

City of Newcastle and Newcastle Public School Hazard Mitigation Plan 2024-2029



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City of Newcastle Resolution No. 2024-10

City of Newcastle
Newcastle City Council
120 NE 2nd St., PO Box 179
Newcastle, OK 73065

RESOLUTION FOR ADOPTION OF MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE FOR NEWCASTLE PUBLIC SCHOOLS AND THE CITY OF NEWCASTLE

WHEREAS, the City of Newcastle, with the assistance from the Hazard Mitigation Planning Team, has gathered information and prepared the multi-jurisdictional City of Newcastle and Newcastle Public Schools Hazard Mitigation Plan Update; and

WHEREAS, the City of Newcastle and Newcastle Public Schools Hazard Mitigation Plan Update has been prepared in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, the City of Newcastle is a local unit of government that has afforded the citizens an opportunity to comment and provide input in the Plan and the actions in the Plan; and

WHEREAS the City Council of the City of Newcastle has reviewed the Plan and affirms that the Plan will be updated no less than every five years;

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Newcastle that the City of Newcastle adopts the multi-jurisdictional City of Newcastle and Newcastle Public Schools Hazard Mitigation Plan update as this jurisdiction's Natural Hazard Mitigation Plan.

ADOPTED this 15th day of October 2024, at the meeting of the City Council of the City of Newcastle.



Mayor

ATTEST:



City Clerk



Newcastle Public Schools

101 N. Main
Newcastle, OK 73065
<http://www.newcastle.k12.ok.us>
(405) 387-2890

Newcastle Public School
Newcastle Board of Education
101 N. Main Street
Newcastle, OK 73065

RESOLUTION

WHEREAS, Newcastle Public School, with the assistance from the Hazard Mitigation Planning Team, has gathered information and prepared the Newcastle and Newcastle Public School Update Hazard Mitigation Plan Update; and

WHEREAS, the Newcastle and Newcastle Public School Hazard Mitigation Plan Update has been prepared in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS Newcastle Public School is a local unit of government that has afforded the citizens an opportunity to comment and provide input in the Plan and the actions in the Plan; and

WHEREAS, Newcastle Public School have reviewed the Plan and affirms that the Plan will be updated no less than every five years;

NOW THEREFORE, BE IT RESOLVED by Newcastle Board of Education that Newcastle Public School adopts the Newcastle and Newcastle Public School Hazard Mitigation Plan Update as this jurisdiction's Natural Hazard Mitigation Plan.

ADOPTED the 8th day of October 2024 at the meeting of the Newcastle Board of Education

(Commissioner) or (Mayor) or (Superintendent)

(Clerk)

CHAPTER ONE: INTRODUCTION

1.1 Overview of Planning Area

The City of Newcastle and the Newcastle Public Schools are faced with a variety of hazards, both natural and man-made. In recent history, winter storms, dam releases, lightning, floods, and tornadoes have made the national headlines but any part of a city can also be impacted by high winds, drought, hail, fire, hazardous materials events, and other threats. In some cases, such as flooding and dam failure, the areas most at risk have been mapped and delineated. A map showing the location of Newcastle is shown in Figure 1-1. A base map of the City of Newcastle with its major features and highways is shown in Figure 1-2.



A map displaying the boundaries of Newcastle Public Schools is shown in Figure 1-3.

The City of Newcastle is located 16 miles south of downtown Oklahoma City on Interstate 44. Newcastle's city limits contain 35,136.

Topography

Latitude: 35.247 N FIPS Code: 51150
Longitude: -97.599 W

The City of Newcastle covers 62.5 square miles in northern McClain County, 16 miles from downtown Oklahoma City. The city is bounded on the north and east by the Canadian River and shares borders with the city of Blanchard to the south, the town of Goldsby to the southeast, the city of Norman to the east, the city of Oklahoma City to the north, Bridge Creek to the west, and the city of Tuttle to the northwest.

Newcastle lies within the Cross Timbers Transition ecoregion, which is defined by rough plains covered by prairie grasses and eastern red cedar, scattered oaks, and elms. The woodlands exist primarily along the streams that dissect the city. Large tracts of pastureland, row crops and small grain crops are also present throughout the area. The topography is mildly rolling with elevations ranging from approximately 1,150 feet to 1,300 feet.

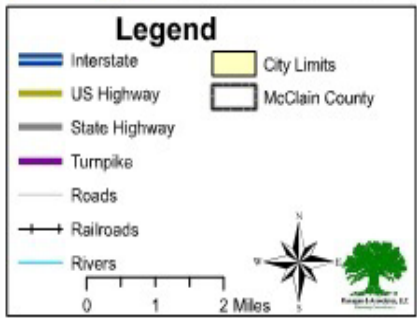
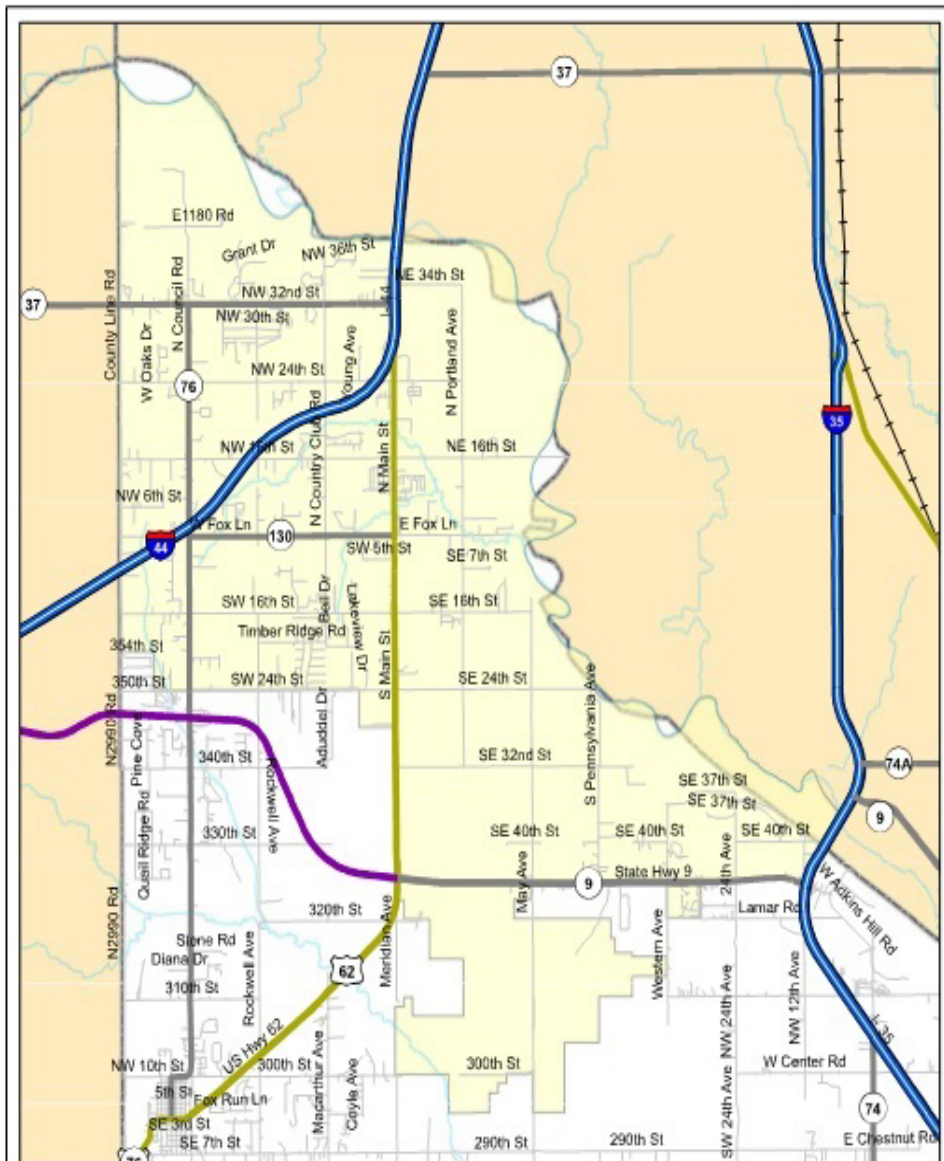


Figure 1- 2

The City of Newcastle

Basemap

Climate

Newcastle lies in the humid subtropical climate zone of the southeastern United States. This climate zone is noted for hot summers, mild winters, and the lack of a distinct dry season. Newcastle also experiences the effects of continentality, which is characterized by a wide annual temperature range and rapid temperature changes. Winter temperatures occasionally fall below zero due to strong cold fronts, but these temperature extremes only last a short time. Temperatures of 100°F or higher are often experienced from July to early September. January's average temperature is 47° F and July's average is 81° F.

