

**Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply
- Prepare a public water supply system emergency operation plan
- Identify priority water customers and develop plans for restoring their service first
- Evaluate the condition of water utility electrical equipment to accept generators and repair or upgrade as necessary
- Continue education and outreach programs related to backflow prevention

**Recommendations addressing loss of sewerage system**

- Prepare a sewerage system emergency operation plan
- Initiate facility planning when flows into the wastewater treatment plant reach 80 percent of the plant's design capacity
- Provide backup power for vital system components

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

# Recommendations from the Washington County Hazard Mitigation Plan for the Village of Newburg

## **Recommendations addressing multiple hazards**

- Maintain, update, and upgrade public early warning systems. Consider expanding these as necessary
- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply, sewerage systems, and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

## **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to four structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to two structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to two structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

## **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

## **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

## **Recommendations addressing transportation accidents**

- Continue enforcing traffic laws
- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

**Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing loss of sewerage system**

- Prepare a sewerage system emergency operation plan
- Initiate facility planning when flows into the wastewater treatment plant reach 80 percent of the plant's design capacity
- Provide backup power for vital system components

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

# Recommendations from the Washington County Hazard Mitigation Plan for the Village of Richfield

## **Recommendations addressing multiple hazards**

- Maintain, update, and upgrade public early warning systems. Consider expanding these as necessary
- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

## **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 200 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to seven structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 193 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

## **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

## **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

## **Recommendations addressing transportation accidents**

- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

## **Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing hazardous material incidents**

- Continued participation in the Wisconsin Hazardous Materials Response System
- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

# Recommendations from the Washington County Hazard Mitigation Plan for the Village of Slinger

## **Recommendations addressing multiple hazards**

- Maintain, update, and upgrade public early warning systems. Consider expanding these as necessary
- Encourage the installation of safe rooms in community facilities, businesses, manufacturing facilities, and mobile home parks
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply, sewerage systems, and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

## **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels
  - Conduct regular inspections and maintenance of Tennes Pond Dam
  - Consider developing, maintaining, and periodically updating an emergency action plan for Tennes Pond Dam
  - Consider conducting a dam failure analysis for Tennes Pond Dam
  - Consider regulating the hydraulic shadow from the dam failure analysis for Tennes Pond Dam as floodway

## **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

## **Recommendations addressing drought**

- Develop a drought emergency plan
- Develop a water conservation program
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development
- Develop interconnections with adjacent water utilities

## **Recommendations addressing transportation accidents**

- Continue enforcing traffic laws
- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

**Recommendations addressing contamination or loss of water supply**

- Develop an emergency water supply plan
- Identify potential distribution points for emergency water supply
- Prepare a public water supply system emergency operation plan
- Identify priority water customers and develop plans for restoring their service first
- Evaluate the condition of water utility electrical equipment to accept generators and repair or upgrade as necessary
- Develop interconnections with adjacent water utilities
- Continue education and outreach programs related to backflow prevention

**Recommendations addressing loss of sewerage system**

- Prepare a sewerage system emergency operation plan
- Initiate facility planning when flows into the wastewater treatment plant reach 80 percent of the plant's design capacity
- Provide backup power for vital system components

**Recommendations addressing hazardous material incidents**

- Continued participation in the Wisconsin Hazardous Materials Response System
- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages



## Recommendations from the Washington County Hazard Mitigation Plan for the Town of Addison

### **Recommendations addressing multiple hazards**

- Maintain, update, and upgrade public early warning systems. Consider expanding these as necessary
- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply, sewerage systems, and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 36 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to 14 structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 22 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

### **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

### **Recommendations addressing drought**

- Develop a drought emergency plan
- Develop a water conservation program
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

### **Recommendations addressing transportation accidents**

- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

**Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply
- Prepare a public water supply system emergency operation plan
- Identify priority water customers and develop plans for restoring their service first
- Evaluate the condition of water utility electrical equipment to accept generators and repair or upgrade as necessary
- Develop interconnections with adjacent water utilities
- Continue education and outreach programs related to backflow prevention

**Recommendations addressing loss of sewerage system**

- Prepare a sewerage system emergency operation plan
- Initiate facility planning when flows into the wastewater treatment plant reach 80 percent of the plant's design capacity
- Provide backup power for vital system components

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

# Recommendations from the Washington County Hazard Mitigation Plan for the Town of Barton

## **Recommendations addressing multiple hazards**

- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply, sewerage systems, and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

## **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 37 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to six structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 31 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

## **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

## **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

## **Recommendations addressing transportation accidents**

- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

## **Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing loss of sewerage system**

- Prepare a sewerage system emergency operation plan
- Initiate facility planning when flows into the wastewater treatment plant reach 80 percent of the plant's design capacity
- Provide backup power for vital system components

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

## Recommendations from the Washington County Hazard Mitigation Plan for the Town of Erin

### **Recommendations addressing multiple hazards**

- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 57 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to two structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 55 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

### **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

### **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

### **Recommendations addressing transportation accidents**

- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

### **Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

## Recommendations from the Washington County Hazard Mitigation Plan for the Town of Farmington

### **Recommendations addressing multiple hazards**

- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 46 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to 18 structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 28 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

### **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

### **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

### **Recommendations addressing transportation accidents**

- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

### **Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing hazardous material incidents**

- Continued participation in the Wisconsin Hazardous Materials Response System
- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages



## Recommendations from the Washington County Hazard Mitigation Plan for the Town of Germantown

### **Recommendations addressing multiple hazards**

- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to eight structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to seven structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to one structure identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

### **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

### **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

### **Recommendations addressing transportation accidents**

- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

### **Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

## Recommendations from the Washington County Hazard Mitigation Plan for the Town of Hartford

### **Recommendations addressing multiple hazards**

- Encourage the installation of safe rooms in community facilities, businesses, manufacturing facilities, and mobile home parks
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 24 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to three structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 21 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

### **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

### **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

### **Recommendations addressing transportation accidents**

- Continue enforcing traffic laws
- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

### **Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing loss of sewerage system**

- Prepare a sewerage system emergency operation plan
- Initiate facility planning when flows into the wastewater treatment plant reach 80 percent of the plant's design capacity
- Provide backup power for vital system components

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

## Recommendations from the Washington County Hazard Mitigation Plan for the Town of Jackson

### Recommendations addressing multiple hazards

- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### Recommendations addressing flooding

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 47 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to 23 structures identified as potentially being located in the floodplain
  - Acquisition and removal of up to 24 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

### Recommendation addressing winter storms

- Work with electrical utility to assess and improve service reliability

### Recommendations addressing drought

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

### Recommendations addressing transportation accidents

- Continue enforcing traffic laws
- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

### Recommendations addressing contamination or loss of water supply

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

## Recommendations from the Washington County Hazard Mitigation Plan for the Town of Kewaskum

### **Recommendations addressing multiple hazards**

- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 11 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Acquisition and removal of up to 11 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels
  -

### **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

### **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

### **Recommendations addressing transportation accidents**

- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

### **Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages



# Recommendations from the Washington County Hazard Mitigation Plan for the Town of Polk

## **Recommendations addressing multiple hazards**

- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

## **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 17 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to five structure identified as potentially being located in the floodplain
  - Acquisition and removal of up to 12 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

## **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

## **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

## **Recommendations addressing transportation accidents**

- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

## **Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

## Recommendations from the Washington County Hazard Mitigation Plan for the Town of Trenton

### **Recommendations addressing multiple hazards**

- Encourage the installation of safe rooms in community facilities, businesses, manufacturing facilities, and mobile home parks
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 45 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to nine structure identified as potentially being located in the floodplain
  - Acquisition and removal of up to 36 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

### **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

### **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

### **Recommendations addressing transportation accidents**

- Continue enforcing traffic laws
- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

### **Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

# Recommendations from the Washington County Hazard Mitigation Plan for the Town of Wayne

## **Recommendations addressing multiple hazards**

- Encourage the installation of safe rooms in community facilities, businesses, and manufacturing facilities
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

## **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 23 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to five structure identified as potentially being located in the floodplain
  - Acquisition and removal of up to 18 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels
  - Conduct regular inspections and maintenance of dams owned by the City
  - Consider developing, maintaining, and periodically updating emergency action plans for dams owned by the City
  - Consider conducting a dam failure analysis for Kohlsville Fire Department Dam
  - Consider regulating the hydraulic shadow from the dam failure analyses for dams owned by the City as floodway

## **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

## **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

## **Recommendations addressing transportation accidents**

- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

**Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages

## Recommendations from the Washington County Hazard Mitigation Plan for the Town of West Bend

### **Recommendations addressing multiple hazards**

- Encourage the installation of safe rooms in community facilities, businesses, manufacturing facilities, and mobile home parks
- Consider adopting ordinances requiring provision of community safe rooms in new and expanding mobile home parks
- Develop thorough risk and threat assessments for water supply and terrorism
- Continue planning, training, and preparedness activities for response personnel
- Continue to enforce building code requirements

### **Recommendations addressing flooding**

- Floodplain and environmentally sensitive land preservation element
  - Continue enforcing floodplain and shoreland/wetland zoning ordinances and regulations
  - Protect and preserve environmentally sensitive and open space areas
- Floodplain management element
  - Survey of up to 77 structures identified as potentially being located in the floodplain, if mitigation projects affecting these structures are planned
  - Floodproofing of up to two structure identified as potentially being located in the floodplain
  - Acquisition and removal of up to 75 structures identified as potentially being located in the floodplain
- Stormwater management element
  - Develop, maintain, and update a stormwater management plan
  - Enforce stormwater management regulations
- Public education and involvement
- Secondary plan element
  - Document the extent of future floods
  - Continue maintaining stream channels

### **Recommendation addressing winter storms**

- Work with electrical utility to assess and improve service reliability

### **Recommendations addressing drought**

- Develop a drought emergency plan
- Protect high and very high recharge potential groundwater recharge areas from inappropriate development

### **Recommendations addressing transportation accidents**

- As existing surface arterial roads are resurfaced and/or reconstructed and as new arterials are constructed consider adding bicycle accommodations

### **Recommendations addressing contamination or loss of water supply**

- Develop an emergency drinking water supply plan
- Identify potential distribution points for emergency water supply

**Recommendations addressing hazardous material incidents**

- Develop response plans for hazardous material releases
- Promote continued maintenance and upgrading of transportation infrastructure carrying hazardous cargo

**Recommendations addressing terrorism**

- Develop site emergency plans for schools, factories, office buildings, shopping malls, government buildings, and other appropriate sites
- Develop emergency preparedness plans for critical government, utility, and infrastructure systems
- Promote increased security at events and infrastructure

**Recommendations addressing cyberattack on local government**

- Purchase cyber-insurance
- Consider installing dedicated communication lines for monitoring and/or controlling critical equipment and processes
- Develop and implement a cyber-security and data backup initiative

**Recommendations addressing power outage**

- Review and implement programs to improve reliability of power supply facilities
- Continue educational programs on preparation for and safety during power outages



**Appendix I**

**POTENTIAL FUNDING PROGRAMS TO  
IMPLEMENT PLAN RECOMMENDATIONS**

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## FUNDING PROGRAM DESCRIPTIONS

