

PARTICIPANT SECTION
FOR THE
CITY OF KNOXVILLE



Multi-Jurisdictional Hazard Mitigation Plan

OVERVIEW

The City of Knoxville participated in this hazard mitigation plan in order to reduce the risk to human life and property from hazards. Their participation was extensive: a representative from Knoxville attended every public meeting; met with members from the planning team; completed all hazard identification and project identification worksheets; engaged the general public in the planning process; and, assisted in plan development coordination and data analysis.

For Knoxville, the top concerns that were identified through this planning process include dam failure, hazardous materials, river flooding, severe winter storms, and tornadoes. The highest priority projects identified to address these issues include backup generators, weather radios, and site security.

The following people were heavily involved in the development of Knoxville’s Participant Section:

Table KNO.1. The City of Knoxville Plan Contributors

Name	Title	Department / Organization
Jeff Anderson	Director	Marion County Emergency Management Agency
Patrick Murphy	WRF Superintendent	City of Knoxville
Jim Mitchell	Fire Chief	City of Knoxville
Lauren Dietz	Management Intern	City of Knoxville
Dennis Webb	Street Supervisor	City of Knoxville
Dan Losada	Police Chief	City of Knoxville
Aaron Adams	City Manager	City of Knoxville
Jeff Henson	Senior Planner, Project Manager	JEO Consulting Group, Inc.
John Brennan	Planner, Project Coordinator	JEO Consulting Group, Inc.

This section contains important information about the City of Knoxville relevant to hazard mitigation, including the following elements:

- Location /Geography
- Climate
- Transportation
- Population
- Economic and Housing
- Major Employers
- Future Development Trends
- Parcel Improvements and Valuations
- Critical Infrastructure and Key Resources
- Historical Hazard Events
- Local Hazard of Concern / Risk Assessment
- Capability Assessment
- Governance
- Plan Integration
- Mitigation Actions

CLIMATE

Knoxville’s climate is classified as humid continental, which is marked by variable weather patterns and a large seasonal temperature variance. The average high temperature in Knoxville for the month of July is 87.6 degrees and the average low temperature for the month of January is 13.3 degrees. Knoxville averages 29.7 days with a temperature over 90 degrees and 44.3 days below 32 degrees. A historic low of -30.0 degrees occurred in 1912, and a historic high of 114 occurred in 1934. On average, Knoxville gets 33.7 inches of rain and 26.9 inches of snowfall per year. The following table compares these climate indicators with those of the entire planning area and the State of Iowa.

Table KNO.2: Climate Data for the City of Knoxville

Age	Knoxville	Marion County	State of Iowa
July High Temp	87.6°	87.6°	86.0°
January Low Temp	13.3°	13.3°	14.0°
Annual Rain Fall	33.7 inches	33.5 inches	34.7 inches
Annual Snow Fall	26.9 inches	26.9 inches	32.4 inches
Days over 90°	29.7	29.7	13.8
Days below 32°	44.3	44.3	62.9

Source: University of Iowa, High Plains Regional Climate Center, NCDC 2015

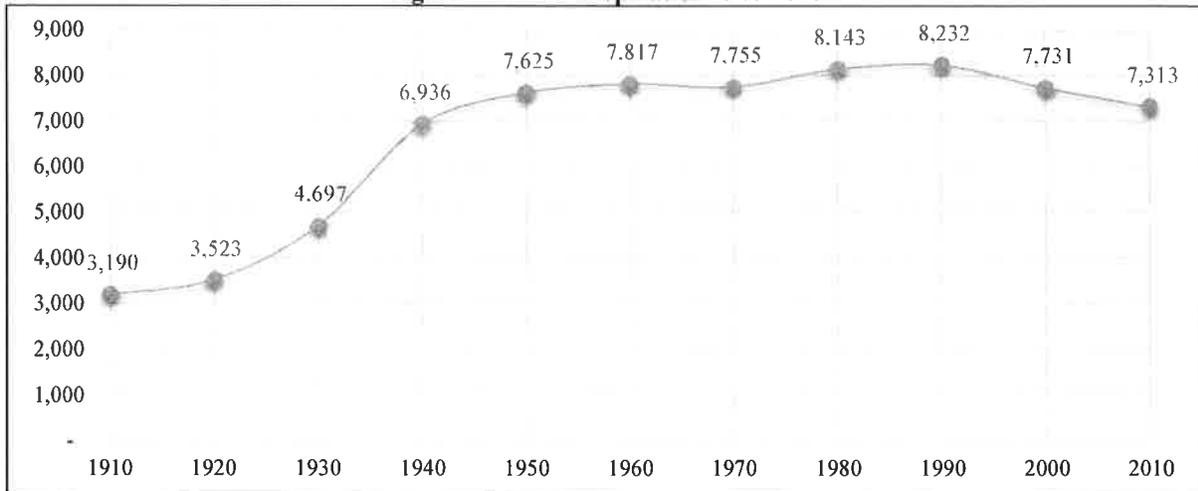
TRANSPORTATION

Knoxville’s major transportation corridors include State Highway 92, which runs east-west through the south edge of Knoxville. The main east to west corridor through the city is McKimber St/ W Pleasant St and East Main St, which collectively formed Old Highway 92 before it was relocated towards the southern edge of the city. N Lincoln St / Highway 14 is the main north-south coridor, and runs through the west central portion of the city. Knoxville Municipal Airport is located in the extreme south edge of the city. The BNSF rail line runs generally east-west through Knoxville, running north of McKimber St/ W Pleasant St and East Main St in the northern portion of the city. This information is relevant to hazard mitigation plans because it indicates possible evacuation corridors in the community, as well as areas more at risk to transportation incidents.

POPULATION

The following figure displays the historical population trend from 1910 to 2010. This figure indicates that the population of Knoxville has experienced three decades of decline and seven decades of growth. This is reflected in housing development as well, which saw development during decades of growth. Over the past decade, the population has declined by 418 people, or by 5 percent. Population trends are notable for hazard mitigation because communities with declining population may have a higher level of unoccupied housing that is not being up kept. Decreasing populations can also represent decreasing tax revenue for the community which could make implementation of mitigation actions more fiscally challenging.

Figure KNO.212: Population 1910-2010



Source: U.S. Census Bureau, 2010, Table DP-01; UNL Iowa Historical Population Report

The following table indicates the Knoxville has a slightly higher percentage of people under the age of 5 and over the age of 64 than Marion County. Marion County has a slightly higher median age, and a slightly higher percentage of people between the ages of 5 and 64. Knoxville is less ethnically diverse than the county and the state of Iowa as a whole. These demographic variables are relevant to hazard mitigation insofar as the very young and elderly populations may be at greater risk from certain hazards than others. Likewise, additional social indicators may indicate vulnerability. For a more elaborate discussion of this vulnerability, please see *Section Four: Risk Assessment*.

Table KNO.3: Population Makeup

Age	Knoxville	Marion County	State of Iowa
<5	7.7%	6.4%	6.5%
5-64	74.0%	77.7%	78.5%
>64	18.3%	15.9%	15.1%
Median Age	36.6	38.6	38.1
% ethnic minority	2.9%	3.5%	8.5%
% households with children	34.1%	32.8%	30.5%
% that speak English less than very well	1.7%	1.1%	3.0%

Source: U.S. Census Bureau, 2009-2013 ACS 5 Years Estimates

ECONOMICS AND HOUSING

The following tables indicate that Knoxville’s median household income, per capita income, median home value, and median rent are all lower than county and state levels. Knoxville has a slightly higher poverty rate, and percentage of people living alone. Economic indicators are relevant to hazard mitigation because they indicate the relative economic strength of an area. Economic indicators may also influence a community’s level of resiliency during hazardous events.