Precipitation in the Newcastle area is generally evenly distributed throughout the year. Average rainfall is 33.7 inches per year and average snowfall is 7.5 inches per year. Most of this precipitation comes in the form of convective thunderstorms that produce heavy amounts of rain in short durations. Heavy winds, flash floods, and hail are all associated with these seasonal storms.

April, May, and June account for 55% of all severe weather during a typical year, with 77% of the severe weather occurring between the months of March and July. June is the most active month of the year for hail, wind, floods, and tornadoes.

Prevailing surface winds for the area are southerly during most of the year.

Economy

Newcastle is recognized by the Oklahoma Department of Commerce as a Century Community (formerly known as Certified City). The objective of the Oklahoma Century Community program is community readiness—a key factor in both the community and economic development efforts of a city.

The U.S. 2020 Census listed Newcastle's population at 10,984. This is a 42.9% increase from the U.S. 2010 Census.

Employment and income data for Newcastle is listed in Table 1-3, as reported by the 2020 US Census. Of Newcastle's population over the age of 16 years, 68.4 percent are in the labor force. The median household income was \$86,907, and the median individual income \$45,674, according to the 2020 Census – both figures considerably above the State of Oklahoma's medians of \$56,956 and \$30,976, respectively.

City of Newcastle Employment and Income Data Table 1-3

<i>Subject</i>	<i>Number</i>	<i>Percent</i>
Population	10,984	100
Population 16 years and over in Labor Force	7,513	68.4
Population 65 years and over	1,658	15.1
Unemployed	166	4.3
Total Households	4,092	100
Median Individual Income	\$45,674	100
Median Household Income	\$86,907	100
Individuals in Poverty	373	3.4

Major Employers

<i>Company</i>	<i>Product/Services</i>	<i>Number Employed</i>
Newcastle Gaming Center	Casino, Travel Plaza	800
Newcastle Public Schools	Education	324
Walmart	Retail Sales	315
Capital Gaming Group	Casino Services	110
City of Newcastle	Government	108
Thru-Tubing	Oil Well Drilling Solutions	100
Lacey Mechanical	HVAC	50
Ardor Solutions	Flooring Sales	45
Carlito's Café	Food Service	40
The Pizza Shop	Food Service	35
Pioneer Telephone Service	Telephone/internet	35
OG&E	Gas & Electric Services	32
Braum's Ice Cream	Food Service	31
First National Bank	Financial Services	30
Sooner State Bank	Banking Services	29
PK Riverside Tractor	Retail Services	25
Leisure Nation RV	RV Sales and Service	30

Newcastle Gaming Center is a casino operated by the Chickasaw Tribes.

Wal-Mart is the nation's largest retailer.

Critical Facilities

The Hazard Mitigation Plan for the City of Newcastle identifies critical facilities located in the city. A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the city, or fulfills important public safety, emergency response, disaster recovery functions, and/or continuity of government.

Due to security concerns, the critical facilities specifics are not available for public review. A complete list of the City's critical facilities is on file with the City's Emergency Manager who maintains a comprehensive listing of all city facilities including those deemed critical.

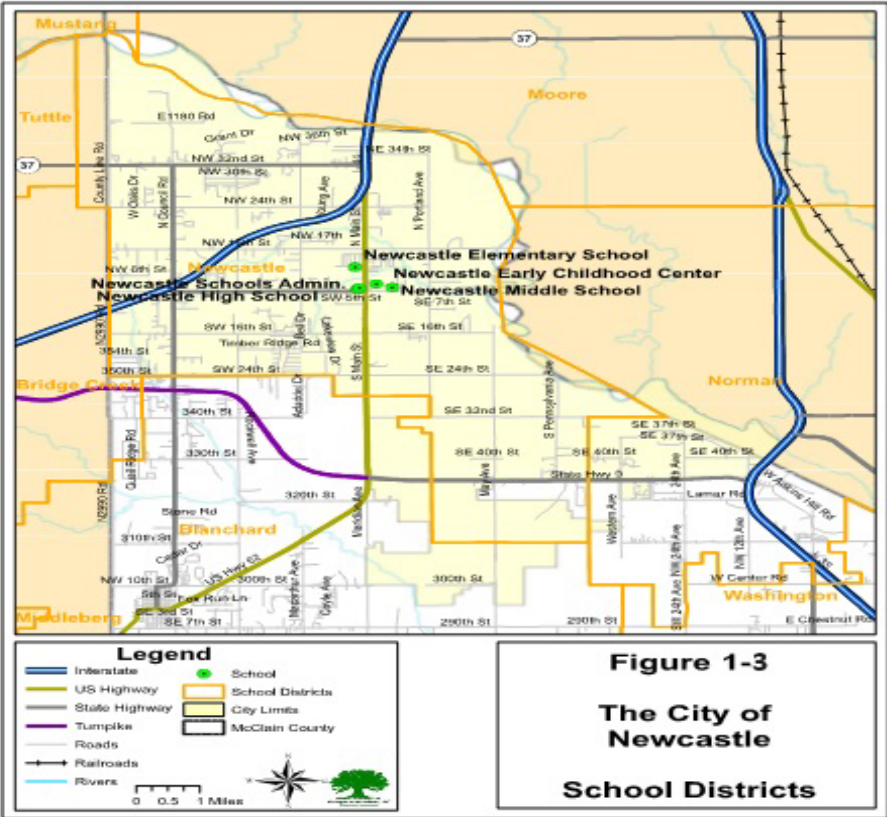
1.2 Participating Jurisdictions

There are two jurisdictions participating in this plan: The City of Newcastle and the Newcastle Public Schools District (NPS).

NPS is located in the City of Newcastle. The district enrollment for the 2022-23 school year was 2,613 students, and there are 160 certified staff members.

The following schools are included in the NPS:

- Newcastle Early Childhood Center, PreK-1
- Newcastle Elementary School, 2-5
- Newcastle Middle School, 6-8
- Newcastle High School, 9-12



CHAPTER TWO: PLANNING PROCESS

2.1 Overview of Planning Process

The Planning Team participated in the development and review of this plan update. The Planning process began in September 2023 and concluded in September 2024 with the submittal of the plan update. Three team meetings were held: September 14, 2023, November 16, 2023, and March 28, 2024. Sign-in sheets and minutes of these meetings are available for review. Team members were invited by email to each meeting. In the first meeting, the planning team discussed hazard mitigation measures and action items with the following hazards Drought, Expansive Soils, Earthquakes, and Extreme Heat. In the second meeting, the planning team discussed hazard mitigation measures and action items with the following hazards Flooding, High Winds, and Severe Storms with Hail and Lightning specifically. In the final meeting, the planning team discussed hazard mitigation measures and action items with the following hazards Tornados, Wildfire, and Winter Storms.

The Emergency Management Director, Donnie Sullins reviewed the draft of the plan and made the draft available for review by other team members. The following individuals served on the City of Newcastle Hazard Mitigation Planning Team:

2.2 Planning Committee Members

Planning Committee Team Members

Point of Contact

Name	Title	Jurisdiction Represented	Contribution to Planning Process
Kevin Self	City Manager	City of Newcastle	Provided past and current hazard information and vulnerable impacts.
Jeanette McNally	Assistant City Manager	City of Newcastle	Provided past and current hazard information and vulnerable impacts.
Donnie Sullins	Emergency Manager	City of Newcastle	Coordinated survey results, meetings, draft plans, updates, and vulnerable impacts.
Todd Yates	Fire Chief	City of Newcastle	Provided past and current hazard information.
Tim Edwards	Building Inspector	City of Newcastle	Impact of hazards on housing and businesses.
John Canary	Street Department Superintendent	City of Newcastle	Impact of hazards on city streets.
Kyle Marks	Parks Director	City of Newcastle	Impact of hazards on city parks and facilities.
Kevin Hegerberg	Floodplain Administrator	City of Newcastle	Impact of flooding hazards.

Name	Title	Jurisdiction Represented	Contribution to Planning Process
Frank Craven	Operations Manager	Newcastle Public Schools	Impact of current hazard information for the school district.
Jim Miller	Public Works Superintendent	City of Newcastle	Overview of effect of hazards for city's public works department.