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
1	U.S. Federal Emergency Management Agency (FEEMA)	Hazard Mitigation Grant Program	State agencies and participating National Flood Insurance Program (NFIP) communities, private nonprofit organizations	<ol style="list-style-type: none"> <li>1. Acquisition and relocation or demolition of structures in flood hazard areas</li> <li>2. Floodproofing</li> <li>3. Construction or modification of dikes, levees, floodwalls, seawalls, groins, jetties, breakwaters, and stabilized sand dunes</li> <li>4. Soil stabilization</li> <li>5. Minor structural projects</li> <li>6. Flood control projects for critical facilities</li> <li>7. Management costs</li> <li>8. Informational activities</li> <li>9. Plan preparation</li> <li>10. Technical assistance</li> <li>11. Safe room construction</li> </ol>	75 percent Federal cost-share assistance; 12.5 percent State match and 12.5 percent local match required <sup>a</sup>	Within 60 days of a Presidential disaster declaration
2	FEMA	Flood Mitigation Assistance Grant Program	State agencies and participating NFIP communities	<ol style="list-style-type: none"> <li>1. Elevation, relocation, or demolition of insured structures</li> <li>2. Acquisition</li> <li>3. Dry floodproofing</li> <li>4. Minor structural projects</li> <li>5. Beach nourishment activities</li> </ol>	Funding is appropriated by Congress annually; 75 percent Federal cost-share assistance; 25 percent local match required; two types of grants: Planning grant and project grant <sup>b</sup>	Varies
3	FEMA	Homeland Security Preparedness Technical Assistance Program	State and local governments	<ol style="list-style-type: none"> <li>1. Implementation of National Infrastructure Protection Plan</li> <li>2. Strengthen chemical, biological, radiological, nuclear, and explosive detection, response, and decontamination capability</li> </ol>	No statutory matching requirements. Amounts awarded vary based on the scope of the project	Varies
4	FEMA	National Training and Education Division	State and local first responders	<ol style="list-style-type: none"> <li>1. Provides preparedness training and exercise support to first responders in the event of a weapons of mass destruction event</li> <li>2. Provides assistance for local units of government to obtain terrorism readiness equipment</li> </ol>	Provides over 150 training courses for first responders	Varies

Appendix I (continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
5	FEWA	Pre-Disaster Mitigation Program	States and local communities	<ol style="list-style-type: none"> <li>1. Acquisition and relocation or demolition of structures in flood hazard areas</li> <li>2. Floodproofing</li> <li>3. Construction or modification of dikes, levees, floodwalls, seawalls, groins, jetties, breakwaters, and stabilized sand dunes</li> <li>4. Soil stabilization</li> <li>5. Minor structural projects</li> <li>6. Flood control projects for critical facilities</li> <li>7. Management costs</li> <li>8. Informational activities</li> <li>9. Plan preparation</li> <li>10. Technical assistance</li> <li>11. Safe room construction</li> </ol>	Grants are funded annually by Congressional appropriations; 75 percent Federal cost-share assistance; 25 percent State or local match is required	Varies
6	FEWA	Public Assistance Program	State agencies and local communities	<ol style="list-style-type: none"> <li>1. Rebuilding infrastructure damaged during a flood</li> <li>2. Building infrastructure for portions of a community that are to be relocated outside of floodplains</li> <li>3. Limited assistance with structural elevation and relocation</li> </ol>	75 percent Federal cost-share assistance; the State determines the local match	Within 30 days of a Presidential disaster declaration
7	U.S. Army Corps of Engineers (USACE)	Clearing and Snagging for Flood Control Program	State and local units of government	<ol style="list-style-type: none"> <li>1. Removal of obstructions that restrict flood flows of navigable waters</li> <li>2. Projects must be designed and constructed by the Corps</li> </ol>	Project studies are in most cases at Federal expense; 65 percent Federal cost-share assistance is provided for project implementation and cannot exceed \$500,000; a local match of 35 percent is required	None
8	USACE	Emergency Streambank Protection Program	Local communities	<ol style="list-style-type: none"> <li>1. Bank protection of highways, highway bridges, essential public works, churches, hospitals, schools, and other nonprofit public services from flood induced erosion</li> </ol>	Federal share cannot exceed \$1,500,000 for a given project; cost-share program with local match of 35 percent for design and construction required	Continuous

Appendix I (continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
9	USACE	Flood Hazard Mitigation and Aquatic Ecosystem Restoration Program	Local governments	<ol style="list-style-type: none"> <li>1. Flood hazard mitigation to include relocation of threatened structures</li> <li>2. Riverine ecosystem restoration such as conservation or restoration of natural floodwater storage areas</li> <li>3. Planning activities to determine responses to future flood situations</li> <li>4. Project areas must be in a floodplain</li> </ol>	50 percent for studies and 65 percent for project implementation of Federal cost-share assistance; 35 to 50 percent local match is required	Undetermined
10	USACE	Flood Damage Reduction Program	State and local units of government	<ol style="list-style-type: none"> <li>1. Projects designed to reduce the impact of flood events</li> <li>2. Projects must be designed and constructed by the Corps</li> </ol>	50 to 65 percent Federal cost-share assistance above \$100,000 and cannot exceed \$10,000,000; 35 to 50 percent local match is required	None
11	USACE	Hurricane and Storm Damage Reduction Program	State agencies and local units of government	<ol style="list-style-type: none"> <li>1. Beach nourishment</li> <li>2. Floodproofing</li> <li>3. Other structural and nonstructural storm damage reduction projects</li> </ol>	Federal share cannot exceed \$5,000,000 for a given project; cost-share program with local match of 35 percent for design and construction required	Varies
12	USACE	Water Resources Development and Flood Control Acts	Local governments	<ol style="list-style-type: none"> <li>1. Water resources planning assistance</li> <li>2. Emergency streambank and shoreline protection</li> </ol>	50 percent for studies and 65 percent for project implementation of Federal cost-share assistance; 35 to 50 percent local match is required	None
13	National Oceanic and Atmospheric Administration (NOAA)	Coastal and Estuarine Land Conservation Program	Public agencies	<ol style="list-style-type: none"> <li>1. Protect, restore, and enhance Great Lakes coastal wetlands</li> <li>2. Protect restore, and enhance coastal and riparian habitats in the Great Lakes basin</li> </ol>	50 percent Federal cost-share not to exceed \$1,500,000; requires 50 percent non-federal match	October 10
14	U.S. Department of Agriculture (USDA)	Watershed Protection and Flood Prevention Program	State and local units of government	<ol style="list-style-type: none"> <li>1. Watershed protection</li> <li>2. Flood prevention measures</li> <li>3. Projects are intended to be larger scale</li> <li>4. Watersheds can be no larger than 250,000 acres</li> </ol>	Up to 100 percent Federal cost-share assistance for flood control prevention; typical project range is \$3.5 to \$5.0 million in Federal financial assistance	Ongoing

Appendix I (continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
15	USDA	Water and Waste Disposal Loan & Grant Program	Local units of government, nonprofit organizations, associations, and districts	Funds may be used to finance the acquisition, construction, or improvement of: <ol style="list-style-type: none"> <li>1. Drinking water sourcing, treatment, storage, and distribution</li> <li>2. Sewage collection, transmission, treatment, and disposal</li> <li>3. Stormwater collection, transmission, and disposal</li> </ol>	Long-term, low interest loans. If funds are available, grants may be combined with a loan if necessary to keep user costs reasonable	Determined by State USDA office
16	U.S. Department of Agriculture, Farm Services Agency (USDA FSA)	Conservation Reserve Program	Individual agricultural landowners in a 10- or 15-year contract	<ol style="list-style-type: none"> <li>1. Riparian buffers</li> <li>2. Trees</li> <li>3. Windbreaks</li> <li>4. Grassed waterways</li> </ol>	50 percent Federal cost-share assistance; 50 percent local match from individual; an annual rental payment for the length of the contract is also provided	Annually or ongoing
17	USDA FSA	Farmable Wetland Program	Individual agricultural landowners in a 10- or 15-year contract	<ol style="list-style-type: none"> <li>1. Restore currently farmed wetland</li> </ol>	One-time \$100 per acre Federal signing incentive; up to 50 percent Federal cost share assistance for installation of practices plus one-time incentive payment of 40 percent of practice installation cost; annual rental payments based on the weighted average dryland cash rent	Variable
18	USDA Natural Resources Conservation Service (USDA NRCS)	Agricultural Conservation Easement Program- Wetlands Reserve Easements	Local government, individual landowners	<ol style="list-style-type: none"> <li>1. Purchase agricultural land easements that protect the eligible land</li> <li>2. Wetland protection, restoration, and enhancement</li> </ol>	Permanent easement: NRCS pays 100 percent of easement value and 75 to 100 percent of restoration cost 30-year easement: NRCS pays 50 to 75 percent of easement value and 50 to 75 percent of restoration cost	Variable
19	USDA NRCS	Conservation Stewardship Program	Individual landowners in a five-year contract	<ol style="list-style-type: none"> <li>1. Filter strips</li> <li>2. Riparian buffers</li> <li>3. Wildlife corridors</li> <li>4. Stream habitat improvement</li> </ol>	Payments for maintaining and/or enhancing natural resources not to exceed \$40,000 per year or \$200,000 over a five-year period	Annually

Appendix I (continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
20	USDA NRCS	Emergency Conservation Program	Individual landowners	<ol style="list-style-type: none"> <li>1. Regrading and shaping farmland</li> <li>2. Restoring conservation structures</li> <li>3. Redistribution of eroded soil</li> <li>4. Debris removal</li> <li>5. Projects must be in response to natural disaster</li> </ol>	Up to 64 percent Federal cost-share assistance; the remaining percentage is the landowner's responsibility	After a designated State or Presidential disaster declaration
21	USDA NRCS	Emergency Watershed Protection Program	Individual landowners provided they have a local sponsor such as a local unit of government	<ol style="list-style-type: none"> <li>1. Sale of agricultural floodprone lands to NRCS for floodplain easements</li> <li>2. Land must have a history of repeated flooding (at least twice in the past 10 years)</li> <li>3. Landowner retains most of the rights as before the sale</li> <li>4. NRCS has authority to restore the floodplain function and value</li> </ol>	The USDA pays the landowner one of three options: a geographic rate, a value based on the assessment of the land in agricultural production, or an offer made by the landowner; 75 percent Federal cost-share assistance; 25 percent local match is required <sup>d</sup>	Variable
22	USDA NRCS	Environmental Quality Incentives Program	Individual landowners in a three-year contract	<ol style="list-style-type: none"> <li>1. Animal waste management practices</li> <li>2. Soil erosion and sediment control practices</li> <li>3. Nutrient management</li> <li>4. Groundwater protection</li> <li>5. Habitat improvement</li> </ol>	Up to 75 percent Federal cost-share assistance; 25 percent local match is required <sup>g</sup>	Annually
23	USDA Risk Management Agency	Federal Crop Insurance	Agricultural producers	<p>Insurance of selected crops against losses due to natural hazards</p> <p>Provides training to:</p> <ol style="list-style-type: none"> <li>1. Augment prevention and preparedness in a variety of high-risk settings</li> <li>2. Enhance safety and health training of hazardous material workers, emergency responders, and skilled support personnel</li> <li>3. Ensure responders are aware of site-specific hazards and mitigation techniques prior to and during response activities</li> </ol>	Insurance of selected crops against losses due to natural hazards	Deadlines announced annually, vary depending on the type of crop <sup>h</sup>
24	U.S. Department of Health and Human Services, National Institutes of Health	National Institute of Environmental Health Sciences (NIEHS) HAZMAT Disaster Preparedness Training Program	Public and private nonprofit organizations involved in responding to hazardous material incidents	<ol style="list-style-type: none"> <li>1. Augment prevention and preparedness in a variety of high-risk settings</li> <li>2. Enhance safety and health training of hazardous material workers, emergency responders, and skilled support personnel</li> <li>3. Ensure responders are aware of site-specific hazards and mitigation techniques prior to and during response activities</li> </ol>	No statutory matching requirements	Contact NIEHS headquarters for deadline