Table KNO.4: Housing and Income

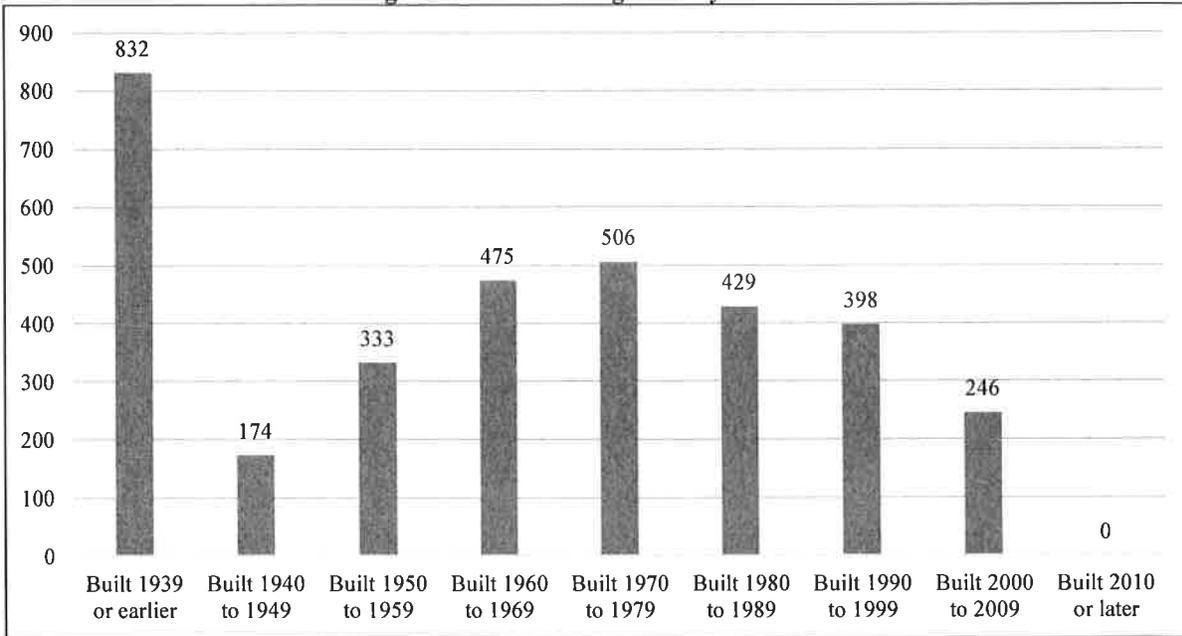
	City of Knoxville	Marion County	State of Iowa
Median Household Income	\$41,958	\$54,723	\$51,653
Per Capita Income	\$21,974	\$25,477	\$26,992
Median Home Value	\$93,000	\$132,000	\$124,300
Median Rent	\$567	\$652	\$670
% Employed	61.2%	64.8%	64.8%

	City of Knoxville	Marion County	State of Iowa
% of people living in poverty	15.6%	9.2%	12.4%
% living alone	34.5%	26.0%	28.8%

Source: U.S. Census Bureau, 2013 American Community Surveys 5-year Estimates

The following figure indicates that the majority of the housing in Knoxville was built prior to 1970. According to 2009-2013 ACS 5-year estimates, the community has 3,393 housing units; with 89.4 percent of those units occupied. There are approximately 177 mobile homes in the community and 39 percent of the community’s housing was built before 1960. Communities with a substantial number of mobile homes may have a higher number of residents vulnerable to the impacts of high winds, tornados, and severe winter storms.

Figure KNO.3: Housing Units by Year Built



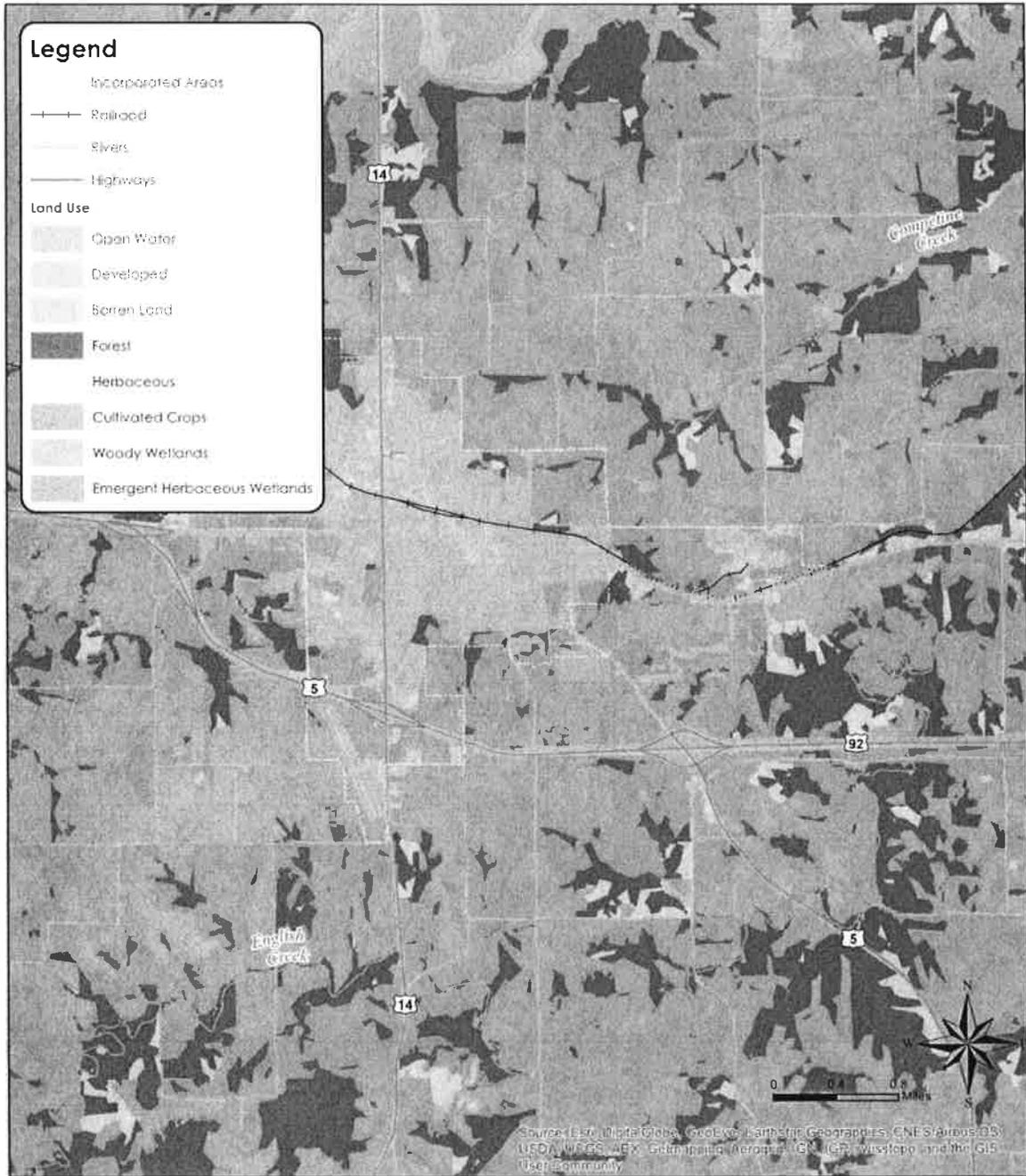
Source: Source: U.S. Census Bureau, 2009-2013 American Community Surveys 5-year Estimates, Table DP04