2.3 Stakeholders

Stakeholders - Neighboring Communities, Businesses, and Non-Profit Agencies Contacted

Name	Title	Agency Represented	How Agency Was Contacted/Invited to Participate
Ron Johnson	Emergency Manager	McClain County	Email
Mike Peck	Walmart Manager	Newcastle Walmart	Phone Call
Brandon Burchfield	Emergency Manager	Chickasaw Nation Tribe	Phone Call
Ron Hamett	Resident/Business Owner	Resident of Newcastle, retired Assistant Fire Chief, and Business Owner	Phone Call
Linda Medford	Disaster recovery	Red Cross	Phone Call
Heather Murrell	Assistant Emergency Manager	McClain County	Email

State and Federal Agencies Contacted

Name	Title	Agency Represented	How Agency Was Contacted
Moriah Stanford	Hazard Mitigation Planner	Oklahoma Emergency Management	Email
Rick Smith	Warning Coordination Meteorologist	National Weather Service and Resident of Newcastle	Email
Elizabeth Leslie	Hazard Mitigation Planner	Oklahoma Emergency Management	Email

2.4 Public Involvement

During the planning process, team members were encouraged to discuss the city's plan with staff and citizens, and due to the number of people that use the Community Storm Shelter for a variety of events such as rotary club meetings, GOP meetings, Boy Scout and Girl Scout meetings, and Newcastle Sports Association meetings, Emergency Management staff posted notifications on the outside of the Community Storm Shelter inviting the public to the final two meetings. The City also developed a survey and posted the survey for 30 days on numerous social media

outlets. The public was allowed to share their greatest and lowest concerns of the following hazards, Bridge Conditions, Disease, Drought/Extreme Heat, Earthquake, Fire/Wildfires, Flooding, Hazardous Materials, Lightning/Hail, Soil Erosion, Terrorism/Security Concerns, Thunderstorms, Tornadoes, Wind, and Winter Weather. The survey also allowed the public to list which hazards they feel that the Planning Area is most vulnerable to experience and if they have been impacted by any of the hazards. If so, then the public was allowed to share their experience with any assistance that they may have received from local, state, or federal. The final two survey questions allowed the public to give any suggestions on how the City of Newcastle can implement strategies to lessen hazard risks and how to improve disaster recovery. The internet survey was available from **April 23 to May 23, 2024**. The results of the survey were available to team members and were made available on the Newcastle Emergency Management Facebook page, the City of Newcastle Facebook page, the City of Newcastle website, and 3 other local Newcastle community Facebook pages. Posting the flyers outside of the community storm shelter, as well as utilizing the survey, proved to be the best methods to reach the citizens of Newcastle, including the underserved populations. Below is a brief list of outcomes from the questions presented in the survey.

Hazard survey participants had the highest concern.

Flooding	20%
High Wind	26%
Winter Storm	24%
Thunderstorm/Hail	19%
Tornado	45%
Lightning	22%
Earthquake	16%
Fire/Wildfire	25%
Drought/Extreme Heat	17%
Hazardous Material	17%
Disease	14%
Terrorism	17%
Bridge Conditions	22%
Soil Erosion	16%

Hazard survey participants felt Newcastle is most vulnerable to experience.

Tornado	39%	Winter Storm	21%
Flooding	20%	Thunderstorm/Hail	19%
High Wind	24%	Fire/Wildfires	22%
Lightning/Hail	22%	Drought/Extreme Heat	18%
Earthquake	15%	Hazardous Materials	16%
Bridge Conditions	23%	Disease	14%
Terrorism/Security Concerns	17%	Soil Erosion	16%

Suggestions Hazard survey participants suggested strategies to lessen hazard risks in the City of Newcastle.

- * Routine cleaning of culverts
- * State/local training for large aircraft crashes
- * Adequately staff Fire Department and Police Department
- * Widen the narrow bridges over I-44
- * Additional storm sirens and add lightning detectors at parks
- * Upgrade building codes to include reinforced safe rooms/storm shelters
- * Improve drainage issues
- * Trim trees from power lines and roads, road maintenance and treatment during icy weather

Information collected from the public survey will be incorporated into the action items of this plan.

2.5 Plans, Documents, Agency Literature, and Resources Reviewed

Major sources are listed below that provide data necessary to assess hazards that affect the Newcastle community.

Plans, Documents, Agency, Literature, and Resources Reviewed	Relevant Information Incorporated into Plan
National Climatological Data Center (NCDC)	Storm data
US Census Bureau Population Data, 10/1/2023	Local and state information
National Flood Insurance Program (NCDC)	Flood Insurance
Oklahoma Department of Transportation	County, State, and Federal roadways
Oklahoma Department of Emergency Management	Hazard Mitigation Plan
Oklahoma Department of Environmental Quality (DEQ)	Debris Management
Oklahoma Geological Survey (OGS)	Earthquake data
Newcastle School Emergency Action Plan	Evacuation data, bus routes
National Weather Service, Norman Office	Storm data and related material
National Oceanic and Atmosphere Administration (NOAA)	Climate data
The Storm Prediction Center (SPC)	Storm data
City of Newcastle Emergency Operations Plan (Approved in 2023 and updated annually)	Procedures, siren locations, resource availabilities
National Drought Mitigation Center (NDMC)	Drought data
National Lightning Safety Institute (NLSI)	Lightning data
Oklahoma Water Resource Board (OWRB)	Rain, river, drought data

2.6 Continued Public Involvement

The city consistently interacts with the public through various channels such as social media, local newspapers, notices at city hall, and the library, and actively seeks input regarding initiatives aimed at mitigating, recovering from, and preventing future damages caused by disasters. Public meetings will be organized and integrated into the city's regular agendas to facilitate public input and council participation. Additionally, once the plan is approved, the City intends to distribute a survey to gather feedback from citizens, which will be incorporated into the ongoing updates of the plan.

2.7 Plan Monitoring, Evaluating, and Updating

The Newcastle Emergency Management Director holds the responsibility for overseeing, assessing, and revising all aspects of the Hazard Mitigation Plan, following the guidelines outlined in 44 CFR. Additionally, they serve as the primary contact for communication and scheduling of meetings.

Monitoring

The Newcastle Emergency Management Director will be the designated personnel who will monitor all aspects of the Newcastle Hazard Mitigation Plan update process. This will be accomplished with the assistance of the Newcastle Public School POC, who will provide the Newcastle Emergency Management Director with information regarding action items implemented by the Newcastle Public School District. The Newcastle Emergency Management Director will provide this report to the Newcastle City Council on an annual basis. The Newcastle Emergency Management Director will be responsible for:

- Contacting Newcastle Public School POC every six months or after significant natural hazard events as they occur;
- Documenting any damages that might have occurred;
- Documenting if Newcastle Public Schools encountered any implementation problems as action projects were initiated.

These findings will be compiled in an annual assessment that the Newcastle Emergency Management Director will provide to and review with the Newcastle Public School POC at an annual meeting. This assessment will be presented to the Newcastle City Manager and Council on an annual basis.

Evaluating

The Newcastle Emergency Management Director or designee will perform the following tasks at least annually:

- Evaluate any disaster events and determine if the event prompts any changes to the Plan's hazard profile data and/or jurisdictional priorities.
 - Evaluate the magnitude of hazard risk, and the jurisdictions' vulnerability to each hazard, and determine if there have been any changes.
-

- Evaluate current resources and determine if they are appropriate for implementing mitigation actions.
- Evaluate the effectiveness of implemented mitigation actions and if the outcomes occurred as expected.
- Evaluate if the implemented action items met the proposed timeline and budget if their intended purpose was met, and if the agencies listed in the Plan participated in the mitigation action.

The Newcastle Emergency Management Director will document all findings in a report. The Newcastle Emergency Management Director will provide this report to the Newcastle City Council on an annual basis.

Updating

The Plan will be updated on a five-year cycle. Eighteen months before plan expiration, the Newcastle Emergency Management Director and the Hazard Mitigation Planning Committee will begin the planning process. Once the plan update is drafted, it will be submitted for State and Federal review as required. In addition to this five-year cycle, the Plan will also be reviewed annually, and any relevant information gathered through the monitoring and evaluating processes will be incorporated into the Plan as appropriate.

CHAPTER THREE: HAZARD IDENTIFICATION AND RISK ASSESSMENT

3.1 List of Identified Hazards

The Local Emergency Planning Committee, City staff, local business representatives, tribal representatives, local stakeholders, and state and local agencies reviewed the hazards listed in the 2019 Hazard Mitigation Plan for the City of Newcastle and Newcastle Public Schools.

All hazards listed in the 2019 plan are listed in this plan update. Dam Failure and Landslides were in the last plan update but are not being included in this update due to these reasons.