Appendix I (continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
25	U.S. Department of Health and Human Services, National Institutes of Health	National Institute of Environmental Health Sciences (NIEHS) Hazardous Waste Worker Health and Safety Training	Public and private nonprofit organizations involved in hazardous waste clean up	<ol style="list-style-type: none"> <li>1. Develop institutional competency to provide training and education to hazardous waste workers</li> <li>2. Development of model health and safety training programs regarding hazardous materials</li> <li>3. Training and education in emergency response to a hazardous waste incident</li> </ol>	No statutory matching requirements. Grants generally range from \$24,000 to \$3.4 million	Contact NIEHS headquarters for deadline
26	U.S. Department of Homeland Security (DHS)	Program to Prepare Communities for Complex Coordinated Terrorist Attacks	States, local governments, Federally recognized tribal governments	<ol style="list-style-type: none"> <li>1. Identifying capability gaps related to preparing for, preventing, and responding to a complex coordinated terrorist attack</li> <li>2. Development and/or updating plans, annexes, and processes to address the identified gaps</li> <li>3. Training personnel and the whole community to implement the plans and processes and build needed capacities</li> <li>4. Conducting exercises to validate capabilities</li> </ol>	Up to \$2.5 million	February 10
27	DHS	Homeland Security Grant Program	State governments	Planning, organization, equipment purchase, training, exercises, and management	\$1.03 billion provided for projects and programs nationally	April
28	DHS	Homeland Security National Training Program – Continuing Training Grants	States, local governments, tribal governments, school districts, high education institutions, nonprofit organizations	Focus areas are cybersecurity, hazardous materials, economic recovery, and rural preparedness	\$11.5 million provide for projects nationally	August
29	DHS	Countering Violent Extremism Grants	States, local governments, tribal governments, school districts, higher education institutions, nonprofit organizations	<ol style="list-style-type: none"> <li>1. Developing resilience</li> <li>2. Training and engaging with community members</li> <li>3. Managing intervention activities</li> <li>4. Building capacity of community-level nonprofit organizations</li> </ol>	\$10 million provided for projects nationally	September
30	U.S. Department of Housing and Urban Development (HUD)	Community Development Block Grant Program	Local governments	<ol style="list-style-type: none"> <li>1. Relocation and demolition</li> <li>2. Housing Grants to fund the rehabilitation of housing to meet current building codes</li> <li>3. Construction of public facilities and improvements</li> </ol>	75 to 100 percent Federal cost-share assistance; 0 to 25 percent local match may be required	May 27



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Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
31	HUD	Community Development Block Grant Program Emergency Assistance Program	Local governments	<ol style="list-style-type: none"> <li>Emergency response activities related to flood events</li> <li>Long-term needs related to flooding issues</li> </ol>	75 to 100 percent Federal cost-share assistance; 0 to 25 percent local match may be required	After a Presidential disaster declaration
32	HUD	Healthy Homes Production Grant Program	State, tribal, and local governments	<ol style="list-style-type: none"> <li>Identify and remediate priority (significant) housing-related health and safety hazards in privately-owned, low income rental or owner occupied housing</li> <li>Projects that comprehensively address multiple residential health and safety issues</li> </ol>	Up to \$2,000,000 Federal assistance; Minimum 10 percent match required	June
33	U.S. Department of Justice Office of Justice Programs	Economic, Cyber, and High-Tech National Training and Technical Assistance Program	Nonprofit and for-profit organizations and higher education institutions	Provides training and technical assistance to state, local, and tribal law enforcement officials; intelligence analysts; prosecutors; and other crime fighting entities on preventing, investigating, and responding to economic, cyber, and other high tech crimes	\$6 million in assistance for programs nationally	None
34	U.S. Department of Justice, Community Oriented Policing Services (DOJ COPS)	COPS Hiring Program Grants	State, local, and tribal law enforcement agencies	Provides funding to hire and rehire entry-level career law enforcement officers	Up to \$137 million available annually nationwide Number of officer positions an agency can apply for is equal to 5 percent of the agency's actual sworn force strength 75 percent of the entry-level salary and fringe benefits of each newly hired full-time officer, up to \$125,000 per officer	None
35	DOJ COPS	Community Policing Development Program	All public governmental agencies, nonprofit and for-profit organizations, higher education institutions, community groups, and faith-based organizations	Advance the practice of community policing through training and technical assistance, development of innovative community policing strategies, applied research, guidebooks, and best practices	Up to \$8 million available for projects or programs nationally	None
36	U.S. Department of Justice, Federal Bureau of Investigation (FBI)	Law Enforcement Assistance-FBI Field Police Training and Advanced Training Programs	All authorized municipal, county, local, and state, criminal justice personnel	Specialized instruction in such areas as police community relations, hostage negotiation, computer fraud, and cyber-attack	Training	None

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Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
37	U.S. Department of Transportation (USDOT)	Transportation Enhancement Program	State and local units of government	<ol style="list-style-type: none"> <li>1. Wetland preservation and restoration</li> <li>2. Stormwater treatment systems to address runoff from roads and highways</li> <li>3. Reduce vehicle-caused wildlife mortality while maintaining habitat connectivity</li> <li>4. Pedestrian and bicycle infrastructure and safety programs</li> </ol>	80 percent Federal cost-share assistance; 20 percent local match is required	None
38	USDOT	Transportation Enhancement Program	State and local units of government	<ol style="list-style-type: none"> <li>1. Land acquisition for: scenic easements, pedestrian and bike trails, and abandoned railway corridors</li> </ol>	50 percent Federal cost-share assistance; 50 percent local match is required	None
39	U.S. Environmental Protection Agency (USEPA)	Environmental Education Grants Program	Local or State education agencies, colleges, and nonprofit organizations, State environmental agencies, and noncommercial education broadcasting agencies	<ol style="list-style-type: none"> <li>1. Improving environmental education teaching skills</li> <li>2. Educating teachers, students, or the public about human health problems</li> <li>3. Building capacity for environmental education programs</li> <li>4. Educating the public through print, broadcast, or other media</li> </ol>	\$3.4 million available nationally; locally, grants are for \$5,000; \$5,000 to \$25,000; and up to \$125,000, up to 75 percent of the project cost, a 25 percent match is required	Ongoing
40	USEPA	Targeted Watershed Grants	Watershed organizations nominated by State Governors or Tribal leaders	<ol style="list-style-type: none"> <li>1. Watershed-based projects to protect water resources</li> <li>2. Training and technical assistance to local partnerships</li> </ol>	75 percent maximum Federal cost-share assistance. Minimum 25 percent non-Federal match	November
41	U.S. Fire Administration	Assistance to Firefighters Grant Program	Counties; city, village, township fire departments, and nonaffiliated EMS organizations	<ol style="list-style-type: none"> <li>1. Firefighter and EMT training</li> <li>2. Firefighting and EMS equipment</li> <li>3. Firefighter personal protective equipment</li> </ol>	80 percent Federal cost-share assistance for communities with population greater than 50,000; 90 percent for communities with population less than 50,000 but greater than 20,000; 95 percent for communities with population less than 20,000	See program guidance
42	U.S. Fire Administration	Fire Management Assistance Grants	States, Indian tribal governments, and local governments	Provides assistance for the mitigation, management, and control of fires on publicly or privately owned forests or grasslands, which threaten sufficient destruction as to constitute a major disaster	75 percent Federal cost-share assistance; 25 percent State and local match	Rolling

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Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
43	U.S. Fire Administration	Fire Prevention and Safety Grants (FP&S)	County, city, village, and township fire departments	<ol style="list-style-type: none"> <li>Public education</li> <li>Arson prevention</li> <li>Prevention-related training</li> <li>Fire prevention activities</li> <li>Risk Assessments</li> </ol>	Cost-share matching fund requirements dependent upon size of population served by the Fire Department	See program guidance
44	U.S. Fire Administration	National Fire Academy	Persons with substantial involvement in fire prevention and control, emergency medical services, fire-related emergency management activities, or allied professions	Provides tuition-free training in firefighting, prevention, emergency medical services, and related areas	Provides tuition-free training in firefighting, prevention, emergency medical services, and related areas	June 15 for fall semester, December 15 for spring semester
45	U.S. Fire Administration	National Fire Academy Training Assistance Student Stipend Reimbursement Program	Members of fire departments or sponsoring department	Provides travel stipends for students attending National Fire Academy courses	Travel reimbursement	Rolling
46	U.S. Fish and Wildlife Service (FWS)	North American Wetlands Conservation Fund	State and public agencies	<ol style="list-style-type: none"> <li>Property acquisition for the protection of wetlands that migratory birds, fish, and wildlife are dependent on</li> <li>Wetland restoration and protection projects</li> <li>Habitat restoration projects</li> </ol>	50 percent Federal cost-share assistance; 50 percent local match is required	February, July
47	FWS	Partners for Fish and Wildlife Habitat Restoration Program	Private landowners for a 10-year-minimum contract	<ol style="list-style-type: none"> <li>Restoration of degraded wetlands, native grasslands, stream and riparian corridors, and other habitat areas</li> </ol>	Full cost-share and technical assistance; individual projects cannot exceed \$25,000	Continuous
48	U.S. Geological Survey (USGS)	Upper Mississippi River System Long Term Resource Monitoring Program	State and local units of government, nonprofit organizations, and inter and intrastate agencies	<ol style="list-style-type: none"> <li>Monitoring resources</li> <li>Developing alternative management measures</li> <li>Managing information with respect to those resources</li> </ol>	Federal cost-share program with no local match required; average financial assistance has been \$250,000 per project	None
49	U.S. Small Business Administration	Disaster Loan Program	Homeowners, renters, and businesses	<ol style="list-style-type: none"> <li>Property repair</li> <li>Property replacement</li> <li>Meeting building code requirements</li> <li>Involuntary relocations out of a special flood hazard area</li> </ol>	Low interest loans	After a Presidential disaster declaration
50	Wisconsin Department of Natural Resources (WDNR)	Forest Fire Protection Grant Program	Fire department, county/area fires associations	<ol style="list-style-type: none"> <li>Personal protective equipment</li> <li>Forest fire training</li> <li>Forest fire prevention and wildland urban interface</li> <li>Forest fire suppression materials</li> <li>Communication equipment</li> <li>Dry hydrant installation</li> </ol>	50 percent State cost share; grants of \$750-\$10,000 for fire departments, \$5,000-\$25,000 for county/area fire associations	July 1