Table KNO.5: Housing Units

Jurisdiction	Total Housing Units				Occupied Housing Units	
	Occupied		Vacant		Owner	Renter
	Number	Percent	Number	Percent	Number	Number
Knoxville	3,035	89.4%	358	10.6%	2,091	944
Marion County	13,924	91.1%	1,233	8.9%	9,622	3,609
Iowa	1,341,001	91.5%	114,454	8.5%	885,942	340,605

Source: Selected Housing Characteristics: 2009 - 2013 ACS 5-year estimates

Figure KNO.4: Land Use Map



	<p>Knoxville, Iowa</p> <p>2016 Hazard Mitigation Plan</p> <p>Land Use</p>	<p>Project No. 199 Date: 05/01/14 Software: ArcGIS 10.4 Prepared by: 2016 Hazard Mitigation Plan Map: Land Use</p> <p>This map was prepared using information from various sources, including the City of Knoxville, Iowa. The City of Knoxville, Iowa, is not responsible for any errors or omissions in this map. The City of Knoxville, Iowa, is not responsible for any damages or liabilities arising from the use of this map.</p>
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PARCEL IMPROVEMENTS AND VALUATION

The planning team requested parcel data from the Marion County Assessor. This data allowed the planning team to analyze the location, number, and value of property improvements at the parcel level. Improvements are defined as anything that make land more valuable, such as constructing a home. The data did not contain the number of structures on each parcel. A summary of the results of this analysis is provided in the following table.

Table KNO.6: Parcel Improvements

Total Parcels	Number of Parcels in Floodplain	Total Value of Parcels	Value of Parcels in Floodplain	Structures in Floodplain	Total Structures
221	62	\$5,379,331	\$1,754,530	26	180

Source: Iowa Department of Revenue, Property Assessment Division

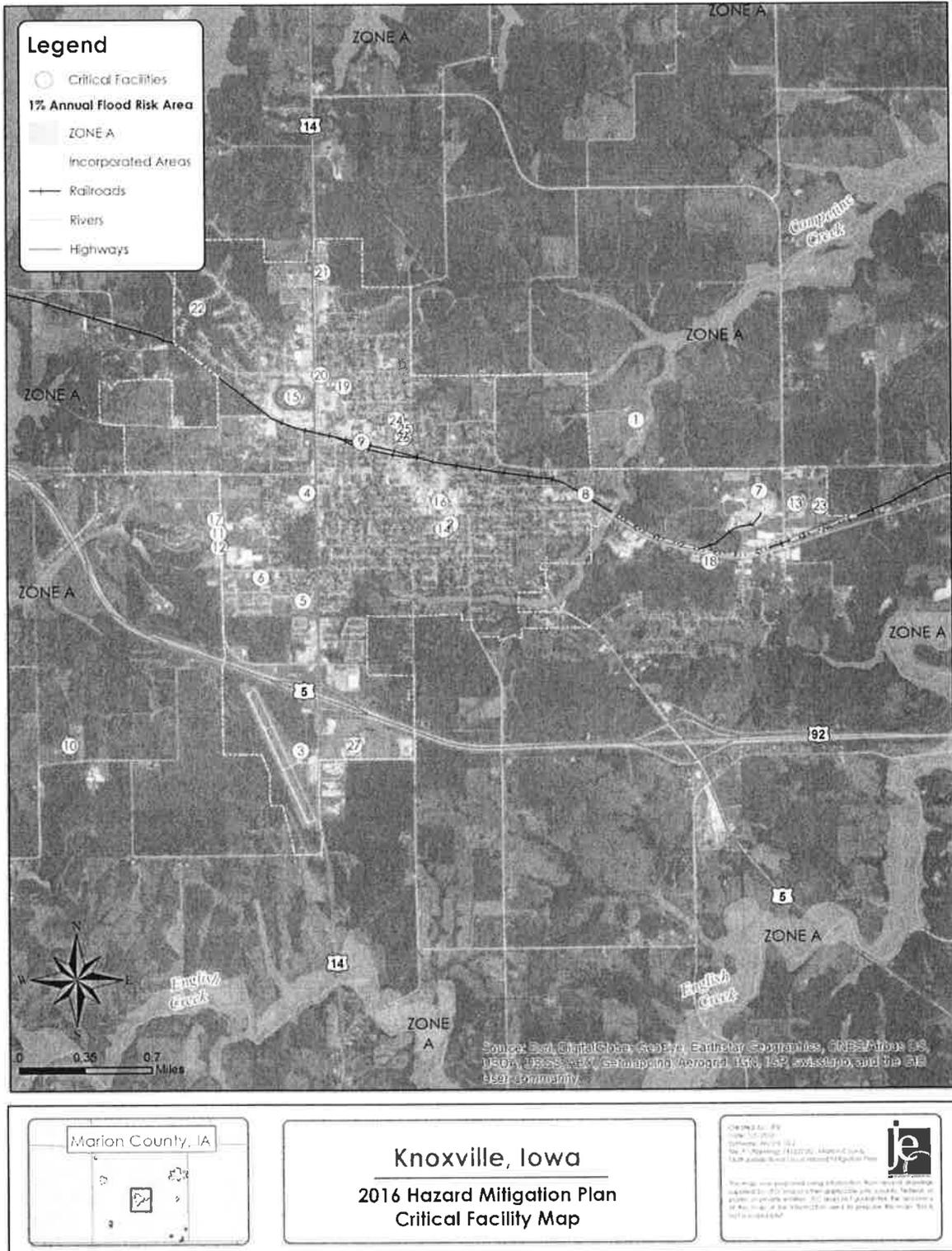
CRITICAL INFRASTRUCTURE/KEY RESOURCES

Each participating jurisdiction identified critical facilities vital for disaster response, providing shelter to the public, and essential for returning the jurisdiction’s functions to normal during and after a disaster. Knoxville identified 27 critical facilities meeting these criteria. Critical facilities were identified during the original planning process and updated by the local planning team as a part of the plan update. The following table and figure provide a summary of the critical facilities for the jurisdiction.

Table KNO.7: List of Critical Facilities in the City of Knoxville

Number	Name	In Floodplain?
1	Water Reclamation Facility	No
2	City Hall/Police Dept.	No
3	Municipal Airport	No
4	Knoxville Middle School	No
5	Knoxville Hospital	No
6	Recreation Center	No
7	3M Knoxville plant	No
8	BNSF Rail Overpass	No
9	BNSF Railway	No
10	County Care Facility	No
11	County Engineer Shop	No
12	County Engineers shop	No
13	Hormel	No
14	Knoxville Fire Station	No
15	Knoxville Raceway	No
16	Marion County Courthouse	No
17	Marion County Parks Dept	No
18	Mediacom Communications	No
19	National Guard Armory	No
20	Power Substation	No
21	Public Health	No
22	Sewer Lift Station	No
23	Sheriff's Office	No
24	Streets Department	No
25	Water Department	No
26	Water Tower	No
27	Weiler Inc.	No

Figure KNO.5: Knoxville Critical Facilities



CHEMICAL STORAGE FIXED SITES

According to the Tier II System reports submitted to the Iowa Department of Environmental Quality, there is one chemical storage site in Knoxville, which houses Acrylic acid, Ethylbenzene, Mercury Compounds, Methyl Isobutyl Ketone, Toluene, Xylene, and Zinc Compounds.