Dam Failure: Newcastle is not including Dam Failure as a hazard in their hazard mitigation plan because there are no dams within or near the city's boundaries that pose a threat to the community. The absence of dams in the area means there is no potential risk of dam failure, making it unnecessary to address this hazard in the plan.

Landslides: Newcastle is not including Landslides as a hazard in their hazard mitigation plan because the city is in a region with flat terrain and stable soil conditions, which eliminates the potential risk of landslides. Since there are no steep slopes or other geographical features that could trigger landslides, it is unnecessary to address this hazard in the plan.

Hazard	Jurisdictions Affected
Drought	City of Newcastle & Newcastle Public Schools
Earthquake	City of Newcastle & Newcastle Public Schools
Expansive Soils	City of Newcastle & Newcastle Public Schools
Extreme Heat	City of Newcastle & Newcastle Public Schools
Flood	City of Newcastle & Newcastle Public Schools
Hail	City of Newcastle & Newcastle Public Schools
High Wind	City of Newcastle & Newcastle Public Schools
Lightning	City of Newcastle & Newcastle Public Schools
Subsidence	City of Newcastle & Newcastle Public Schools
Tornado	City of Newcastle & Newcastle Public Schools
Wildfire	City of Newcastle & Newcastle Public Schools
Winter Storm	City of Newcastle & Newcastle Public Schools

3.2 Disaster History

State and/or Federally Declared Disasters Since Last Plan Update

Disaster #	Declaration Date	Incident Type
DR4530	01/19/2020	Covid-19
DR4575	10/25/2020	Severe Winter Storm
DR4587	02/07/2021	Severe Winter Storm

3.3 Hazard Probability Rating

Probability can be determined by calculating the total number of events divided by the total number of years to reach a probability percentage of event occurring each year. Based on this calculation, probability is quantified as follows:

High	=	> 90%
Medium	=	30 - 89%
Low	=	10 - 29%
Very Low	=	< 10%

Hazard	Probability Rating
Drought	High
Dam Failure	Low
Earthquake	Low
Expansive Soils	Low
Extreme Heat	High
Flood	High
Hail	High
High Wind	High
Landslides	Low
Lightning	Medium
Subsidence	Medium
Tornado	High
Wildfire	High
Winter Storm	High

3.4 Profiled Hazards

3.4.1 Expansive Soils

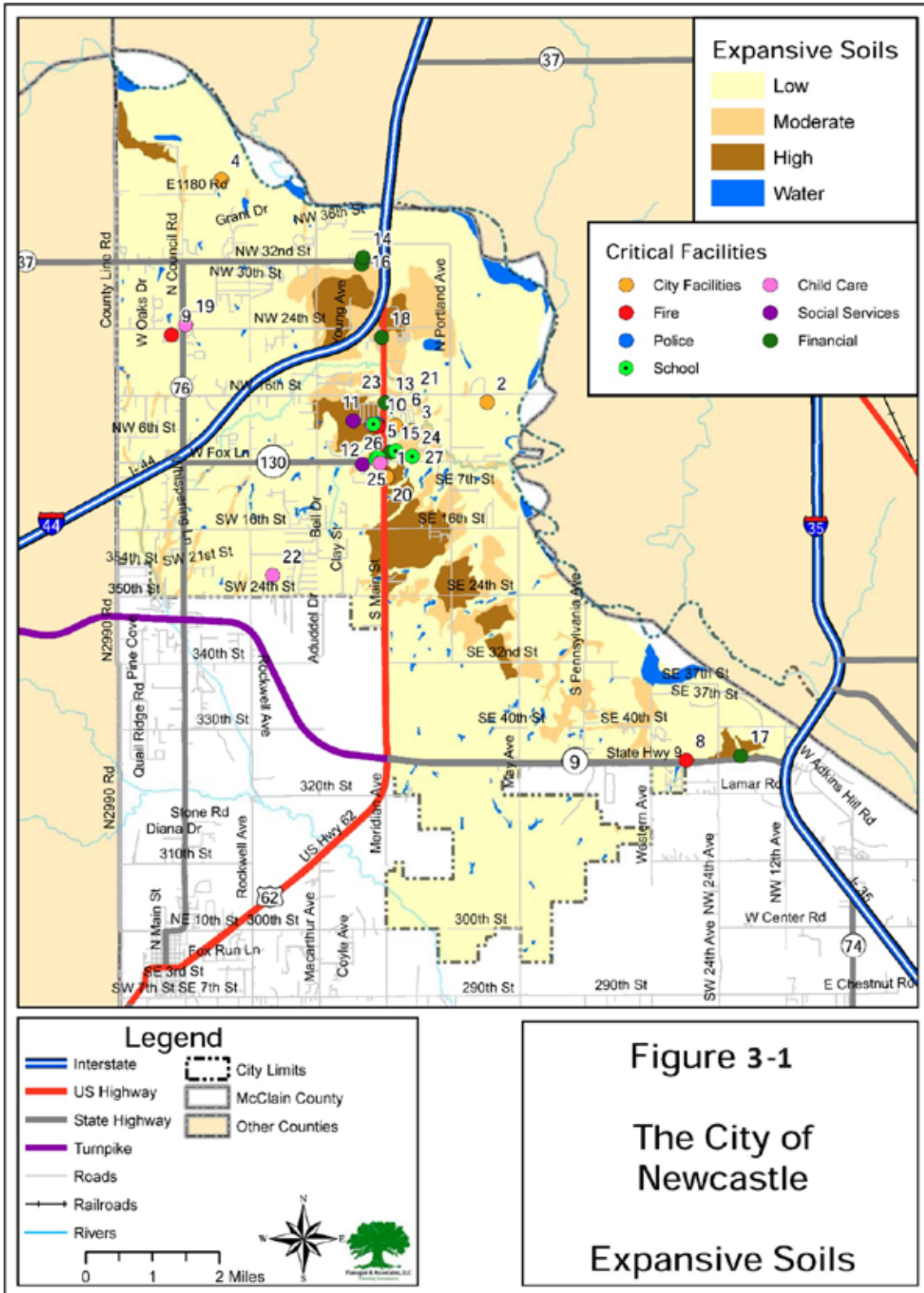
Description

Expansive or swelling soils are soils that swell when subjected to moisture. Swelling soils typically contain clay minerals that attract and absorb water. Another category of expansive soil known as swelling bedrock contains a special type of mineral called clay stone.

Changes in soil volume present a hazard primarily to structures built on top of expansive soils. The most extensive damage occurs to highways and streets. The effect of expansive soil is most prevalent in regions of moderate to high precipitation, where prolonged periods of drought are followed by long periods of rainfall. Expansive soils can be recognized either by visual inspection in the field or by conducting laboratory analysis.

Location

The entire Planning Area could be affected by Expansive Soils as shown in Figure 3-1.





Extent

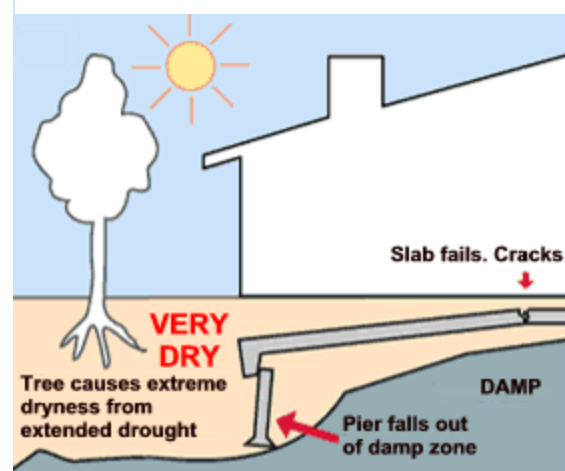
The risk associated with expansive soil is related to shrink/swell potential in a qualitative manner: very high, high, moderate, and low. As shown in Table 3-1, linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than three percent; moderate if three to six percent; high if six to nine percent; and very high if more than nine percent. If the linear extensibility is more than three, shrinking and swelling can cause damage to buildings, roads, buried utilities, and other structures. Special design or soil preparation is often needed.

Table 3-1: Expansive Soils Linear Extensibility Percent

Expansion Potential	Linear Extensibility Percent
Very High	> 9%
High	6% - 9%
Moderate	3% - 6%
Low	< 3%
Water	0%

The National Resource Conservation Service (NRCS), in its Soil Survey Geographic Database (SSURGO), identified expansive soils for Newcastle as shown in Figure 3-2. SSURGO map units were classified from low to very high based on the linear extensibility percent (LEP) for the soils within the identified map units to depths up to 60 inches—the depth at which damage to improvements from expansive soils is most likely to occur. Soil samples are dehydrated through air- or oven-drying for a predetermined length of Figure 3-2: Effects of Expansive Soils time under a constant temperature. Linear extensibility percent is the linear expression of the volume difference of natural soil fabric at 1/3 bar or 1/10 bar water content and oven dryness. The volume change is reported as a percent change for the whole soil. In addition, the Oklahoma Department of Transportation has a program to evaluate the expansive tendencies of soils and shale formations in the state.