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Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
51	WDNR	Lake Classification and Local Ordinance Development Grants, Section NR 191.30 of the <i>Wisconsin Administrative Code</i>	Local units of government, lake districts	Development or improvement of ordinances related to conservancy, wetland, shoreline, floodplain, construction erosion control, stormwater control or other ordinances with water quality or lake protection benefit.	75 percent State cost-share, not to exceed \$50,000	December 10
52	WDNR	Lake Planning Grant Program, Chapter NR 190 of the <i>Wisconsin Administrative Code</i>	Local units of government, lake districts, town sanitary districts, qualified school districts, qualified lake associations, and qualified nonprofit conservation organizations	<ol style="list-style-type: none"> <li>Gathering and analyzing water quality information</li> <li>Land use planning within lake watersheds</li> <li>Gathering and compiling demographic information pertinent to individual lakes</li> <li>Developing lake management plans</li> </ol>	Up to 67 percent State cost-share assistance, not to exceed \$8,000 for small-scale projects or \$25,000 for large-scale projects; 33 percent local match is required; lakes are eligible for more than one grant, however, the total amount of State dollars cannot exceed \$100,000	December 10
53	WDNR	Lake Protection Grant Program, Chapter NR 191 of the <i>Wisconsin Administrative Code</i>	Local units of government, lake districts, town sanitary districts, qualified school districts, qualified lake associations, and qualified nonprofit conservation organizations	<ol style="list-style-type: none"> <li>Land acquisition for easement establishment</li> <li>Wetland restoration</li> <li>Lake restoration projects</li> <li>Other projects involving lake improvement</li> </ol>	75 percent State cost-share which cannot exceed \$200,000 for land acquisition or lake management plan implementation or \$100,000 for wetland and shoreline habitat restoration; 25 percent local match is required	February 1
54	WDNR	Land and Water Conservation Fund Program	Counties, cities, villages, towns, school districts	<ol style="list-style-type: none"> <li>Land acquisition or development that will provide opportunities for outdoor recreation</li> <li>Property with frontage on rivers, streams, lakes, estuaries, and reservoirs that will provide water-based outdoor recreation</li> <li>Property that provides special recreation opportunities, such as floodplains, wetland, and areas adjacent to scenic highways</li> </ol>	50 percent State cost-share assistance; 50 percent local match is required	May 1
55	WDNR	Land/Easement Acquisition for River Management Section NR 195.13 of the <i>Wisconsin Administrative Code</i>	Local units of government, lake districts, town sanitary management associations, and qualified nonprofit conservation organizations	Land acquisition and easements for river protection	75 percent State cost-share assistance; 25 percent local match is required; Grant not to exceed \$50,000	February 1

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Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
56	WDNR	Municipal Dam Grant Program	Counties, cities, villages, tribes, inland lake protection and rehabilitation districts	<ol style="list-style-type: none"> <li>Dam repair, reconstruction, or modification to improve safety</li> <li>Dam abandonment and removal</li> </ol>	<p>For repair, reconstruction, or modification projects grant awards will cover 50 percent of the first \$400,000 and 25 percent of the next \$800,000 of eligible project costs</p> <p>For abandonment and removal projects, grant awards will cover 100 percent of the first \$400,000 of eligible project costs</p>	January 21
57	WDNR	Municipal Flood Control Grants Chapter NR 199 of the <i>Wisconsin Administrative Code</i>	Cities, villages, towns, metropolitan sewerage districts	<ol style="list-style-type: none"> <li>Acquisition and removal of structures</li> <li>Flood proofing and elevation of structures</li> <li>Riparian restoration projects</li> <li>Acquisition of vacant land or purchase of easements</li> <li>Construction of stormwater and groundwater facilities related to flood control and riparian restoration projects</li> <li>Flood mapping</li> </ol>	70 percent State cost-share assistance; 30 percent local match	March 15 of even-numbered years
58	WDNR	Remediation and Redevelopment Spills and Releases program	Responsible party	Provide technical assistance and support within the agency and to those outside the agency	Provide technical assistance and support	Department will take emergency action to remove or contain a spill at the expense of the responsible party
59	WDNR	River Management Grant Program, Section NR 195.05 of the <i>Wisconsin Administrative Code</i>	Local units of government, lake districts, town sanitary management associations, and qualified nonprofit conservation organizations	<ol style="list-style-type: none"> <li>River restoration projects</li> <li>Educational projects</li> <li>Activities associated with river management plan implementation</li> <li>Ordinance development</li> <li>Installation of practices to control nonpoint source pollution</li> </ol>	75 percent State cost-share assistance; 25 percent local match is required; Grant not to exceed \$50,000	February 1
60	WDNR	Safe Drinking Water Loan Program	Local governments	Provides subsidized interest rate loans to municipalities seeking to fund wastewater and storm water infrastructure projects.	Loans at subsidized interest rates	October 31
61	WDNR	Stewardship Grant Program, Chapter NR 47 of the <i>Wisconsin Administrative Code</i>	Local government and nonprofit conservation organizations	<ol style="list-style-type: none"> <li>Streambank protection projects</li> <li>Land acquisition of stream corridors for water quality improvement</li> </ol>	50 percent State cost-share assistance; 50 percent local match is required	May 1

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Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
62	WDNR	Stewardship Grant Program, Urban Green Space Program	Local units of government, lake protection and rehabilitation districts, and nonprofit conservation organizations	<ol style="list-style-type: none"> <li>Land acquisition for greenway space in urban areas, protection of scenic or ecological features, and wildlife habitat improvement</li> </ol>	50 percent State cost-sharing assistance; 50 percent local match is required	May 1
63	WDNR	Targeted Runoff Management Grants, Chapter 120 of the <i>Wisconsin Administrative Code</i> ; in the future, specific rural nonpoint source abatement measures will be funded under proposed Chapter NR 151 of the <i>Wisconsin Administrative Code</i>	Counties, cities, villages, regional planning commissions, tribal governments, and special purpose lake, sewerage, and sanitary districts	<ol style="list-style-type: none"> <li>Complying with nonpoint source performance standards</li> <li>Improving 303(d) waters</li> <li>Protecting outstanding water resources</li> <li>Compliance with a notice of discharge for an animal feeding operation</li> <li>Addressing a water quality concern of national or statewide importance, such as the Upper Mississippi River</li> </ol>	70 percent State cost-share assistance; 30 percent local match is required. Large-scale agricultural projects receive typical grants of \$500,000 to \$1 million, small-scale rural and urban projects cannot exceed \$150,000	April 15
64	WDNR	Urban Nonpoint Source and Stormwater Grants Program. Funding is through Chapter NR 155 of the <i>Wisconsin Administrative Code</i>	Counties, cities, villages, regional planning commissions, tribal governments, and special purpose lake, sewerage, and sanitary districts	<ol style="list-style-type: none"> <li>Planning</li> <li>Educational and information activities</li> <li>Ordinance development and enforcement</li> <li>Training</li> <li>Storm water detention ponds</li> <li>Streambank and shoreline stabilization</li> </ol>	70 percent State cost-share assistance for projects not involving construction, requiring a 30 percent local match; 50 percent State cost-share assistance for projects involving construction, requiring a 50 percent local match	April 15
65	WDNR	Urban Rivers Grant Program	Local units of government and nonprofit conservation organizations	<ol style="list-style-type: none"> <li>Land acquisition to preserve open areas in urban environments adjacent to streams and rivers</li> </ol>	50 percent State cost-share assistance; 50 percent local match is required	May 1
66	WDNR	Wisconsin Forest Landowner Grant Program	Individual landowners <sup>e</sup>	<ol style="list-style-type: none"> <li>Stream buffers</li> <li>Streambank stabilization</li> <li>Wetland Restoration</li> </ol>	Up to 50 percent cost-share for the preparation of management plans and implementation of designated practices, maximum cost-share of \$10,000 per year	Ongoing
67	University of Wisconsin Cooperative Extension	Extension Disaster Education Network	Local communities	Provides Community education and public information programs promoting hazard awareness and mitigation concepts	Education and Information provided through the University of Wisconsin System	Continuous

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Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
68	Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP)	Farmland Preservation Program	Individual landowners for a period of 10 years	1. Best management practices that will lower the soil erosion rate to the tolerable soil loss rate or below and improve water quality	Tax incentives on an annual basis	None
69	DATCP	Land and Water Resource Management Program	Individual landowners	1. Grassed waterways 2. Manure storage systems 3. Grade stabilization structures 4. Well abandonment 5. Conservation tillage	50 to 70 percent State cost-share assistance; 30 to 50 percent individual cost-share is required; in the case of financial hardship, up to 90 percent cost-share assistance can be obtained from the State	December 31
70	DATCP	Soil and Water Resource Management Program	Individual landowners	1. Wetland restoration 2. Filter strip, riparian buffers 3. Subsurface drainage 4. Well abandonment	Program funds 70 percent of the cost of conservation project	Variable
71	Wisconsin Department of Health Services	Special Needs Technical Assistance	Local communities	Technical assistance to determine if an actual or potential human service and/or population threat is present	Provide technical assistance and support	--
72	Wisconsin Department of Health Services	Chemical Contamination Technical Assistance	Local communities	Technical assistance to determine if an actual or potential public health threat is present and if hazard mitigation is warranted or desirable	Provide technical assistance and support	--
73	Wisconsin Department of Health Services	Communicable or Infectious Diseases Technical Assistance	Local communities	Technical assistance to determine if an actual or potential human threat is present	Provide technical assistance and support	--
74	Wisconsin Department of Transportation (WisDOT)	Transportation Alternatives Program	Local governments, regional transportation authorities, transit agencies, natural resource or public land agencies, school districts, tribal governments	1. On- and off-road facilities for pedestrians and bicyclists 2. Infrastructure-related projects and systems that will provide safe routes for non-drivers 3. Community improvement projects 4. Environmental mitigation activities	80 percent State match; minimum of \$300,000 for infrastructure projects, minimum of \$50,000 for non-infrastructure projects. No maximum, but grants exceeding \$1,000,000 are unlikely	January 29
75	WisDOT	Freight Railroad Infrastructure Improvement Program	Counties, municipalities, railroads, transit commissions	Projects that: 1. Rehabilitate a rail line segment 2. Improve transportation efficiency 3. Promote safety	Loans not to exceed \$3,000,000	Ongoing