Table KNO.8: Chemical Storage Fixed Sites

Facility	Address	Hazardous Material
3M Co	3406 E Pleasant	See above

Source: Iowa Department of Environmental Quality

HISTORIC SITES

According to the National Register of Historic Places for Iowa, there are five historic units located in the City of Knoxville. None of these units are located within the 1% annual risk floodplain.

Table KNO.9: National Historic Registry

Site Name	Date Listed	Address	In Floodplain?
Hays, E. R., House	19840927	301 N. 2nd St.	No
Marion County Courthouse	19810702	Main St.	No
Coal Ridge Baptist Church and Cemetery	20060823	1034 IA S71	No
Knoxville WPA Athletic Field Historic District	20070802	Bounded by Lincoln St., Robinson St., Stadium St. and Marion St.	No
Knoxville Veterans Administration Hospital Historic District	20120501	1515 W. Pleasant St.	No

Source: Iowa State Historical Society

HISTORICAL OCCURRENCES

The planning team used the NCDC Storm Event Database to determine the number of severe weather events in the community from January 1996 to April 2015. Tornado events have a period of record from January 1950 to April 2015. Due to the large number of events only those with reported impacts are listed in the following table. Hazard events which are only reported at the county zonal level, such as Blizzard, Heavy Snow, etc., are in a following table, however, the exact amount of damage in Knoxville for these events is unknown. The table below also contains information on each severe weather event with reported damages in Knoxville, including date, deaths, injuries, and property damages. The events may have caused crop damage as well. For a detailed description of each of these hazards, please see *Section Four: Risk Assessment*.

Table KNO.10: NCDC Severe Weather Events

Month, Year	Day	Hazard	Deaths	Injuries	Property Damage (\$)
Local Damage Reported					
June, 1997	21	Thunderstorm Wind	0	0	1,000,000
June, 2000	23	Flash Flood	0	0	200,000
June, 1998	29	Thunderstorm Wind	0	0	150,000
May, 20017	7	Flash Flood	0	0	150,000
June, 1998	18	Flash Flood	0	0	100,000
July, 2008	27	Hail	0	0	100,000
June, 2011	9	Flash Flood	0	0	100,000
September, 2000	14	Thunderstorm Wind	0	0	75,000

Month, Year	Day	Hazard	Deaths	Injuries	Property Damage (\$)
April, 2012	14	Thunderstorm Wind	0	0	75,000
May, 1996	9	Flood	0	0	50,000
June, 1998	14	Flood	0	0	50,000
May, 1998	6	Flood	0	0	50,000
June, 2008	3	Flash Flood	0	0	50,000
April, 2010	25	Flood	0	0	50,000
July, 2011	22	Lightning	0	0	50,000
July, 2014	12	Flash Flood	0	0	50,000
June, 1998	18	Flood	0	0	40,000
July, 1998	6	Flood	0	0	25,000
July, 2010	18	Flash Flood	0	0	25,000
June, 1998	29	Thunderstorm Wind	0	0	15,000
May, 2011	29	Thunderstorm Wind	0	0	15,000
June, 2011	26	Thunderstorm Wind	0	0	15,000
July, 2011	22	Thunderstorm Wind	0	0	15,000
May, 1996	24	Hail	0	0	10,000
May, 1998	20	Hail	0	0	10,000
May, 1999	27	Hail	0	0	10,000
June, 2000	25	Thunderstorm Wind	0	0	10,000
August, 2003	20	Thunderstorm Wind	0	0	10,000
June, 2005	4	Thunderstorm Wind	0	0	10,000
April, 2010	5	Hail	0	0	10,000
April, 2010	5	Hail	0	0	10,000
May, 2011	29	Thunderstorm Wind	0	0	10,000
June, 2011	26	Thunderstorm Wind	0	0	10,000
August, 2011	6	Thunderstorm Wind	0	0	10,000
July, 2000	5	Thunderstorm Wind	0	0	5,000
June, 2001	12	Hail	0	0	5,000
May, 2003	10	Hail	0	0	5,000
May, 2003	4	Thunderstorm Wind	0	0	5,000
May, 2003	4	Thunderstorm Wind	0	0	5,000
August, 2004	3	Thunderstorm Wind	0	0	5,000
August, 2004	3	Thunderstorm Wind	0	0	5,000
September, 2005	8	Thunderstorm Wind	0	0	5,000
June, 2007	22	Thunderstorm Wind	0	0	5,000
September, 2009	14	Thunderstorm Wind	0	0	5,000
April, 2010	5	Hail	0	0	5,000
June, 2010	26	Thunderstorm Wind	0	0	5,000
April, 2009	8	Hail	0	0	4,000
April, 2001	11	Hail	0	0	3,000

Marion County Multi-Jurisdictional Hazard Mitigation Plan

Month, Year	Day	Hazard	Deaths	Injuries	Property Damage (\$)
June, 2001	14	Thunderstorm Wind	0	0	3,000
May, 2002	8	Thunderstorm Wind	0	0	3,000
September, 2009	18	Hail	0	0	3,000
July, 2008	27	Hail	0	0	3,000
April, 2010	5	Hail	0	0	3,000
April, 2010	5	Hail	0	0	3,000
April, 2010	6	Hail	0	0	3,000
June, 2000	25	Thunderstorm Wind	0	0	2,000
June, 2000	25	Thunderstorm Wind	0	0	2,000
April, 2001	11	Hail	0	0	2,000
June, 2001	12	Hail	0	0	2,000
May, 2003	4	Thunderstorm Wind	0	0	2,000
August, 2004	25	Thunderstorm Wind	0	0	2,000
June, 2005	4	Thunderstorm Wind	0	0	2,000
April, 2006	2	Hail	0	0	2,000
May, 2010	12	Hail	0	0	2,000
April, 2010	2	Thunderstorm Wind	0	0	2,000
May, 1998	20	Hail	0	0	1,000
April, 2010	11	Hail	0	0	1,000
April, 2010	11	Hail	0	0	1,000
May, 2002	8	Thunderstorm Wind	0	0	1,000
March, 2006	8	Hail	0	0	1,000
June, 2006	21	Hail	0	0	1,000
June, 2006	27	Hail	0	0	1,000
		Totals	0	0	\$1,356,000

Source: January 1996 to October 2014 NOAA National Climatic Data Center

RISK ASSESSMENT

Hazard Identification

The following table is a localized risk assessment of hazards identified specifically for Knoxville. Hazards marked with asterisks those that the planning team identified as posing the greatest risk. The following table also indicates if the hazard has occurred previously, historical local losses, and specific concerns identified for this hazard. A description of why this hazard is a concern, what the community is currently doing to address this hazard, and what mitigation projects they propose are included in this section. If available, a map indicating the location of mitigation projects can be found at the end of this participant section.