Figure 3-2: Effects of Expansive Soils



The planning area has and expects to continue to experience a shrink-swell potential coefficient of a low to moderate range.

Previous Occurrence

Oklahoma does not have disaster information on Expansive Soils because a catastrophic event has not been declared. This hazard develops gradually and is difficult to attribute dollar amounts to this hazard. Due to the lack of comprehensive data on expansive soil hazards in Newcastle and the absence of catastrophic events, the planning team recognizes the need to take proactive measures. They aim to create an action item focused on implementing a record-keeping system to track these events. This system will help gather essential information, monitor soil-related damage over time, and enable better-informed decisions regarding mitigation and prevention efforts. By addressing this data deficiency, the city can work toward effectively managing the risks associated with expansive soil and safeguarding its infrastructure and residents.

Probability of Future Events

The potential for serious Expansive Soil events in Newcastle is unlikely but could occur under the right soil and weather conditions. The probability of expansive soil occurrence is Low.

Future Climatological Trends

As Newcastle looks to the future, it must consider the potential impact of climatological trends on its expansive soil. With climate change leading to shifts in precipitation patterns, temperature extremes, and increased weather variability, the risk associated with expansive soils may evolve. Higher temperatures and changing rainfall patterns can exacerbate soil expansion and contraction, potentially increasing the occurrence of soil-related damage to structures and infrastructure. To prepare for these challenges, Newcastle should prioritize ongoing monitoring of climatic changes and their effects on local soil conditions. Additionally, city planning, and construction practices may need to adapt to these evolving conditions to minimize the long-term risks associated with expansive soils in the face of a changing climate.

Vulnerability and Impact

The impact of this hazard occurs over time and affects structures and infrastructure in the planning area. If the shrink-swell potential is rated moderate to very high it can damage buildings, roads, and other structures. The high degree of shrinkage associated with high and very high shrink-swell potentials can damage plant roots.

Despite its costly effects, expansive soil is a silent hazard. Because the hazard develops gradually and seldom presents a threat to life, expansive soils have received limited attention. Many problems are not recognized as being related to expansive soils, but often it is merely considered a nuisance and never repaired.

Due to the nature of the hazard, direct threats to life or personal injury from expansive soil are minimal. There are, however, instances that may occur as a result of expansive soil that may cause a threat to life and health. Such instances in the planning area can include leaking gas, water, and sewer lines, the possibility of cross-contamination between the storm and sanitary sewer lines, or the contamination of freshwater lines or groundwater by sewer line breaks.

Houses and small buildings are impacted more by expansive soil than larger buildings. The greatest damage occurs when small buildings are constructed when clays are dry, such as during a drought, and then subsequent soaking rains swell the clay. Other cases of damage involve increases in moisture volume from broken or leaking water and sewer

lines, over-watering of lawns and landscapes, and surface modifications that produce ponding.

Impacts from climatological changes, land use development, and population patterns.

Newcastle's population has surged in the past 5 years, and with projects like the turnpike to North Norman and the upcoming construction of the nation's largest Tribal Hospital, development is accelerating. However, this growth raises concerns about the impact of expansive soils, influenced by climatic changes, land development, and population increase. Expansive soils can jeopardize infrastructure stability. As Newcastle expands, proactive measures such as soil stabilization and thoughtful land use planning are essential to mitigate these risks.

Jurisdiction	Vulnerability	Impact
City of Newcastle	<p>Critical facilities, residential homes, businesses, roadways, bridges, gas lines, water lines, and sewer lines.</p> <p>Lack of previous occurrence data and system to track the previous occurrences.</p>	<p>Could cause damage to foundations at city critical facilities, residential homes, and businesses resulting in unexpected repairs, and damage to gas, water, and sewer lines resulting in the possibility of cross-contamination between storm and sanitary sewer lines or groundwater by sewer line breaks. Could cause damage to roads and bridges resulting in unexpected repairs, and delayed response for first responders.</p> <p>A lack of reporting and tracking occurrences leads to a lack of knowledge of the locations within the planning area that have experienced expansive soils. This could lead to damage not being repaired as well as continued occurrences in the same areas or buildings.</p>
Newcastle Public Schools	Newcastle Public School facilities are located in the Low to High categories of expansive soils, putting them at risk for experiencing different levels of swelling and shrinkage of soils.	Newcastle Elementary School/facilities in the High category could experience the worst level of damage such as structural damage, disruption of pipelines and sewer lines, cracked sidewalks, and parking lots while the Newcastle ECC, Middle School, and High School facilities are in the Low to Moderate category could

	Lack of previous occurrence data and system to track the previous occurrences.	<p>experience damages such as damage to buildings, sticking doors, uneven floors, and cracked walls and ceilings.</p> <p>A lack of reporting and tracking occurrences leads to a lack of knowledge of the locations within the planning area that have experienced expansive soils. This could lead to damage not being repaired as well as continued occurrences in the same areas or buildings.</p>
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3.4.2 Drought

Description

Drought: A drought is a period of drier-than-normal conditions. If dry weather persists and water supply problems develop, the dry period can become a drought.

Location

The entire Planning Area is affected by Drought.

Extent

The Planning Area uses the Palmer Drought Severity Index to classify Drought conditions. The Planning Area can experience any value on the index.

Palmer Drought Severity Index

	< -4.0	Extreme Drought
	-3.99 to -3.0	Severe Drought
	-2.99 to -2.0	Moderate Drought
	-1.99 to -1.0	Mild Drought
	-0.99 to -0.5	Incipient Drought
	-0.49 to 0.49	Near Normal
	0.5 to 0.99	Incipient Moist Spell
	1.0 to 1.99	Moist Spell
	2.0 to 2.99	Unusual Moist Spell
	3.0 to 3.99	Very Moist Spell
	> 4.0	Extreme Moist Spell