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Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
76	WisDOT	Highway Safety Improvement Program	Local governments	<ol style="list-style-type: none"> <li>1. Intersection safety improvements</li> <li>2. Installing guardrails, signs, pavement markings</li> <li>3. Corridor signal upgrades</li> <li>4. Warning devices or elimination of hazards at rail crossings</li> </ol>	90 percent Federal reimbursement; 10 percent match required. State pays match on projects on State trunk highways, local government pays match on local streets and highways	August 15, February 15
77	Wisconsin Public Service Commission (WPSC)	Telecommunications, Water, Gas and Electric Divisions	Local communities	Incorporate disaster resistance into regulation, development, land use practices and environmental impacts of public utilities	General Utility Assistance	Continuous
78	Great Lakes Protection Fund	Great Lakes Protection Fund	State and local units of government, nonprofit organizations and individuals	<ol style="list-style-type: none"> <li>1. To improve the health of the Great Lakes</li> <li>2. To promote the interdependence of healthy ecological and economic systems</li> <li>3. To support innovative, creative, and venturesome ideas</li> </ol>	Finance the total cost of accepted projects	Continuous applications process
79	Great Lakes Restoration Initiative	Multiple funding programs available	Varies by program	Clean toxins, combat invasive species, protect water quality, restore wetlands and other habitats	Varies by program	Varies by program
80	Joyce Foundation	Joyce Foundation Grant program	State and local units of government, nonprofit organizations and individuals	<ol style="list-style-type: none"> <li>1. To improve the health of the Great Lakes</li> <li>2. To promote the interdependence of healthy ecological and economic systems</li> <li>3. To support innovative, creative, and venturesome ideas</li> <li>4. Developing improved regulatory approaches</li> <li>5. Better understanding of the supply of and demand for Great Lakes water</li> <li>6. Creating transportation alternatives to reduce over reliance on automobiles</li> </ol>	Finance the total cost of accepted projects	Grant proposals are considered at meetings of the Foundation's Board of Directors in April, July, and December
81	National Fish and Wildlife Foundation (NFWF)	Five-Star Restoration Program	State agencies, local governments, tribal institutions, and 501(c) nonprofit organizations	<ol style="list-style-type: none"> <li>1. Wetland restoration projects</li> <li>2. Riparian restoration projects</li> <li>3. Projects must be part of a larger watershed project</li> <li>4. Projects must have at least five contributing parties</li> </ol>	\$2,500,000 available nationally annually; project awards range from \$20,000 to \$50,000, average award \$30,000; minimum 50 percent local match preferred, higher local match preferred	January 31



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Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided	Application Deadline
82	NFWF	Resilient Communities Grant Program	Local governments and 501(c) nonprofit organizations	1. Green infrastructure 2. Stream buffer enhancements	Awards range between \$200,000 and \$500,000	Preproposals due March 30, full proposals due May 31
83	NFWF	Sustain Our Great Lakes Community Grant Program	State agencies, local governments, tribal institutions, educational institutions, and 501(c) nonprofit organizations	1. Restoring aquatic connectivity through means such as dam removal and bridge and culvert replacement 2. Stream restoration, enhancement, and protection projects 3. Coastal wetland restoration, enhancement, and protection projects 4. Installation of green infrastructure 5. Projects must be in Great Lakes watershed	Grant awards range from \$50,000 to \$1,500,000. No match is required; however, the ratio of matching funds offered is considered during review with grants that meet or exceed a one-to-one match ratio being more competitive.	February 21
84	NFWF	Wal-Mart Stores, Inc. Acres for America	State and local units of government, nonprofit conservation organizations	1. Acquisition or permanent easement for conservation of habitat	\$2.5 million available annually; minimum 50 percent local match required, higher local match preferred	Preproposals due May 19 Full proposals due July 28
85	Ozaukee/Washington Land Trust	Stewardship Grant Program, Urban Green Space Program	Land trusts, local units of government, and nonprofit organizations	1. Land acquisition for greenway space in urban areas, protection of scenic or ecological features, and wildlife habitat improvement	Funding on a project basis	- -
86	Southeastern Wisconsin Watersheds Trust (Sweet Water)	Sweet Water Mini-Grant Program	Nonprofit organizations and community groups Projects must be located in the Kinnickinnic, Menomonee, Milwaukee, Root River and/or Oak Creek watersheds	Supports local grassroots efforts that employ green infrastructure practices and other water quality-related activities	Annual grants of \$1,000 - \$5,000	RFP issued in fall; grants are awarded for execution the following spring and summer
87	State Farm Companies Foundation	State Farm Good Neighbor Citizenship Company Grants	Government entities, educational institutions, 501(c)(3) nonprofit organizations, 501(c)(4) volunteer fire companies, 501(c)(6) chambers of commerce	1. Auto and Road safety 2. Teen driver education 3. Home safety and fire prevention 4. Disaster preparedness and recovery	Grants of \$5,000 or more	October 30

<sup>a</sup>The NonFederal share is 25 percent. In Wisconsin, the State Division of Emergency Management pays 12.5 percent and the local community pays 12.5 percent.

<sup>b</sup>Available on an annual basis.

<sup>c</sup>Municipalities must have a flood mitigation plan to be eligible for a project grant.

<sup>d</sup>In kind services are allowed as a part of the local cost-share assistance.

<sup>e</sup>Applicants must have a Forest Stewardship Plan prepared by a forester in place on their land or be applying to have one prepared.

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<sup>f</sup>Two types of sign-up are available for CRP: continuous CRP, which has no timeline and is used for small sensitive tracts of land and regular CRP, which has an annual sign up application period and is used for large tracts of land.

<sup>g</sup>EQIP in southeastern Wisconsin provides minimal funding.

<sup>h</sup>USDA Risk Management Agency administers this program. Producers purchase Federal crop insurance policies through private insurance agents.

Source: SEWRPC.

**Appendix J**

**FUNDING PROGRAMS CONTACT INFORMATION<sup>a</sup>**

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Administrator of Grant Program	Name of Grant Program	Address	Phone Number	Internet Web Address
Federal Emergency Management Agency (FEMA)	Hazard Mitigation Grant Program Public Assistance Program	Federal Emergency Management Agency Region V 536 South Clark Street, 6th Floor Chicago, IL 60605	(312) 408-5500	<a href="https://www.fema.gov/hazard-mitigation-grant-program">https://www.fema.gov/hazard-mitigation-grant-program</a> <a href="https://www.fema.gov/public-assistance-local-state-tribal-and-non-profit">https://www.fema.gov/public-assistance-local-state-tribal-and-non-profit</a>
FEMA	Flood Mitigation Assistance Grant Program Pre-Disaster Mitigation Program	Headquarters: Federal Emergency Management Agency Federal Insurance & Mitigation Administration 500 C Street, SW Washington, DC 20472	(202) 646-2500	<a href="https://www.fema.gov/flood-mitigation-assistance-grant-program">https://www.fema.gov/flood-mitigation-assistance-grant-program</a> <a href="https://www.fema.gov/pre-disaster-mitigation-grant-program">https://www.fema.gov/pre-disaster-mitigation-grant-program</a>
U.S. Army Corps of Engineers (USACE)	Small Flood Damage Reduction Program Snagging and Clearing for Flood Control Emergency Bank Protection Program Water Resources Development and Flood Control Act Small Hurricane and Storm Damage Reduction Program Flood Hazard Mitigation and Aquatic Riverine Ecosystem Restoration Program	U.S. Army Corps of Engineers 231 S. LaSalle Street, Suite 1500 Chicago, IL 60604  U.S. Army Corps of Engineers 477 Michigan Avenue, Room 617 Detroit, MI 48226	(312) 846-5330  (313) 226-6760	<a href="http://www.usace.army.mil">www.usace.army.mil</a>
National Oceanic and Atmospheric Administration (NOAA)	Coastal and Estuarine Land Conservation Program	Ms. Rachael Franks Taylor NOAA Ocean Service, OCM/TBG 307 W. Twelfth Street Traverse City, MI	(617) 834-2493	<a href="http://coast.noaa.gov/czmlandconservation">coast.noaa.gov/czmlandconservation</a>
U.S. Department of Agriculture (USDA)	Watershed Protection and Flood Prevention Program	Headquarters: Department of Agriculture Natural Resources Conservation Service 1400 Independence Avenue SW Washington, DC 20113	(202) 720-3413	<a href="https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wfpo/">https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wfpo/</a>
USDA	Water and Waste Disposal Systems for Rural Communities	U.S. Department of Agriculture Rural Utilities Service Water and Environmental Programs Room 4050-S, Stop 1548 1400 Independence Avenue, SW Washington, DC 20250	(202) 690-2670	<a href="https://www.rd.usda.gov/programs-services/water-waste-disposal-loan-grant-program">https://www.rd.usda.gov/programs-services/water-waste-disposal-loan-grant-program</a>
USDA, Farm Services Agency (FSA)	Conservation Reserve Program	U.S. Department of Agriculture Farm Services Agency 1012 Vine Street Union Grove, WI 53182	(262) 878-3353	<a href="http://www.fsa.usda.gov">www.fsa.usda.gov</a>

Appendix J (continued)

Administrator of Grant Program	Name of Grant Program	Address	Phone Number	Internet Web Address
USDA, Natural Resources Conservation Service (NRCS)	Emergency Watershed Protection Program	U.S. Department of Agriculture Natural Resources Conservation Service 8030 Excelsior Drive Madison, WI 53717	(608) 662-4422	www.nrcs.usda.gov
NRCS	Emergency Conservation Program Conservation Stewardship Program Environmental Quality Incentives Program	U.S. Department of Agriculture Natural Resources Conservation Service 1012 Vine Street Union Grove, WI 53182	(262) 878-1243	www.nrcs.usda.gov
U.S. Department of Health and Human Services, National Institute of Environmental Health Sciences	HAZMAT Disaster Preparedness Training Program Hazardous Waste Worker Health and Safety Training	National Institute of Environmental Health Sciences Worker Education and Training Program 111 T.W. Alexander Drive Research Triangle Park, NC 27709	(919) 541-3345	https://www.niehs.nih.gov/careers/hazmat/about_wetp/hdpt/index.cfm
U.S. Department of Homeland Security	Program to Prepare Communities for Complex Coordinated Terrorist Attacks	Federal Emergency Management Agency Office of Counterterrorism and Security Preparedness 500 C Street S.W. Washington, D.C. 20472	(202) 646-2500	https://www.fema.gov/media-library/assets/documents/127506
U.S. Department of Homeland Security (DHS)	Homeland Security Grant Program Program to Prepare Communities for Complex Coordinated Terrorist Attacks Countering Violent Extremism Grants Homeland Security National Training Program – Continuing Training Grants	Federal Emergency Management Agency Office of Counterterrorism and Security Preparedness 500 C Street S.W. Washington, D.C. 20472	(202) 646-2500	https://www.dhs.gov/cve/resources/cve-grants/Homeland-Security-Grant-Program-HSGP https://www.fema.gov/media-library/assets/documents/127506 https://www.dhs.gov/cve/resources/cve-grants/countering-violent-extremism-grants https://www.dhs.gov/cve/resources/cve-grants/National-Training-Program-HSNTP-Continuing-Training-Grants-CTG
U.S. Department of Housing and Urban Development (HUD)	Community Development Block Grant Program	U.S. Department of Housing and Urban Development Office of Community Planning and Development Office of Block Grant Assistance State and Small Cities Division, Room 7184 451 7th Street, SW Washington, DC 20410	(202) 708-1112	https://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs
HUD	Healthy Homes Production Grant Program	U.S. Department of Housing and Urban Development Room 8236 451 7th Street, SW Washington, DC 20410	(202) 402-5769	https://portal.hud.gov/hudportal/HUD?src=/program_offices/healthy_homes/hhi/hhd

Appendix J (continued)