Table KNO.12: The City of Knoxville’s Risk Assessment

HAZARD TYPE	PREVIOUS OCCURRENCE Yes/No	LOCAL LOSSES	SPECIFIC CONCERNS IDENTIFIED
Animal/Crop/Plant Disease	Yes	Economic losses	No
Dam Failure*	No	None	Yes
Drought	Yes	Economic losses, threat to water supply	No
Earthquake	No	None	No
Expansive Soils	No	None	No
Extreme Heat	Yes	None	No
Flash Flooding*	Yes	Minor flooding	No
Grass and Wildland Fires	Yes	None	No
Hailstorm	Yes	None	No
Hazardous Materials*	Yes	None	Yes
Human Disease	Yes	None	No
Infrastructure Failure	Yes	Minor, power lines	No
Landslide	No	None	No
Levee Failure	No	None	No
River Flooding	Yes	None	Yes
Severe Winter Storms	Yes	None	Yes
Sinkholes	No	None	No
Thunderstorms and Lightning	Yes	None	No
Tornadoes	Yes	None	Yes
Transportation Incidents	Yes	None	No
Windstorms	Yes	None	No

*Identified by the planning team as a top concern for the jurisdiction

For more information regarding area wide hazards, please see *Section Four: Risk Assessment*. The following provides community specific information, reported in Knoxville’s Risk Assessment Summary, that is relevant to the hazards which the community identified as top concerns.

DAM FAILURE

Red Rock Dam is a state-owned dam located about five miles northeast of the City of Knoxville proper, along Lake Red Rock – a lake that’s part of the Des Moines River. According to the U.S. Army Corps of Engineers, Lake Red Rock entails more than 15,000 acres of water, and collects runoff and drainage from more than 12,320 square miles of land from Iowa and southern Minnesota. Red Rock Dam controls the flow of this reservoir, so a failure of this dam could be catastrophic, possibly involving mass casualties and extensive damage to property and natural resources. Construction on the dam is ongoing, raising concerns among city officials about the stability of the dam during construction.

As a high hazard dam, the dam is required to have an Emergency Action Plan. Knoxville will also work to develop plans specific to the city related to emergency response. The city also identified the needs for GIS technology, this can be used to develop evacuation plans to facilitate more efficient evacuations should a dam related emergency arise. For structural improvements to the Red Rocks Dam, this exceeds that jurisdictional capabilities and authorities as it is a state owned structure. The city and county will continue to collaborate regarding dam needs and local measure that can reduce city specific vulnerabilities.

FLASH FLOODING AND RIVER FLOODING

Knoxville is equally concerned about flash flooding and river flooding. English Creek runs along the southern edge of town, and the Des Moines River runs along the northern and northeastern edges. Areas east of Main Street in town have poor drainage. Fortunately, flooding has not damaged critical municipal buildings in recent years.

To mitigate this hazard going forward, the city plans to continue to participate in the NFIP, and acquire, relocate, and elevate structures.

HAZARDOUS MATERIALS

While no known hazardous materials incidents have occurred in Knoxville in recent years, the city is concerned about hazardous materials that are transported along local highways. State Routes 5 and 92 run east to west through the center, southeastern, and southern parts of town, while State Highway 14 runs through town from north to south. Local car shops, the Hormel plant, and the 3M plant in town all store hazardous materials on site. State Highway 92, in particular, runs by a hospital and a Walmart. The city is concerned that it is not prepared to handle a hazardous materials incident, and the risks to public safety resulting from such an incident. Transportation of hazardous materials along the BNSF rail line is also a significant concern—many of the chemicals stored at the 3M plant come through town by rail. The Hormel plant has a large tank of hazardous materials, as well as a set of eight MidAmerican power backup generators.

To mitigate this hazard, Knoxville presently does have a hazardous materials team with some training for these kinds of incidents. However, city officials believe that more training and resources – including additional personnel – are needed to ensure the preparedness of this team. In addition, city officials believe that hospital staff need additional training on hazardous material incidents.

GOVERNANCE

A community’s governance structure impacts its ability to implement hazard mitigation actions. Knoxville is governed by a Mayor and a 5 member council. Knoxville also has a City Manager, City Clerk, City Attorney, Police Chief, Fire Chief, and a Street Supervisor. The community has a variety of city departments,

including Administration, Fire & Rescue, Airport, Library, Parks & Recreation, Planning & Zoning, Police, and Public Works.

CAPABILITY ASSESSMENT

The planning team developed a capability assessment to better understand the community’s ability to implement hazard mitigation projects. The capability assessment consisted of two main components: a Capability Assessment Survey completed by the jurisdiction and a review of local existing policies, regulations, plans, and the programs. The survey is used to gather information regarding the jurisdiction’s planning and regulatory capability; administrative and technical capability; fiscal capability; and educational and outreach capability.

Mitigation actions will be incorporated into capital improvement plans and annual budgets as opportunities allow. Annual budgets allow for ongoing maintenance of community infrastructure and maintaining critical community assets.

Table KNO.13: Capability Assessment

Survey Components/Subcomponents		Existing (Yes/No)
Planning Capability	Comprehensive Plan	Yes
	Capital Improvements Plan	Yes
	Hazard Mitigation Plan	Yes
	Economic Development Plan	No
	Local Emergency Operations Plan	Yes
	Debris Management Plan	No
	Local Recovery Plan	No
	Natural Resources Protection Plan	No
	Transportation Plan	No
	Watershed Plan	No
	Open Space Preservation Plan	No
	Floodplain Management Plan	No
	Storm Water Management Plan	No
	Policies / Ordinances	Storm Water Ordinance
Tree Trimming Ordinance		No
Zoning Ordinance		Yes
Subdivision Regulation/Ordinance		Yes
Site Plan Review Requirements		Yes
Historic Preservation Ordinance		No
Floodplain Ordinance		Yes
Building Codes		Yes
National Flood Insurance Program		Yes
Community Rating System		No
Staffing	Planning Commission	Yes
	Hazard Mitigation Planning Commission	Yes
	Floodplain Administrator	Yes
	Emergency Manager	County-level
	GIS/Mapping Coordinator	County-level
	Chief Building Official/Inspector	Yes
	Engineer	No
	Grant Manager	No
Public Works Official	No	

Survey Components/Subcomponents		Existing (Yes/No)
	Sanitation Department	No
	Housing Program Staff	No
	Historic Preservation Staff	No
Studies and Maps	Flood Insurance Rate Maps	No
	Flood Insurance Study	No
	Critical Facilities Inventory	No
	Land Use Map	Yes
	Evacuation Route Map	No
Fiscal Capability	Capital Improvement Project Funding	Yes
	Community Development Block Grant	No
	Authority to Levy Taxes for Specific Purposes	Yes
	Gas/Electric Service Fees	No
	Storm Water Service Fees	No
	Water/Sewer Service Fees	Yes
	Development Impact Fees	No
General Obligation Revenue or Special Tax Bonds	Yes	
Education and Outreach Programs	Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc. Please list.	No
	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes
	Natural Disaster or Safety related school programs	No
	StormReady Certification	County-level
	Firewise Communities Certification	No
	Public-private partnership initiatives addressing disaster-related issues	No
	Mutual Aid Agreements	Yes

PLAN INTEGRATION

Building safer and stronger communities can be accomplished through effective plan integration. Integrating hazard mitigation principles into other local planning mechanisms, such as plans addressing land use, transportation, climate change, sustainability, natural and cultural resource protection, watershed management, economic development and others can greatly increase an area’s level of resiliency. While this HMP planning process involved interdepartmental coordination at the local level, this planning process also sought to analyze how existing planning mechanisms were presently integrated and make suggestions for further integration. The plans listed in the preceding table were analyzed using guidance from FEMA’s 2014 *Plan Integration Guide*. The following paragraph presents a summary of the findings of this analysis are presented.