Previous Occurrences

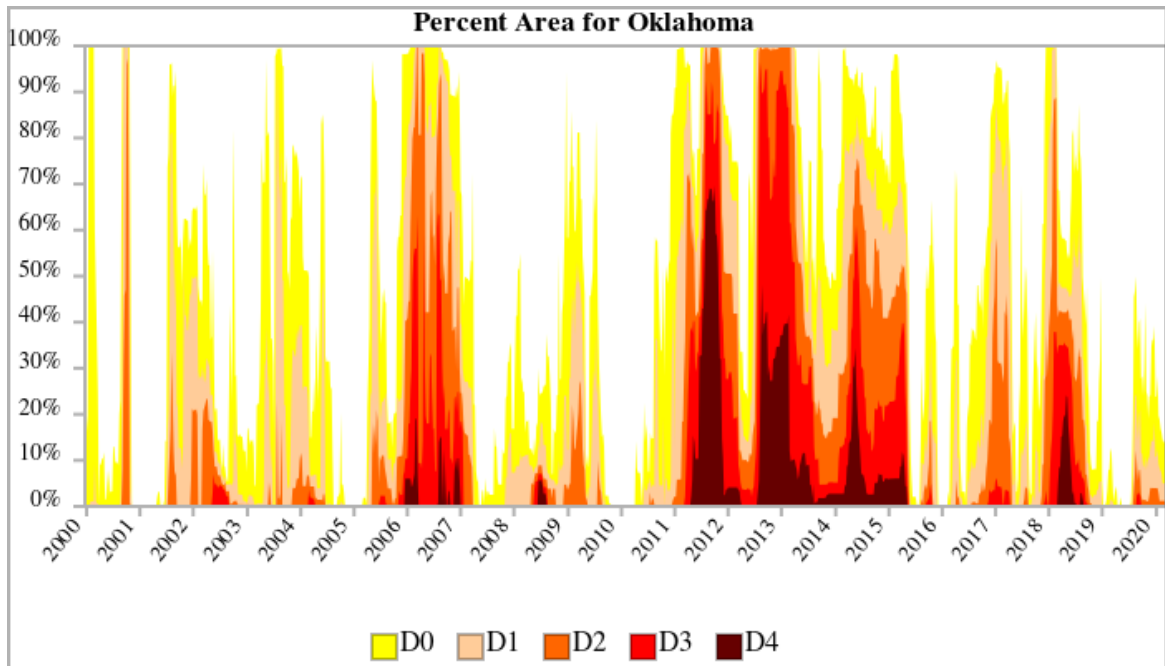
Drought Events, 2013-2023

From the NOAA Storm Events Database

<https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=40,OKLAHOMA>

Date	Crop Damage	Description
Jan-April 2013	None	Very few rainfall events occurred during the month of January over Oklahoma. This allowed drought conditions to persist or even worsen in some areas. D3 (extreme) drought continued through the month in McClain County with persistent dry conditions.
Sept. 2013	None	Rainfall ranged from somewhat below to somewhat above average during September in Oklahoma. The northern half of the state generally saw a marginal improvement in drought conditions, while the southern half saw marginal worsening with less rainfall. D0 (abnormally dry) drought continued through the month with persistent dry conditions.
May-Nov. 2014	None	Despite several rounds of shower and thunderstorm activity, rain was fairly sparse through the month. A bout of very warm temperatures through the first half of the month allowed for substantial surface drying and drought conditions worsened across all of Oklahoma. Drought conditions worsened through the month. While D1 (moderate) drought was present at the beginning of the month, D3 (extreme) drought became more prevalent by month's end.
April-May 2015	None	With persistent dry conditions, drought persisted with some improvement across much of western and central Oklahoma. With persistent dry weather, a D2 (severe) drought continued across the southwest portion of the county, while the remainder of the county remained under a D1 (moderate) drought.
Dec. 2016-April 2017	None	With a lack of any significant rainfall, severe drought conditions continued over south central Oklahoma and spread into central and northwest Oklahoma through the month of December. Atoka county and southeast Coal county continued in extreme drought, spreading into Bryan county.
Dec. 2017-Feb. 2018	None	With a lack of rainfall, severe drought began to develop across western Oklahoma and persisted across south central Oklahoma.
Aug. 2019	None	Severe drought expanded across southwest into central Oklahoma and intensified into the extreme category in some areas of southwest Oklahoma later in the month.
Sept. 2021-	None	Drought rapidly expanded across the area during the month of September, with moderate drought increasing

Oct. 2021		from 7% coverage at the beginning of the month to 70% by month's end.
Dec. 2021- April 2022	None	Drought was extensive across much of western Oklahoma and western north Texas during the beginning of the month, with continued dry conditions causing the eastward expansion of drought across much of central Oklahoma by month's end.
July 2022- Feb. 2023	None	Hot and dry conditions allowed for drought to rapidly expand during the month of July, encompassing most of the western two thirds of Oklahoma by the end of the month.



<https://www.drought.gov/drought/states/oklahoma>

Probability of Future Events

The probability of future Drought events in the Planning Area is HIGH.

Future Climatological Trends

Researchers are suggesting a shift in precipitation patterns that could significantly impact drought conditions in the future for places like Newcastle. As climate change progresses, there's a growing consensus that there will be fewer days of light or moderate rainfall, but when precipitation does occur, it's expected to be in the form of heavy, intense rain events. These intense rainfall events can lead to flash flooding and erosion, but they may not necessarily alleviate long-term drought conditions. In fact, they can exacerbate the situation by causing runoff that doesn't effectively recharge groundwater supplies. This changing pattern underscores the complexity of future drought scenarios and emphasizes

the need for adaptive water management strategies that account for both the intensity and distribution of precipitation in a changing climate.

Vulnerability and Impact

The Planning Area is vulnerable to Drought in multiple ways. Drought is a natural part of Oklahoma’s climate that will continue to impact Newcastle’s ability to accommodate the needs of water users and provide essential municipal operations and services.

Newcastle supplies water services to residents, businesses, Newcastle Public School District, and several developed areas outside of the city limits. A higher rate of consumption may also occur during a Drought.

Newcastle Public School District depends on the city for ample water for each school location. Practice fields and playground areas with natural grass may require irrigation during times of drought.

The planning area has various sections of farmland used for agricultural purposes. The damaging effects of drought can lead to crop failure.

Impacts from climatological changes, land use development, and population patterns.

Newcastle's rapid growth exacerbates drought risks due to climate change, urbanization, and population expansion. Climate shifts lead to less rainfall and higher temperatures, worsening water scarcity. Urban development reduces natural water absorption and increases runoff. With more people, water demand rises during dry spells, impacting agriculture, ecosystems, and public health. Addressing these challenges requires efficient water management, sustainable development, and community resilience initiatives to ensure Newcastle's long-term sustainability amid changing conditions.

Jurisdiction	Vulnerability	Impact
City of Newcastle	<p>The city has a water aquifer that supplies the city with water. When drought occurs, this water table is placed in jeopardy.</p> <p>Water usage by citizens and business causes a greater need for water and city facilities are then at a higher risk of breaking parts that supply water.</p>	<p>A depleted water table will result in a loss of revenue for the city as it supplies water to citizens for a fee.</p> <p>When parts break due to high volume of use, lack of water pressure and complete lack of water available to residents can occur. Obtaining correct parts in a timely manner will delay the return of service to residents and/or businesses.</p>

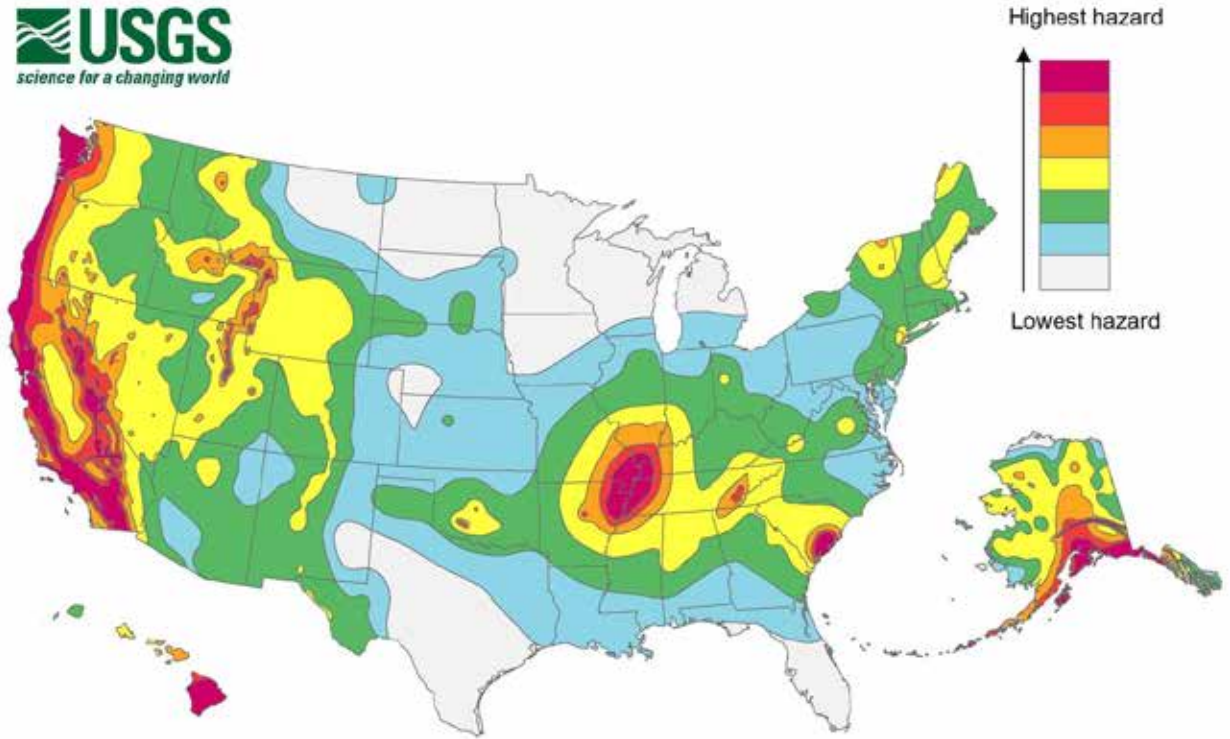
Newcastle Public Schools	Newcastle Public Schools depends on the city to provide water to all school locations.	Periods of drought, and subsequent water bans can result in a lack of water usage for schoolgrounds such as ball fields and playgrounds, which can lead to cracking of the soil and uneven surfaces for playgrounds and practice fields with natural grass. This could result in student injury and can make the area unusable for long periods of time.
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3.4.3 Earthquake

Description

Earthquake: An earthquake occurs when two blocks of the earth suddenly slip past one another. The surface where they slip is called the fault or fault plane. The location below the earth's surface where the earthquake starts is called the hypocenter, and the location directly above it on the surface of the earth is called the epicenter.