Administrator of Grant Program	Name of Grant Program	Address	Phone Number	Internet Web Address
U.S. Department of Justice, Office of Justice Programs	Economic, Cyber, and High-Tech National Training and Technical Assistance Program	U.S. Department of Justice, Office of Justice Programs 810 7th Street NW Washington, DC 20531	(202) 616-6500	--
U.S. Department of Justice, Office of Community Oriented Policing Services	Community Policing Development Program	U.S. Department of Justice Office of Community Oriented Policing Services 145 North Street NE Washington, DC 20530	(800) 421-6770	<a href="https://cops.usdoj.gov/Default.asp?Item=65">https://cops.usdoj.gov/Default.asp?Item=65</a>
U.S. Department of Justice, Federal Bureau of Investigation (FBI)	COPS Hiring Program Grants	Law Enforcement Assistance-FBI Field Police Training and Advance Training Programs	(414) 276-4684	<a href="https://www.fbi.gov/contact-us/field-offices/milwaukee">https://www.fbi.gov/contact-us/field-offices/milwaukee</a>
U. S. Environmental Protection Agency (USEPA)	Environmental Education Grants Program	Megan Gavin U.S. EPA Region 5 77 West Jackson Boulevard Mail Code AT-18J Chicago, IL 60604	(312) 353-2000	<a href="https://www.epa.gov/education/environmental-education-ee-grants">https://www.epa.gov/education/environmental-education-ee-grants</a>
USEPA	Targeted Watershed Grants	Paul Thomas U.S. EPA Region 5 77 West Jackson Boulevard Mail Code AT-18J Chicago, IL 60604	(312) 886-7742	--
U.S. Fire Administration	Firefighters Grant Program	Assistance to Firefighters Grant Program DHS-FEMA-GPD-AFG 400 C Street S.W., 3N Washington, DC 20472-3635	(866) 274-0960	<a href="https://www.fema.gov/welcome-assistance-firefighters-grant-program">https://www.fema.gov/welcome-assistance-firefighters-grant-program</a>
U.S. Fish and Wildlife Service (FWS)	North American Wetlands Conservation Fund	U.S. Fish and Wildlife Service Division of Bird Habitat Conservation 5275 Leesburg Pike Falls Church, VA 22041-3803	(703) 358-1784	<a href="http://www.fws.gov/birdhabitat/Grants/NAWCA/">www.fws.gov/birdhabitat/Grants/NAWCA/</a>
FWS	Partners for Fish and Wildlife Habitat Restoration Program	U.S. Fish and Wildlife Service Branch of Habitat Restoration 5275 Leesburg Pike Falls Church, VA 22041-3803	(703) 358-2332	<a href="http://www.fws.gov/partners/">www.fws.gov/partners/</a>
U.S. Geological Survey (USGS)	Upper Mississippi River System Long Term Resource Monitoring Program	Upper Midwest Environmental Sciences Center 2630 Fanta Reed Road LaCrosse, WI 54603	(608) 781-6221	<a href="http://www.emewc.usgs.gov/ltrmp.html">www.emewc.usgs.gov/ltrmp.html</a>
U.S. Small Business Administration	Disaster Loan Program	U.S. Small Business Administration 409 3rd St, SW Washington DC 20416	(800) 659-2955	<a href="https://www.sba.gov/loans-grants/see-what-sba-offers/sba-loan-programs/disaster-loans">https://www.sba.gov/loans-grants/see-what-sba-offers/sba-loan-programs/disaster-loans</a>

Appendix J (continued)

Administrator of Grant Program	Name of Grant Program	Address	Phone Number	Internet Web Address
Wisconsin Emergency Management	Hazard Mitigation Section	Wisconsin Emergency Management 2400 Wright Street P.O. Box 7865 Madison, WI 53707-7865	(608) 242-3232	<a href="http://www.emergencymanagement.wi.gov/">http://www.emergencymanagement.wi.gov/</a>
WDNR	Lake Planning Grant Program Lake Protection Grant Program Lake Classification Grant Program	Wisconsin Department of Natural Resources Lake Coordinator-Southeast Region 141 NW Barstow Street, Room 180 Waukesha, WI 53188	(262) 574-2130	<a href="http://dnr.wi.gov/Aid/SurfaceWater.html">http://dnr.wi.gov/Aid/SurfaceWater.html</a>
WDNR	Forest Fire Protection Grant	Jennifer Feyerherm Wisconsin Department of Natural Resources- CF/2 P.O. Box 7921 Madison, WI 53707-7921	(608) 266-1967	<a href="http://dnr.wi.gov/Aid/ForestFireProtection.html">http://dnr.wi.gov/Aid/ForestFireProtection.html</a>
WDNR	Land and Water Conservation Fund	Jennifer Gihring Wisconsin Department of Natural Resources- CF/2 P.O. Box 7921 Madison, WI 53707-7921	(608) 264-6138	<a href="http://dnr.wi.gov/Aid/fedLWCF.html">http://dnr.wi.gov/Aid/fedLWCF.html</a> <a href="http://dnr.wi.gov/Aid/LWCF.html">http://dnr.wi.gov/Aid/LWCF.html</a>
WDNR	Remediation and Redevelopment Program	Wisconsin Department of Natural Resources 2300 N. Dr. Martin Luther King Jr. Drive Milwaukee, WI 53212	(414) 263-8557	<a href="http://dnr.wi.gov/topic/brownfields/rprogram.html">dnr.wi.gov/topic/brownfields/rprogram.html</a>
WDNR	River Management Grant Program	Craig Helker Wisconsin Department of Natural Resources 9531 Rayne Rd., Ste. 4 Sturtevant, WI 53177	(262) 884-2357	<a href="http://dnr.wi.gov/Aid/SurfaceWater.html">http://dnr.wi.gov/Aid/SurfaceWater.html</a>
WDNR	Stewardship Grant Program Urban Rivers Grant Program	Jim Ritchie Wisconsin Department of Natural Resources 2300 N. Dr. Martin Luther King Jr. Drive P.O. Box 12436 Milwaukee, WI 53212	(414) 263-8610	<a href="http://dnr.wi.gov/topic/Stewardship/">http://dnr.wi.gov/topic/Stewardship/</a>
WDNR	Targeted Runoff Management Grants Urban Nonpoint Source and Storm Water Grants Program	Peter Wood 2300 N. Dr. Martin Luther King Jr. Drive P.O. Box 12436 Milwaukee, WI 53212	(414) 263-8716	<a href="http://dnr.wi.gov/Aid/TargetedRunoff.html">http://dnr.wi.gov/Aid/TargetedRunoff.html</a> <a href="http://dnr.wi.gov/Aid/UrbanNonpoint.html">http://dnr.wi.gov/Aid/UrbanNonpoint.html</a>



**Appendix J (continued)**

Administrator of Grant Program	Name of Grant Program	Address	Phone Number	Internet Web Address
WDNR	Wisconsin Forest Landowner Grant Program	Jeff Soellner Wisconsin Department of Natural Resources- CF/2 P.O. Box 7921 Madison, WI 53707-7921	(608) 267-7152	<a href="http://dnr.wi.gov/Aid/ForestLandowner.html">http://dnr.wi.gov/Aid/ForestLandowner.html</a>
WDNR	Safe Drinking Water Loan Program	Nicole Mathews Wisconsin Department of Natural Resources- CF/2 P.O. Box 7921 Madison, WI 53707-7921	(608) 266-0849	<a href="http://dnr.wi.gov/Aid/EIF.html">http://dnr.wi.gov/Aid/EIF.html</a>
Wisconsin Department of Transportation (WisDOT)	Transportation Alternatives Program Highway Safety Improvement Program	Robert Schmidt Wisconsin Department of Transportation 141 NW Barstow Street P.O. Box 798 Waukesha, WI 53187-0798	(262) 548-8789	<a href="http://wisconsin.gov/Pages/doing-bus/local-gov/astnce-pgms/aid/tap.aspx">http://wisconsin.gov/Pages/doing-bus/local-gov/astnce-pgms/aid/tap.aspx</a> <a href="http://wisconsin.gov/Pages/doing-bus/local-gov/astnce-pgms/highway/hsip.aspx">http://wisconsin.gov/Pages/doing-bus/local-gov/astnce-pgms/highway/hsip.aspx</a>
WisDOT	Freight Railroad Infrastructure Improvement Program	Rich Kedzior Railroads and Harbors Section Wisconsin Department of Transportation 4802 Sheboygan Avenue Madison WI 53705	(608) 266-7094	<a href="http://wisconsin.gov/Pages/doing-bus/local-gov/astnce-pgms/aid/frrip.aspx">http://wisconsin.gov/Pages/doing-bus/local-gov/astnce-pgms/aid/frrip.aspx</a>
University of Wisconsin - Extension	Extension Disaster Education Network	UW-Extension Headquarters 432 N. Lake Street Madison, WI 53706	(608) 262-3980	<a href="http://uwex.edu/Disaster/index.html">lgc.uwex.edu/Disaster/index.html</a>
Wisconsin Department of Agriculture Trade and Consumer Protection (DATCP)	Land and Water Resource Management Program Farmland Preservation Program	Wisconsin Department of Agriculture, Trade and Consumer Protection Agricultural Resource Management 2811 Agriculture Drive P.O. Box 8911 Madison, WI 53708	(608) 224-4500  (608) 224-4621	<a href="http://www.datcp.state.wi.us">www.datcp.state.wi.us</a>  <a href="https://datcp.wi.gov/Pages/Programs_Services/FarmlandPreservation.aspx">https://datcp.wi.gov/Pages/Programs_Services/FarmlandPreservation.aspx</a>
Wisconsin Public Service Commission	Public Utilities Assistance	Wisconsin Public Service Commission 610 North Whitney Way, P.O. Box 7854 Madison, Wisconsin 53707-7854	(608) 266-5481	<a href="http://psc.wi.gov/">psc.wi.gov/</a>
Great Lakes Protection Fund	Great Lakes Protection Fund Grants Program	Great Lakes Protection Fund 1560 Sherman Avenue, Suite 1370 Evanston, IL 60201	(847) 425-8150	<a href="http://www.glpf.org">www.glpf.org</a>
Joyce Foundation	Joyce Foundation Grant Program	The Joyce Foundation 321 North Clark Street Suite 1500 Chicago, IL 60654	(312) 782-2464	<a href="http://www.joycefdn.org">www.joycefdn.org</a>

Appendix J (continued)

Administrator of Grant Program	Name of Grant Program	Address	Phone Number	Internet Web Address
National Fish and Wildlife Foundation (NFWF)	Five Star Restoration Program Wal-Mart Stores, Inc. Acres for America Program Sustain Our Great Lakes Program	National Fish and Wildlife Foundation 1133 15th Street, NW, Suite 1100 Washington, DC 20005	(202) 857-0166	<a href="http://www.nfwf.org/fivestart/Pages/home.aspx">http://www.nfwf.org/fivestart/Pages/home.aspx</a> <a href="http://www.nfwf.org/acresforamerica/Pages/home.aspx">http://www.nfwf.org/acresforamerica/Pages/home.aspx</a> <a href="http://www.nfwf.org/greatlakes/Pages/home.aspx">http://www.nfwf.org/greatlakes/Pages/home.aspx</a>
Ozaukee/Washington Land Trust	Stewardship Program Urban Green Space Program	Ozaukee/Washington Land Trust 200 Wisconsin Avenue West Bend, WI 53095	(262) 338-1794	<a href="https://owlt.org/">https://owlt.org/</a>
Southeastern Wisconsin Watersheds Trust (Sweet Water)	Watersheds Mini-Grant Program	Southeastern Wisconsin Watersheds Trust 600 E. Greenfield Avenue Milwaukee, WI 53204	(414) 382-1766	<a href="http://www.swwwater.org/mini-grants/">http://www.swwwater.org/mini-grants/</a>
State Farm Companies Foundation	State Farm Good Neighbor Citizenship Company Grants	State Farm Insurance One State Farm Plaza Bloomington, IL 61710	--	<a href="https://www.statefarm.com/about-us/community/education-programs/grants-scholarships/company-grants">https://www.statefarm.com/about-us/community/education-programs/grants-scholarships/company-grants</a>

<sup>a</sup>A complete listing of U.S. government assistance programs can be found at the Catalog of Federal Domestic Assistance web site: [www.cfda.gov](http://www.cfda.gov).