The city of Knoxville works hard to maintain a number of planning mechanisms, including a Comprehensive Plan, an Emergency Operations Plan, a Zoning Ordinance, a Building Code, a Capital Improvements Program, a Floodplain Ordinance, and a Subdivision Regulation. The city’s zoning ordinance prevents the development or filling in of wetlands, floodplains, and floodways, Knoxville also adopted 2009 International Building Codes (IBC) in 2014, and these building codes recommend the use of wind-resistant construction practices. Principles of hazard mitigation are also found in the Capital Improvement Program, which includes updating/replacing a stretch of storm sewer. In 2016 Knoxville will begin work on updating the community’s comprehensive plan. The comprehensive plan will continue to

support development outside of areas documented to be vulnerable to hazards, further the comprehensive plan will acknowledge and reference the hazard mitigation plan related to future development in the city.

Marion County also has a Comprehensive Plan, which outlines future land use areas. The Marion County Comprehensive Plan shows that all 1% Annual Flood Risk Area is zoned for Open Space. See Figure 23 & Figure 24 below to see Knoxville's plan for expansion. Future updates of the Marion County Comprehensive Plan will also include the goals and objectives established as a part of the hazard mitigation plan.

Figure KNO.6: Future Land Use (West)

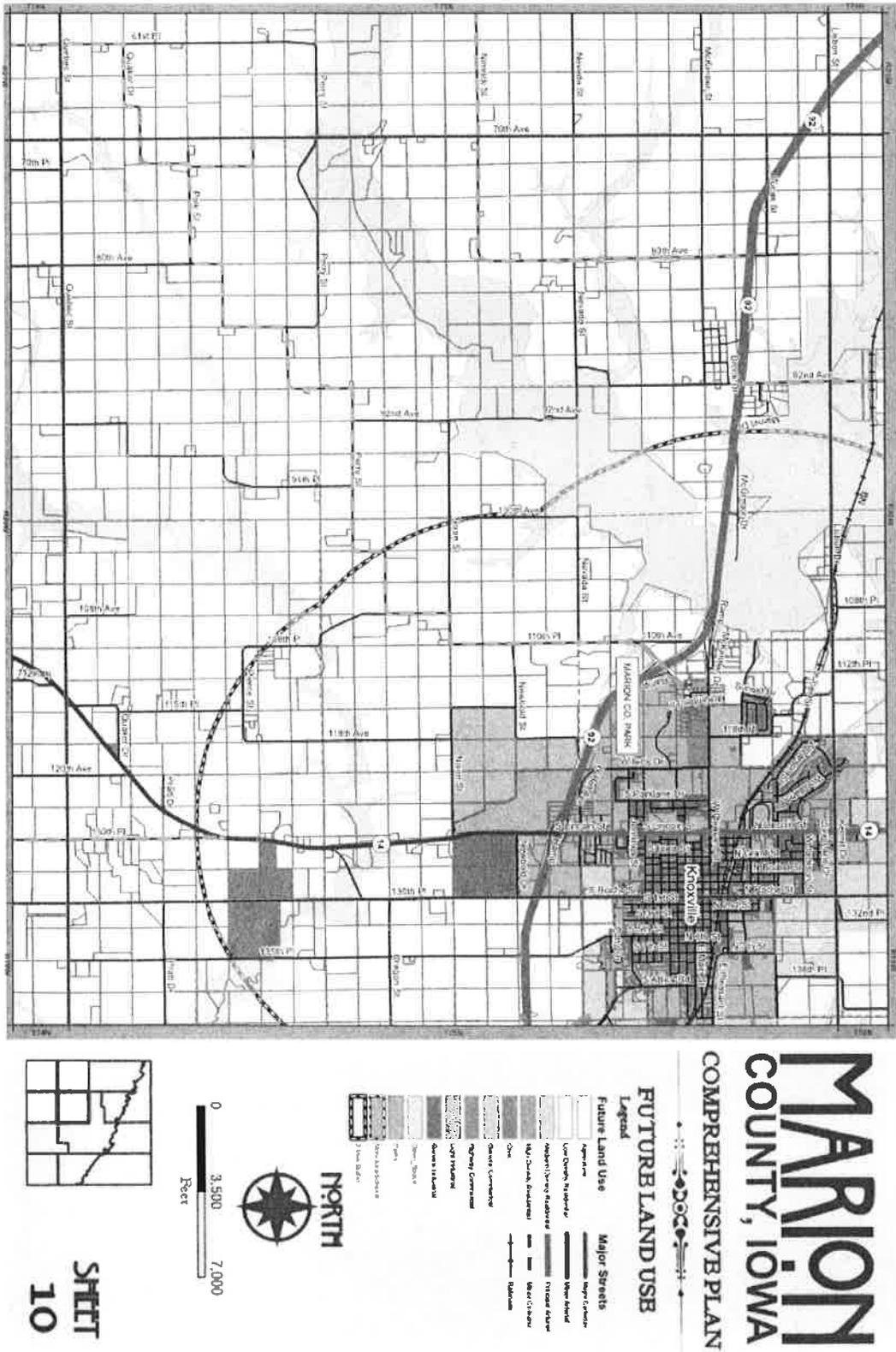
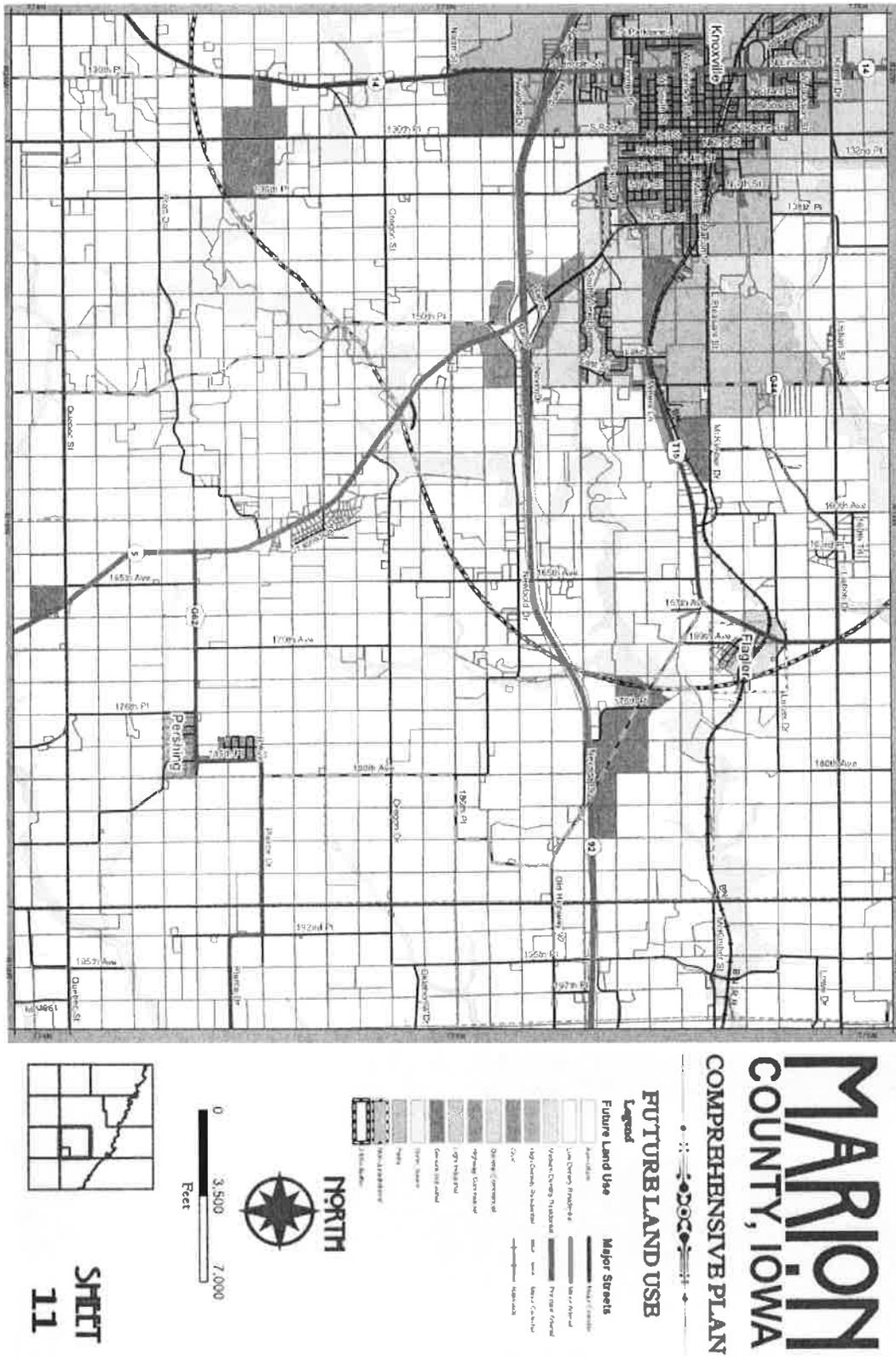