Most earthquakes occur as the result of slowly accumulating pressure that causes the ground to slip abruptly along a geological fault plane on or near a plate boundary. The resulting waves of vibration within the earth create ground motion at the surface that vibrates in a very complex manner.



Earthquake hazard map showing peak ground accelerations having a 2 percent probability of being exceeded in 50 years, for a firm rock site. The map is based on the most recent USGS models for the conterminous U.S. (2018), Hawaii (1998), and Alaska (2007). The models are based on seismicity and fault-slip rates and take into account the frequency of earthquakes of various magnitudes. Locally, the hazard may be greater than shown because site geology may amplify ground motions. Source: USGS, 2022 US National Seismic

Location

The entire Planning Area is affected by earthquakes.

Extent

The Planning Area uses the Modified Mercalli Scale to categorize Earthquake. While the planning area has experienced 195 earthquake events 2-3 on the Mercalli scale, and 13 earthquake events 3-4 on the Mercalli scale, there has been no reported structural damage in the planning area. Given the unpredictability of earthquake events, the Planning Area expects to experience Earthquakes that range from Mercalli value I-IV.

The Modified Mercalli Scale with Richter Magnitude Approximations

Richter Magnitude	Mercalli	Description	Earthquake Effects
1-2	I	Instrumental	Not felt except by a very few under especially favorable conditions.
2-3	II	Feeble	Felt only by a few persons at rest, especially on upper floors of buildings.

Richter Magnitude	Mercalli	Description	Earthquake Effects
3-4	III	Slight	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4	IV	Moderate	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
4-5	V	Rather Strong	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5-6	VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
6	VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6-7	VIII	Destructive	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
7	IX	Ruinous	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7-8	X	Disastrous	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
8	XI	Very Disastrous	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
8+	XII	Catastrophic	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Source: <http://earthquake.usgs.gov/learn/topics/mercalli.php>

Previous Occurrence:

According to data obtained from the Oklahoma Geological Survey Earthquake Catalog, there have been 195 Earthquake events ≥ 2 recorded in the Planning Area, from 2013-2023. Residents in the Planning Area have felt earthquakes that occurred in other areas of the state. In Oklahoma County in central Oklahoma on December 7, 2013, a 4.5 magnitude earthquake occurred and on June 6, 2014, a 4.3 magnitude earthquake occurred. Both earthquake events were felt in the planning area with no reported damages.

According to the Oklahoma Geological Survey staff, movement can be felt and not be recorded on seismic monitoring devices if the movement is very minor and if the Planning Area is not located near a monitoring device.

Probability of Future Events

The probability of future Earthquake events in the Planning Area is High with a Low probability of an earthquake that causes damage.

Future Climatological Trends

In the context of Newcastle, Oklahoma, the future risk, and changes in earthquake patterns due to climate change and human activities hold particular significance. This region, situated within the central United States, has experienced a noticeable uptick in seismic activity in recent years, which many experts attribute to wastewater disposal associated with hydraulic fracturing, or fracking. Climate change-induced fluctuations in precipitation patterns and water availability could further exacerbate this issue, impacting the underground pressure and potentially influencing fault movements in the area. Urban expansion and land use changes also play a significant role in the risk assessment for Newcastle, as continued development can alter the stress on local faults. Given these multifaceted concerns, it is imperative for Newcastle and surrounding areas to implement comprehensive and tailored earthquake preparedness and mitigation measures that address the unique interplay of climate change and human-induced factors specific to this region.

Vulnerability and Impact

As Newcastle continues to rely on outdated building codes, the implications for the city and its institutions, such as Newcastle Public Schools, are profound. In the event of a significant earthquake, the potential damage to infrastructure and buildings could have severe consequences for public safety, essential services, and the local economy. Schools, being a critical component of the community, would be particularly vulnerable, with the safety of students and educators at stake. The economic and educational repercussions could be long-lasting, underscoring the urgent need for a comprehensive overhaul of building codes and proactive measures to ensure the resilience of Newcastle and its educational institutions in the face of seismic hazards.

Impacts from climatological changes, land use development, and population patterns.

Newcastle, bordering Oklahoma City, faces escalating earthquake risks due to climate change, population growth, and land use patterns. Urbanization concentrates people and infrastructure in vulnerable areas. Climate shifts may intensify seismic activity, exacerbating risks. Earthquakes can cause casualties, property damage, and economic losses, especially in densely populated zones. Newcastle's situation is further complicated by its 15 active drill sites since 2019 and over 50 drill permits on hold, which could contribute to seismic activity. Additionally, neighboring Oklahoma City also hosts numerous active drill sites, amplifying seismic concerns.

Jurisdiction	Vulnerability	Impact
City of Newcastle	The roadways, bridges, and utility infrastructures of Newcastle were not built to sustain an Earthquake event, making them vulnerable should a significant Earthquake occur.	Damage to roadways and bridges would disrupt transportation routes and force residents and emergency personnel to seek alternative routes. Damage to utility infrastructure could result in a loss of electrical, sanitation, or communication services. If that were to occur, it would

	<p>Outdated building codes</p> <p>Outdated building codes for critical infrastructure and none of the critical infrastructure has strapping for shelves and equipment to prevent tipping during an Earthquake event.</p>	<p>impede emergency service operations and limit the delivery of essential supplies for life sustainment.</p> <p>Potential damage to infrastructure and buildings could have severe consequences for public safety, essential services, and the local economy. Potential damage to critical infrastructure including City Hall, Fire and Police Stations, Water Treatment Plant, Sewer Treatment Plant, and unstable shelving could cause shelves and equipment to tip over resulting in injuries to city employees and anyone visiting.</p>
Newcastle Public School District	None of the schools have strapping for shelves and equipment to prevent tipping during an Earthquake event.	<p>Unstable shelving and equipment can injure students and staff during an Earthquake event.</p> <p>Damage to equipment can result in an economic and capability loss to schools, potentially causing a disruption to school operations and the burden of unexpected costs for repair and replacement.</p>

3.4.4 Extreme Heat

Description

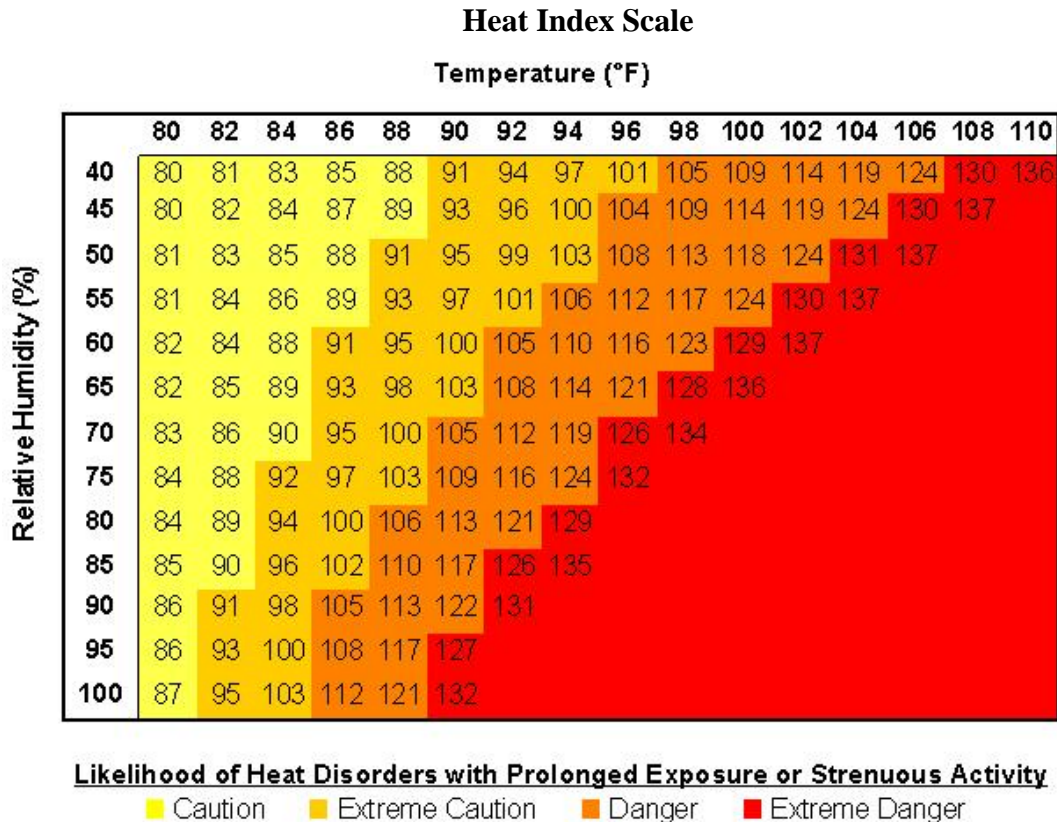
Extreme Heat: Summertime temperatures routinely climb above the 100-degree mark, which can create extremely uncomfortable conditions when combined with high dew points. Temperatures that hover 10 degrees or more above the average high temperature for an area, and last for several days or longer, are one measure of extreme heat. In addition, humid or muggy conditions can persist, and air quality can deteriorate during the summer when a dome of high atmospheric pressure creates a temperature inversion that traps a stagnant air mass near the ground.