Source: SEWRPC.

WASHINGTON CO HMP APPENDIX J DRAFT (00224251).DOC

500-1110

LLK/JEB

03/31/17, 04/04/17

**Appendix K**

**ADOPTING RESOLUTIONS**

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1 **WASHINGTON COUNTY, WISCONSIN**

2  
3 Date of enactment: 12/12/17  
4 Date of publication: 12/20/17

5  
6 **2017 RESOLUTION 45**

7 **Adopt Hazard Mitigation Plan for Washington County, Wisconsin**

8 **WHEREAS**, Washington County recognizes the threat that natural hazards pose to  
9 people and property; and

10 **WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the  
11 potential for harm to people and property, economic disruption, and reduce the amount of  
12 taxpayer funds needed for future disaster assistance costs; and

13 **WHEREAS**, an adopted all hazards Hazard Mitigation Plan is required as a condition of  
14 federal grant funding for future pre- and post-disaster mitigation projects funded by the Federal  
15 Emergency Management Agency (FEMA); and

16 **WHEREAS**, intergovernmental cooperation for purposes of hazard mitigation should be  
17 encouraged, and Washington County participated jointly in the planning process with municipal  
18 units of government within the county and the Southeastern Wisconsin Regional Planning  
19 Commission (SEWRPC) to prepare this Hazard Mitigation Plan; and

20 **WHEREAS**, the adoption of this plan allows municipal governments to adopt it for their  
21 jurisdiction, placing the communities of Washington County in an advantageous position when  
22 competing for pre- and post-disaster mitigation project dollars from the Department of Homeland  
23 Security (DHS) and Federal Emergency Management Agency (FEMA); and

24 **WHEREAS**, adoption of the Washington County Hazard Mitigation Plan is necessary to  
25 comply with the Disaster Mitigation Act 2000 (DMA 2000) as a condition of future grant  
26 funding for mitigation projects; and

27 **WHEREAS**, adoption of this plan will make it valid for the next five years; and

28 **WHEREAS**, the Washington County Office of Emergency Management submitted the  
29 Washington County Hazard Mitigation Plan to the Federal Emergency Management Agency and  
30 Wisconsin Emergency Management officials and received preliminary plan approval on  
31 September 27 and 29, 2017, respectively;


32 **NOW, THEREFORE, BE IT RESOLVED** by the Washington County Board of  
33 Supervisors that the County Board of Supervisors hereby adopts the Washington County Hazard  
34 Mitigation Plan as the official hazard mitigation plan of the County of Washington, State of  
35 Wisconsin.

1           **BE IT FURTHER RESOLVED** that the Washington County Office of Emergency  
2 Management shall submit, on behalf of the participating municipalities, the Washington County  
3 Hazard Mitigation Plan to Wisconsin Emergency Management and Federal Emergency  
4 Management Agency officials for final review and approval.

5  
6  
7  
8 VOTE REQUIREMENT FOR PASSAGE: Majority

9  
10 RESOLUTION SUMMARY: Resolution adopting a Hazard Mitigation Plan for Washington  
11 County, Wisconsin.

12  
13 APPROVED:

14   
15 \_\_\_\_\_  
Bradley S. Stern, County Attorney

16 Dated 12/12/17

Introduced by members of the PUBLIC SAFETY  
COMMITTEE as filed with the County Clerk.

17   
\_\_\_\_\_   
Donald A. Kriefall, Chairperson

18 Considered 12/12/17

19 Adopted 12/12/17

20 Ayes 26 Noes 0 Absent 0

21 Voice Vote \_\_\_\_\_

22  
23 (There is no direct fiscal impact of adopting the plan; however, having an adopted plan can  
24 provide the County with additional federal funding opportunities in the future.)

**CITY OF HARTFORD, WI**

RESOLUTION No. 3497

**Resolution to Adopt the  
Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the CITY OF HARTFORD recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

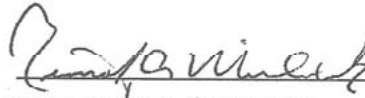
**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the CITY OF HARTFORD participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the CITY OF HARTFORD hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 23<sup>rd</sup> day of Jan. 2018

  
Mayor Timothy C. Michalak

ATTEST:

  
Lori Hetzel, Clerk

RESOLUTION NO. 53  
2017-2018 COMMON COUNCIL

Resolution Adopting the Washington County Hazard Mitigation Plan

---

**WHEREAS**, the City of West Bend recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the City of West Bend participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

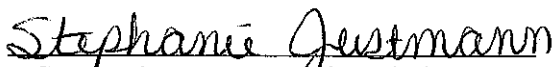
**NOW THEREFORE IT IS HEREBY RESOLVED** that the City of West Bend hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

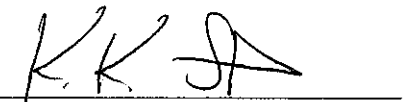
Passed and Approved the 19th day of March, 2018

Introduced by Alderperson

  
Mike Chevalier

Attest:

  
Stephanie Justmann, City Clerk

  
Kraig K. Sadownikow, Mayor



VILLAGE OF GERMANTOWN  
WASHINGTON COUNTY

RESOLUTION NO. 13-2018

---

RESOLUTION TO ADOPT THE WASHINGTON COUNTY  
ALL HAZARD MITIGATION PLAN

---

**FISCAL IMPACT: NONE**

**WHEREAS**, the Village of Germantown recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Village of Germantown participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE BE IT RESOLVED** that the Village of Germantown hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.


Introduced by: *Trustee Baum*

Adopted: *February 19, 2018*

Vote: Ayes: *9* Nays: *0*

  
Dean M. Wolter, Village President

ATTEST:

  
Deanna L. Boldrey, WCMC/CMC  
Village Clerk

**RESOLUTION #18-02**

---

**A RESOLUTION TO ADOPT THE WASHINGTON COUNTY  
ALL HAZARD MITIGATION PLAN**

---

**WHEREAS**, the Village of Jackson recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Village of Jackson participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body;

**NOW THEREFORE BE IT RESOLVED** that the Village of Jackson hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and hereby endorses and agrees to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.


Passed this 13th day of February, 2018

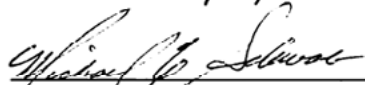
Introduced by: Pres. Schwab

Seconded by: TR. OLSON

Vote: 6 ayes 0 nays

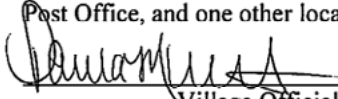
Approved: 02/13/2018

Attest:   
John M. Walker – Administrator

  
Michael E. Schwab – Village President

Proof of Posting:

I, the undersigned, certify that I posted this Resolution on bulletin boards at the Village Hall, Post Office, and one other location in the Village.

  
\_\_\_\_\_  
Village Official

2-15-2018  
\_\_\_\_\_  
Date

**Resolution R2018-04 to Adopt the  
Washington County All Hazard Mitigation Plan  
For the Village of Kewaskum**

**FISCAL IMPACT: NONE**

**WHEREAS**, the Village of Kewaskum recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Village of Kewaskum participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and


**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the Village of Kewaskum hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 4<sup>th</sup> day of June, 2018

  
Village President  
Kevin Scheunemann

ATTEST:

  
Village Clerk – Tracie Sette

**RESOLUTION NO. 12-2018**

**A Resolution Adopting the Washington County All Hazard Mitigation Plan**

**WHEREAS**, the Village of Newburg recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Village of Newburg participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the Village of Newburg hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 12<sup>th</sup> day of April, 2018

  
\_\_\_\_\_  
Mike Heili, Village President

ATTEST:

  
\_\_\_\_\_  
Rick J. Goeckner, Village Administrator/Clerk

STATE OF WISCONSIN

VILLAGE OF RICHFIELD

WASHINGTON COUNTY

**RESOLUTION R2018-02-01**

**A RESOLUTION ADOPTING THE WASHINGTON COUNTY HAZARD MITIGATION PLAN**

**WHEREAS**, the Village of Richfield recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

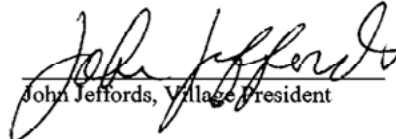
**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Village of Richfield participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and


**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the Village of Richfield hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan.

PASSED THIS 15th DAY OF FEBRUARY, 2018 BY THE VILLAGE BOARD OF THE VILLAGE OF RICHFIELD, WASHINGTON COUNTY, WISCONSIN.

  
John Jeffords, Village President

Attest:

  
Jim Healy, Administrator/Clerk

**Village of Slinger**

RESOLUTION NO. 01-01-2018

**Resolution to Adopt the  
Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the Village of Slinger recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Village of Slinger participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

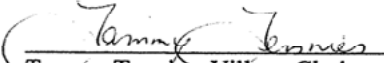
**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the Village of Slinger hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 15 day of January 2018

  
Russell Brandt, Village President

ATTEST:

  
Tammy Tennes, Village Clerk



# TOWN OF ADDISON

## RESOLUTION NO. 2018 – 03

### Resolution to Adopt the Washington County All Hazard Mitigation Plan

**FISCAL IMPACT: NONE**

**WHEREAS**, the Town of Addison recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Town of Addison participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the Town of Addison hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 15<sup>th</sup> day of March, 2018

  
Robert Bingen, Chairman

ATTEST:

  
Ellen Wolf, Clerk

**TOWN OF BARTON  
RESOLUTION 18-001**

**Resolution to Adopt the  
Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the Town of Barton recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

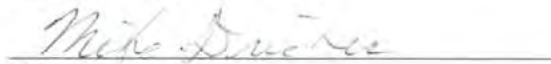
**WHEREAS**, the Town of Barton participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

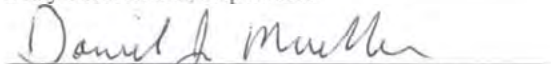
**NOW THEREFORE IT IS HEREBY RESOLVED** that the Town of Barton hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 16<sup>th</sup> day of January, 2018

  
Richard L. Bertram, Chairman

  
Mike Dricken, Supervisor

  
Jerry Meulemans, Supervisor

  
Dan Mueller, Supervisor

  
Kris Turner, Supervisor

ATTEST:

  
Aggie B. Pruner, Town Clerk

**TOWN OF ERIN  
WASHINGTON COUNTY, WISCONSIN  
Resolution 2018-08**

**Resolution to Adopt the  
Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the Town of Erin recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Town of Erin participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the Town of Erin hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 16<sup>th</sup> day of July 2018

  
Dennis Kenealy, Chairman

ATTEST:

  
Julie Kriewaldt, Clerk

Resolution No. 2018-03  
State of Wisconsin  
County of Washington  
Town of Farmington

**RESOLUTION TO ADOPT THE WASHINGTON COUNTY  
ALL HAZARD MITIGATION PLAN**

**FISCAL IMPACT: NONE**

**WHEREAS**, the Town of Farmington recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Town of Farmington participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the Town of Farmington hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Introduced by:     Duane Wollner    

Vote:   3   Ayes   0   Nays   —   Absent   —   Abstained

Adopted this 13<sup>th</sup> day of February, 2018.