Figure KNO.7: Future Land Use (East)



MITIGATION ACTIONS

COMPLETED MITIGATION PROJECTS

Flood Protection of Water/Sewer Plants	
Analysis	Walls built up around clarifiers and lagoon. West side lift station shut down and capped off.
Goal/Objective	Goal 2, Objective 2.1
Hazard(s) Addressed	Flooding
Lead Agency	WRF
Status	Completed

Purchase SCBAs	
Analysis	Purchase SCBAs, purchased 25 bottles in 2016
Goal/Objective	Goal 4, Objective 4.1
Hazard(s) Addressed	Urban Fire
Lead Agency	Fire Department/EMS
Status	Completed

ONGOING/NEW MITIGATION PROJECTS

Acquire/Elevate Structures in Floodplain	
Analysis	Acquire and elevate structures in floodplain areas.
Goal/Objective	Goal 2, Objective 2.3
Hazard(s) Addressed	Flooding
Estimated Cost	Varies
Potential Funding	Grant funding, General Fund
Timeline	5+ years
Priority	Low
Lead Agency	Zoning, Floodplain Administrator
Status	Not Started

Relocate Structures in Floodplain	
Analysis	Acquire and relocate structures in floodplain areas.
Goal/Objective	Goal 2, Objective 2.2
Hazard(s) Addressed	Flooding
Estimated Cost	Varies based on structures
Potential Funding	Grant funding, General Fund
Timeline	5+ years
Priority	Low
Lead Agency	Zoning, Floodplain Administrator
Status	Not Started

Chemical Storage Facilities	
Analysis	Construct storage facilities for pesticides, insecticides, and chemicals.
Goal/Objective	Goal 2, Objective 2.1
Hazard(s) Addressed	Chemical Fixed Site, Hazardous Materials

Chemical Storage Facilities	
Estimated Cost	\$20,000
Potential Funding	Grant Funding, General Fund
Timeline	5+ years
Priority	Medium
Lead Agency	Streets Department
Status	Not Started

Site Security	
Analysis	Develop/maintain security at applicable assets (surveillance, cameras, lighting)
Goal/Objective	Goal 2, Objective 2.1
Hazard(s) Addressed	Terrorism, Civil Disorder
Estimated Cost	\$10,000
Potential Funding	General Fund
Timeline	2-5 years
Priority	High
Lead Agency	Police
Status	Not Started

GPS Units	
Analysis	Install GPS units in emergency/city vehicles.
Goal/Objective	Goal 4, Objective 4.3
Hazard(s) Addressed	All Hazards
Estimated Cost	\$100 per vehicle
Potential Funding	General Fund
Timeline	5+ years
Priority	Low
Lead Agency	Police, Fire, Streets, Water Reclamation
Status	Not Started

Safe Room Retrofits	
Analysis	Install safe room retrofits into critical assets/facilities
Goal/Objective	Goal 2, Objective 2.1
Hazard(s) Addressed	High Winds, Tornados
Estimated Cost	\$150,000
Potential Funding	General Fund, Grant Funding
Timeline	5+ years
Priority	High
Lead Agency	City Hall (department), Police
Status	Not Started

Landscaping Practices	
Analysis	Promote good landscaping practices among property owners.
Goal/Objective	Goal 2, Objective 2.3
Hazard(s) Addressed	Drought
Estimated Cost	Not Applicable

Landscaping Practices	
Potential Funding	General Fund
Timeline	5+ years
Priority	Low
Lead Agency	Zoning Department
Status	Not Started

In-home Tornado Safe Rooms	
Analysis	Promote the construction of private in-home tornado safe rooms.
Goal/Objective	Goal 2, Objective 2.1
Hazard(s) Addressed	Tornados, High Winds
Estimated Cost	\$5,000-\$15,000
Potential Funding	Grant Funding, Citizen Funding
Timeline	2-5 years
Priority	Low
Lead Agency	Zoning
Status	Not Started

Emergency Operations Plan	
Analysis	Adopt a thorough emergency operations plan (EOP) addressing hazards and mass casualties.
Goal/Objective	Goal 2, Objective 2.2
Hazard(s) Addressed	All Hazards
Estimated Cost	\$5,000
Potential Funding	Not Applicable
Timeline	2-5 years
Priority	High
Lead Agency	Marion County Emergency Management, City Hall (department), Streets, Police/Fire Departments
Status	In Progress

Building Codes	
Analysis	Adopt building codes to address various natural hazards.
Goal/Objective	Goal 2, Objective 2.2
Hazard(s) Addressed	All Hazards
Estimated Cost	None
Potential Funding	Not Applicable
Timeline	1-5 years
Priority	Medium
Lead Agency	Zoning
Status	In Progress

Community Drills	
Analysis	Conduct drills/exercises to increase preparedness.
Goal/Objective	Goal 3, Objective 3.1
Hazard(s) Addressed	All Hazards
Estimated Cost	None
Potential Funding	Not Applicable
Timeline	Ongoing
Priority	Medium
Lead Agency	Public Safety (Fire/EMS/Police)
Status	In Progress

Safe Rooms	
Analysis	Conduct community safe rooms in various community assets (parks, buildings, mobile home areas, etc.)
Goal/Objective	Goal 2, Objective 2.2
Hazard(s) Addressed	High Winds, Tornado
Estimated Cost	\$100,000
Potential Funding	Grant Funding, General Fund
Timeline	5+ years
Priority	Medium
Lead Agency	City Hall (department), Public Safety
Status	In Progress

Emergency Response Guidebooks	
Analysis	Emergency response guidebooks in key emergency and city vehicles.
Goal/Objective	Goal 3, Objective 3.1
Hazard(s) Addressed	All Hazards
Estimated Cost	\$2,000
Potential Funding	General Fund
Timeline	Ongoing
Priority	Medium
Lead Agency	Police, Fire, Streets Departments
Status	In Progress

Law Enforcement Capabilities	
Analysis	Expand law enforcement capabilities.
Goal/Objective	Goal 1, Objective 1.1
Hazard(s) Addressed	All Hazards
Estimated Cost	Varies based on officer
Potential Funding	General Fund
Timeline	Ongoing
Priority	Medium
Lead Agency	Police Department
Status	In Progress