By the Town Board:

    Chris Elbe      
Chris Elbe, Chairman

    Mark Foyse      
Mark Foyse, Supervisor

    Duane Wollner      
Duane Wollner, Supervisor

Attested by:

    Chris Schellinger      
Chris Schellinger, Town Clerk

**RESOLUTION NO. 06-11-18-02  
TOWN OF GERMANTOWN, WASHINGTON CO.**

**Resolution to Adopt the  
Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the Town of Germantown recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Town of Germantown participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

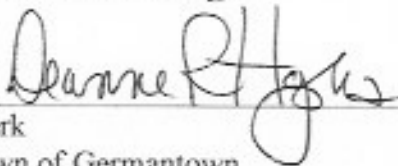
**NOW THEREFORE IT IS HEREBY RESOLVED** that the Town of Germantown hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Adopted this 11 day of June, 2018.

Ayes 3 Noes 0 Absent 0

  
Chairperson  
Town of Germantown

Attest:

  
Clerk  
Town of Germantown

**TOWN OF HARTFORD**

**Resolution 2018-01: A Resolution to Adopt the  
Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the TOWN OF HARTFORD recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

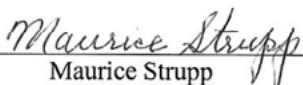
**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the TOWN OF HARTFORD participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

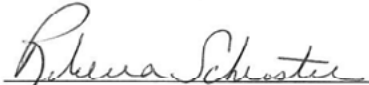
**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the TOWN OF HARTFORD hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 12<sup>th</sup> day of February 2018

  
Maurice Strupp  
Chairman, Town of Hartford

ATTEST:

  
Rebecca Schuster, Clerk

**TOWN OF JACKSON  
WASHINGTON COUNTY, WISCONSIN**

**RESOLUTION J-18-002**

**Resolution to Adopt the Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the Town of Jackson recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

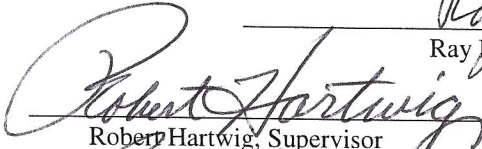
**WHEREAS**, the Town of Jackson participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

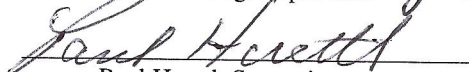
**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

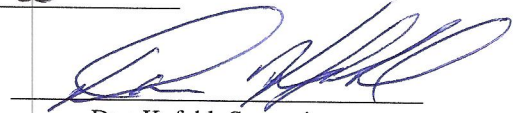
**NOW THEREFORE IT IS HEREBY RESOLVED** that the Town of Jackson hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

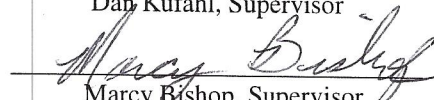
Passed this 8<sup>th</sup> day of March, 2018.


  
\_\_\_\_\_  
Ray Heidtke, Chairman

  
\_\_\_\_\_  
Robert Hartwig, Supervisor

  
\_\_\_\_\_  
Paul Huettl, Supervisor

  
\_\_\_\_\_  
Dan Kufahl, Supervisor

  
\_\_\_\_\_  
Marcy Bishop, Supervisor

Attest:   
\_\_\_\_\_  
Julia Oliver, Town Clerk

**RESOLUTION NO. 2018-02**  
**A Resolution to Adopt the**  
**Washington County All Hazard Mitigation Plan**

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**FISCAL IMPACT: NONE**

**WHEREAS**, the Town of Kewaskum recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

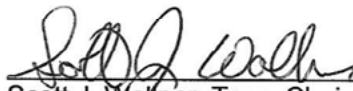
**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Town of Kewaskum participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

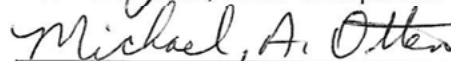
**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the Town of Kewaskum hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

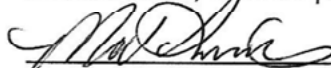
Dated this 19<sup>th</sup> of February, 2018



Scott J. Wolfner, Town Chairperson

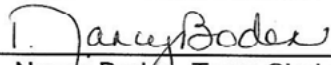


Michael Otten, Town Supervisor



Mark Herriges, Town Supervisor

Adopted: 2-19-18

Attest:   
Nandy Boder, Town Clerk



**TOWN OF POLK  
RESOLUTION NO. 2018.02**

**Resolution to Adopt the  
Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the TOWN OF POLK recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

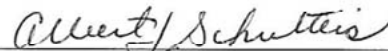
**WHEREAS**, the TOWN OF POLK participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

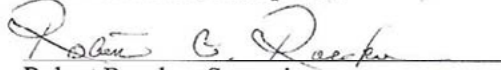
**NOW THEREFORE IT IS HEREBY RESOLVED** that the TOWN OF POLK hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed and adopted this 13<sup>th</sup> day of February, 2018

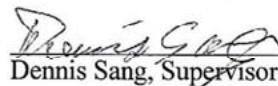
TOWN BOARD, TOWN OF POLK  
WASHINGTON COUNTY, WISCONSIN



Albert Schulteis, Chairperson

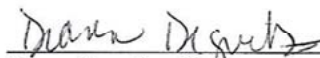


Robert Roecker, Supervisor



Dennis Sang, Supervisor

Attest:

  
\_\_\_\_\_  
Diana Degnitz, Clerk

**Town of Trenton, Washington County**

**Resolution 2018.02.01, to Adopt the  
Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the Town of Trenton recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

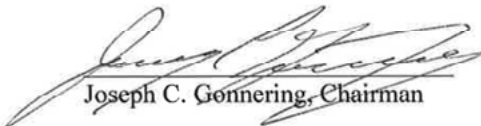
**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Town of Trenton participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the Town of Trenton hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 6<sup>th</sup> day of February, 2018

  
Joseph C. Gonnering, Chairman

ATTEST:

  
Cindy A. Komro, Clerk

**Resolution to Adopt the  
Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the TOWN OF WAYNE recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and


**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the TOWN OF WAYNE participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and

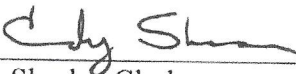
**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the TOWN OF WAYNE hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 16 day of May 2018

  
\_\_\_\_\_  
Carl Klemme, Chairperson

ATTEST:

  
\_\_\_\_\_  
Cindy Shaske, Clerk

**TOWN OF WEST BEND**

**Resolution to Adopt the  
Washington County All Hazard Mitigation Plan**

**FISCAL IMPACT: NONE**

**WHEREAS**, the Town of West Bend recognizes the threat that natural hazards pose to people and property; and

**WHEREAS**, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

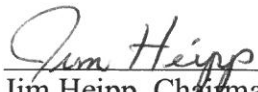
**WHEREAS**, an adopted all hazard mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects under FEMA pre- and post-disaster mitigation grant programs; and

**WHEREAS**, the Town of West Bend participated jointly in the planning process with Washington County, SEWRPC and other local units of government to prepare an All Hazard Mitigation Plan, which was made available for review and will reside permanently in the Washington County Office of Emergency Management; and


**WHEREAS**, the Wisconsin Emergency Management and Federal Emergency Management Agency, Region V, officials have reviewed the 2017 plan and approved it contingent upon this official adoption of the participating governing body; and

**NOW THEREFORE IT IS HEREBY RESOLVED** that the Town of West Bend hereby adopts the 2017 Washington County All Hazards Mitigation Plan as an official plan, and do hereby endorse and agree to participate in the implementation of the Washington County All Hazard Mitigation Plan as it applies to this jurisdiction.

Passed this 15 day of May 2018

  
\_\_\_\_\_  
Jim Heipp, Chairman

ATTEST:

  
\_\_\_\_\_  
Julie Ihlenfeld, Town Clerk

## WASHINGTON COUNTY HAZARD MITIGATION LOCAL PLANNING TEAM

Rob Schmid, Chair..... Emergency Management Coordinator, Washington County  
Joseph E. Boxhorn, Secretary ..... Senior Planner, Southeastern Wisconsin Regional Planning Commission  
Jessi Balcom..... Village of Slinger Administrator  
Kate Barret ..... Public Health Nurse, Washington County Health Department  
Brad Bautz ..... Director of Emergency Management, Town of Erin  
Ryan Betancur..... Emergency Preparedness Coordinator, Washington County Health Department  
Bob Bingen ..... Chairman, Town of Addison  
Tom Bishop..... Chief of Police, Village of Kewaskum  
Eric Damkot..... Geographic Information Systems Manager, Washington County  
Jed Dolnick ..... Chief of Police, Village of Jackson  
Richard Engel..... Chairman, Washington County Volunteer Organizations Active in Disasters and  
Assistant Emergency Coordinator, Amateur Radio Emergency Service  
Ron Eickstedt ..... Highway Supervisor, Town of Jackson  
Phil Gaudet..... Land Resources Manager, Washington County Land Use Division  
Joe Gonnering ..... Chairman, Town of Trenton  
Shawn Graff ..... Executive Director, Ozaukee-Washington Land Trust  
Roxanne Gray ..... Mitigation Section Supervisor, Wisconsin Division of Emergency Management  
Mark Groeschel..... Fire Chief, Kewaskum Fire Department  
Jim Healy ..... Village of Richfield Administrator  
Raymond Heidtke ..... Chair, Town of Jackson  
Mike Heili ..... President, Village of Newburg  
Matt Heiser..... Village of Kewaskum Administrator  
Laura K. Herrick ..... Chief Environmental Engineer, Southeastern Wisconsin Regional Planning Commission  
Peter Hoell ..... Chief of Police, Village of Germantown  
Donald Kriefall ..... Washington County Supervisor  
Gerald W. Kudek..... Fire Chief, City of West Bend  
Jamie Ludovic..... Assistant to the Washington County Administrator  
Chris Marks..... Emergency Management Director, Village of Richfield  
Michael R. Miller..... Washington County Supervisor  
Aaron Owens ..... Planner, Southeastern Wisconsin Regional Planning Commission  
John C. Peters..... Emergency Government Coordinator, Town of Kewaskum  
Jeff Puetz ..... Director of ERM, West Bend Mutual Insurance  
Mark Piotrowicz..... City Planner, City of West Bend  
William R. Sackett ..... President, Village of Newburg  
Scott Schmidt ..... County Engineer/Highway Commissioner, Washington County  
Albert Schulteis..... Chair, Town of Polk  
Deb Sielski..... Deputy Administrator, Washington County Planning and Parks Department  
Katie Sommers..... State Hazard Mitigation Officer, Wisconsin Division of Emergency Management  
G. Fritz Statz ..... GIS Project Lead, Wisconsin Department of Natural Resources  
Judy Steinert..... Administrative Assistant, Washington County Office of Emergency Management  
Paul Stephans ..... Fire Chief/Emergency Management Director, City of Hartford  
Maurice Strupp..... Chair, Town of Hartford

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