	Policy Review
Analysis	Full review of policy, procedure and codes.
Goal/Objective	Goal 2, Objective 2.3
Hazard(s) Addressed	All Hazards
Estimated Cost	None
Potential Funding	Not Applicable
Timeline	Ongoing
Priority	High
Lead Agency	City Hall (department), Police, Fire, Streets, Water Reclamation, and Recreation
Status	In Progress

	GIS Mapping
Analysis	GIS mapping system implementation and digital hazard maps.
Goal/Objective	Goal 2, Objective 2.3
Hazard(s) Addressed	Flooding, Severe Winter Storm
Estimated Cost	\$10,000
Potential Funding	Road Use Tax, Sewer Enterprise Fund
Timeline	2-5 years
Priority	High
Lead Agency	Streets Department, WRF
Status	In Progress

	Harden Public Buildings
Analysis	Harden Public Buildings
Goal/Objective	Goal 1, Objective 1.1
Hazard(s) Addressed	High Winds, Tornados
Estimated Cost	\$75,000
Potential Funding	General Fund
Timeline	2-5 years
Priority	Medium
Lead Agency	City Hall (department), Police, Fire, Streets, Water Reclamation, Recreation
Status	In Progress

	Public Awareness
Analysis	Improve public awareness of hazard risks- dispense print materials.
Goal/Objective	Goal 3, Objective 3.1
Hazard(s) Addressed	All Hazards
Estimated Cost	\$10,000
Potential Funding	General Fund
Timeline	Ongoing
Priority	Medium
Lead Agency	City Hall (department), Police, Fire, Streets, Water Reclamation, and Recreation
Status	In Progress

	Alternative Storm Water Controls
Analysis	Install alternative or sustainable storm water control options such as buffer strips, bioswales, and rain gardens.
Goal/Objective	Goal 3, Objective 3.1
Hazard(s) Addressed	Flooding
Estimated Cost	\$50,000
Potential Funding	General Fund
Timeline	Ongoing
Priority	Low
Lead Agency	Zoning
Status	In Progress

	New or Upgrade Fire Stations
Analysis	Waiting for feasibility to determine next steps of a new/remodeled fire station.
Goal/Objective	Goal 2, Objective 2.1
Hazard(s) Addressed	Wildfire, Urban Fire
Estimated Cost	Presently Unknown
Potential Funding	Grant Funding, General Fund
Timeline	Ongoing
Priority	New
Lead Agency	Fire Department
Status	In Progress

	Weather Radios
Analysis	Promote NOAA weather radio-citizen purchase (rebate initiative)
Goal/Objective	Goal 4, Objective 4.3
Hazard(s) Addressed	All Hazards
Estimated Cost	\$50/radio
Potential Funding	General Fund
Timeline	Ongoing
Priority	Low
Lead Agency	Fire/EMS/Police
Status	In Progress

	Standby Pumps/Generators
Analysis	Purchase standby pumps and generators
Goal/Objective	Goal 2, Objective 2.1
Hazard(s) Addressed	All Hazards
Estimated Cost	\$50,000
Potential Funding	Grant Funding
Timeline	1 year
Priority	High
Lead Agency	Fire/EMS/WRF
Status	In Progress

Backup Power Generators	
Analysis	Purchase/install backup power generators.
Goal/Objective	Goal 2, Objective 2.1
Hazard(s) Addressed	Prolonged Power Outage
Estimated Cost	Will depend on generator
Potential Funding	Vehicle and Equipment Replacement Fund
Timeline	1 year
Priority	High
Lead Agency	City Hall (department), Police
Status	In Progress

Restricted Access Procedures	
Analysis	Denote areas with restricted access.
Goal/Objective	Goal 2, Objective 2.3
Hazard(s) Addressed	Transportation, Civil Disorder, Haz Mat
Estimated Cost	\$1,000
Potential Funding	General Fund
Timeline	5+ years
Priority	High
Lead Agency	Police, Fire Department
Status	In Progress

Utility Lines	
Analysis	Retrofit/harden existing overhead utility lines.
Goal/Objective	Goal 2, Objective 2.2
Hazard(s) Addressed	High Winds, Tornados, Severe Winter Storms, Tornados
Estimated Cost	\$10,000
Potential Funding	General Fund
Timeline	2-5 years
Priority	High
Lead Agency	City Hall (department)
Status	In Progress

Purchase Road Closure Barricades	
Analysis	Purchase road closure barricades.
Goal/Objective	Goal 4, Objective 4.2
Hazard(s) Addressed	Transportation Incidents
Estimated Cost	\$5,000
Potential Funding	General Fund
Timeline	Ongoing
Priority	High
Lead Agency	City Hall (department)
Status	In Progress

Civil Service Improvements	
Analysis	Purchase snow trucks, plows, and sanders
Goal/Objective	Goal 4, Objective 4.3
Hazard(s) Addressed	Severe Winter Storms
Estimated Cost	\$100,000
Potential Funding	Vehicle Equipment Replacement Fund
Timeline	Ongoing
Priority	High
Lead Agency	Public Works
Status	In Progress

Remain active in the NFIP Program	
Analysis	Enforcement of floodplain management requirements, including regulating new construction in Special Flood Hazard Areas (SFHAs)
Goal/Objective	Goal 2, Objective 2.2
Hazard(s) Addressed	Flooding
Estimated Cost	None
Potential Funding	N/A
Timeline	Ongoing
Priority	High
Lead Agency	Planning & Zoning
Status	Ongoing

Implement Stormwater Utility	
Analysis	Implement a municipal stormwater utility to fund stormwater infrastructure maintenance and updates.
Goal/Objective	Goal 2, Objective 2.1
Hazard(s) Addressed	Flooding
Estimated Cost	None
Potential Funding	N/A
Timeline	Ongoing
Priority	High
Lead Agency	Planning & Zoning, Administration
Status	Ongoing

Replace Fire Apparatus	
Analysis	Purchase new fire apparatus to replace older engines
Goal/Objective	Goal 2, Objective 2.1
Hazard(s) Addressed	Safety
Estimated Cost	\$1.5 million
Potential Funding	Vehicle & Equipment Replacement Fund, Municipal Bond
Timeline	Ongoing
Priority	High
Lead Agency	Fire & Rescue
Status	Ongoing

Improve Hazardous Incident Response	
Analysis	Improved training and mutual aid agreements
Goal/Objective	Goal 4, Objective 4.1
Hazard(s) Addressed	Safety
Estimated Cost	None
Potential Funding	General Fund
Timeline	Ongoing
Priority	High
Lead Agency	Fire & Rescue
Status	Ongoing

REMOVED MITIGATION PROJECTS

Rail Over/Underpasses	
Analysis	Build rail over/underpasses to reduce intersection accidents.
Reason for Removal	BNSF asked to close 1-4 crossings, council rejected. Not enough ROW to build over/underpasses without purchasing many residential properties.

Construct or Repair Dams	
Analysis	Construct or Repair Dams
Reason for Removal	No dams present.

Awareness Campaign	
Analysis	Develop annual leadership awareness campaign about the plan.
Reason for Removal	Unrealistic, no community buy in.

Volunteer Organization	
Analysis	Develop volunteer base-trained and standby groups.
Reason for Removal	Not relevant

Contamination Mapping	
Analysis	Map past chemical contamination sites.
Reason for Removal	Done on state level, not local (Fire Marshal, IDNR, etc.)

New Fire Hydrants	
Analysis	Install new fire hydrants.
Reason for Removal	Completed by a private entity