Location

The entire Planning Area is affected by extreme heat.

Extent

The Planning Area uses the National Weather Service Heat Index Scale to monitor Extreme Heat. An example of this map is below. The Planning Area can experience index ranges that fall in the *Caution* to the *Extreme Danger* categories.



Previous Occurrences

Excessive Heat Events, 2013-2023

From the NOAA Storm Events Database

<https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=40,OKLAHOMA>

Date	Description
June -August 2015	With high pressure in place, heat indices ranged from 92-106 degrees between August 1 st and August 5 th .
June -August 2016	With high pressure in place, heat indices ranged from 97-109 degrees between June 15 th and June 20 th .
June -July 2018	Maximum temperatures reached to about 96 degrees with a heat index of 102 degrees.
June - August 2019	Hot temperatures led to heat advisories and excessive heat warnings to be issued many days over this period.

June – August 2020	Hot temperatures and high humidity led to heat advisories.
June – September 2021	Hot temperatures and humidity combined lead to a period of oppressive heat on June 9 th through June 13 th , with heat advisories issued for much of central and western Oklahoma.
June – August 2022	Heat and humidity combined to produce oppressive heat indices that exceeded 105 degrees across much of the State.
June – July 2023	Heat and humidity combined to yield 105-110 degree heat indices across portions of the area.

Probability of Future Events

The probability of future Extreme Heat events in the Planning Area is **HIGH**.

Future Climatological Trends

The city of Newcastle is bracing for future extreme heat conditions that are becoming increasingly likely due to climate change. Scientists and researchers project a significant increase in the frequency and intensity of heat waves. This could mean more scorching summer days with soaring temperatures, posing severe health risks, and stressing energy infrastructure. In response, experts are emphasizing the importance of urban planning measures like green spaces, heat-resistant building designs, and public cooling centers to mitigate the impact of extreme heat. Furthermore, they stress the significance of climate mitigation efforts to curb the progression of extreme heat conditions. Preparing for these challenges will be crucial to safeguard the well-being of Newcastle's residents in a warmer and more unpredictable climate.

Vulnerability and Impact

The impact of extreme heat is primarily a danger to people, resulting in muscle cramps, nausea, heat exhaustion, heat stroke, and death. Heat has consistently caused the highest number of fatalities, among all other hazards.

Extreme heat also increases the risk of and impacts from wildfire and drought and is hazardous to agricultural crops and livestock. The demands on water supplies can result in shortages, rationing, and increased fire hazards. Roads and bridges are susceptible to damage from high temperatures. When high temperatures are combined with drought and high winds, the threat of wildfire can become severe. The impact of the extreme heat hazard can be mitigated by notifications and warnings to vulnerable populations, the establishment of cooling rooms, utility cost assistance programs, backup electric generation for critical facilities, and air conditioner loan programs.

Newcastle Public School District depends on the Oklahoma Electric Coop for electric service for each school location. Each location must maintain a comfortable temperature conducive to adults and children's needs during the school term and during certain school activities.

Impacts from climatological changes, land use development, and population patterns.

Newcastle's rapid population growth over the past 5 years, along with infrastructure projects like the turnpike to North Norman and the forthcoming nation's largest Tribal Hospital, raises concerns about extreme heat. Climate change exacerbates these issues, leading to more frequent and intense heatwaves. Urbanization and land development worsen the urban heat island effect, intensifying local temperatures and heat-related hazards. The growing population strains resources, escalating energy demand for cooling. These factors combine to pose significant health risks and strain infrastructure during heatwaves. Extreme heat events can lead to heat-related illnesses, strain on healthcare systems, and increased energy consumption for cooling. These impacts highlight the urgent need for proactive measures to address heat resilience in Newcastle's rapidly growing urban environment.

Jurisdiction	Vulnerability	Impact
City of Newcastle	<p>The Oklahoma Electric Cooperative supplies electricity service. During times of extreme heat, services routinely suffer outages due to the system being overloaded.</p> <p>Some city facilities do not have backup generators for cooling which can lead to employees experiencing heat-related injuries when buildings or worksite locations experience extreme heat.</p>	<p>Facilities during extreme heat events become too hot to allow work to continue. Businesses without backup generation for cooling may be forced to close.</p> <p>This can lead to the closing of some critical facilities which could mean a lack of city resources for the period of time the facility is closed.</p>
Newcastle Public School District	<p>Newcastle Public Schools depend on the Oklahoma Electric Cooperative to provide electricity that is utilized for cooling during times of extreme heat. School often begins in late August when extreme heat is present. None of the school facilities have back-up generators for cooling or heating purposes.</p>	<p>Extreme heat without adequate cooling devices would create health risks to students and faculty. School events could be reduced or canceled. The school may also lose food products without adequate cooling during extreme heat.</p> <p>If there is no power and no generator, this could lead to school closures which can put the students behind in</p>

		<p>curriculum. If power is lost and with no back-up generators would also lead to no power at the school gym facilities where mass sheltering would take place during a large incident.</p>
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3.4.5 Flood

Description

There are three common types of flooding in the City of Newcastle: riverine flooding, flash flooding, and urban flooding. Riverine flooding occurs from excessive rainfall in upstream areas that forces rivers and streams to rise and overflow their banks, inundating the adjacent floodplains.

Riverine flooding is usually a gradual process, with several hours to several days of warning time. This type of event usually remains in flood for a longer period than flash or urban flooding, and often causes more damage due to the length of time structures are inundated, the velocity and depth of water, and floating debris. Generally, a river rise of one foot above the SFHA is considered a flood of minor severity, with a major flood being a 500-year event.

Flash flooding is associated with the large convective thunderstorms that frequent the region and can drop between 1 and 5 inches of rain in the space of an hour. When the soil is already saturated, rainfall from such storms can converge in creeks and streams suddenly, with little warning. Although potentially hazardous to life and destructive of property, flash flooding usually lasts only a matter of hours.

Urban flooding occurs when heavy rainfall runs off of structures, parking lots, and streets and converges in culverts and drainage ways, often clogged with debris, causing streets to flood and storm sewers to back up.

Location

The entire planning area is susceptible to flooding. The City of Newcastle is located in McClain County in central Oklahoma. Newcastle is situated on relatively high, hilly ground overlooking a great bend in the Canadian River as it curves south towards Purcell. Although the Canadian River is the major waterway in the area, its events do not directly impact Newcastle, which is protected from river flooding by 50-80 foot bluffs on its northern and eastern sides. The Canadian River bed is at about 1100-1130 feet elevation as it sweeps around Newcastle, while the town is largely situated above 1200 feet. Newcastle's city center is located on a rolling plateau above the river, with hills rising to approximately 1,350 feet towards its western and southern borders.

According to the USGS, there are five major drainage basins in the Newcastle area: Coal Creek, Pond Creek, Boggy Creek, Bishop Creek, and Lower North Fork of Walnut

Creek. Newcastle also contains a small portion of the Middle Walnut Creek basin. Of these basins, the primary tributaries and subsequent tributary parts that affect Newcastle are Tributary A, B, and D of the Canadian River, all of Pond Creek Tributaries, and Tributary 1 and 2 of the main Stinson Creek within the North Fork of the Walnut Creek Basin. These tributaries are all identified in *FEMA's Flood Insurance Study* of November 16, 2007.

Pond Creek - Newcastle's city center is bordered by Pond Creek and its branching tributaries, which drain roughly 20 of Newcastle's 62.5 square miles. The *FEMA Flood Insurance Study* for Newcastle identified 14 Pond Creek tributaries. These are primarily right-bank tributaries, flowing out of Newcastle's western and southern hills.

Stinson Creek - Flowing south into the North Fork of Walnut Creek, Stinson Creek drains about 3.5 square miles in Newcastle's far southwestern quadrant—generally south of I-44 and west of OK Hwy 76. There are three Stinson Creek tributaries detailed in *FEMA's Flood Insurance Study*.

According to the USGS, the streams within Newcastle are part of six major drainage basins, which are listed in Table 3-3.

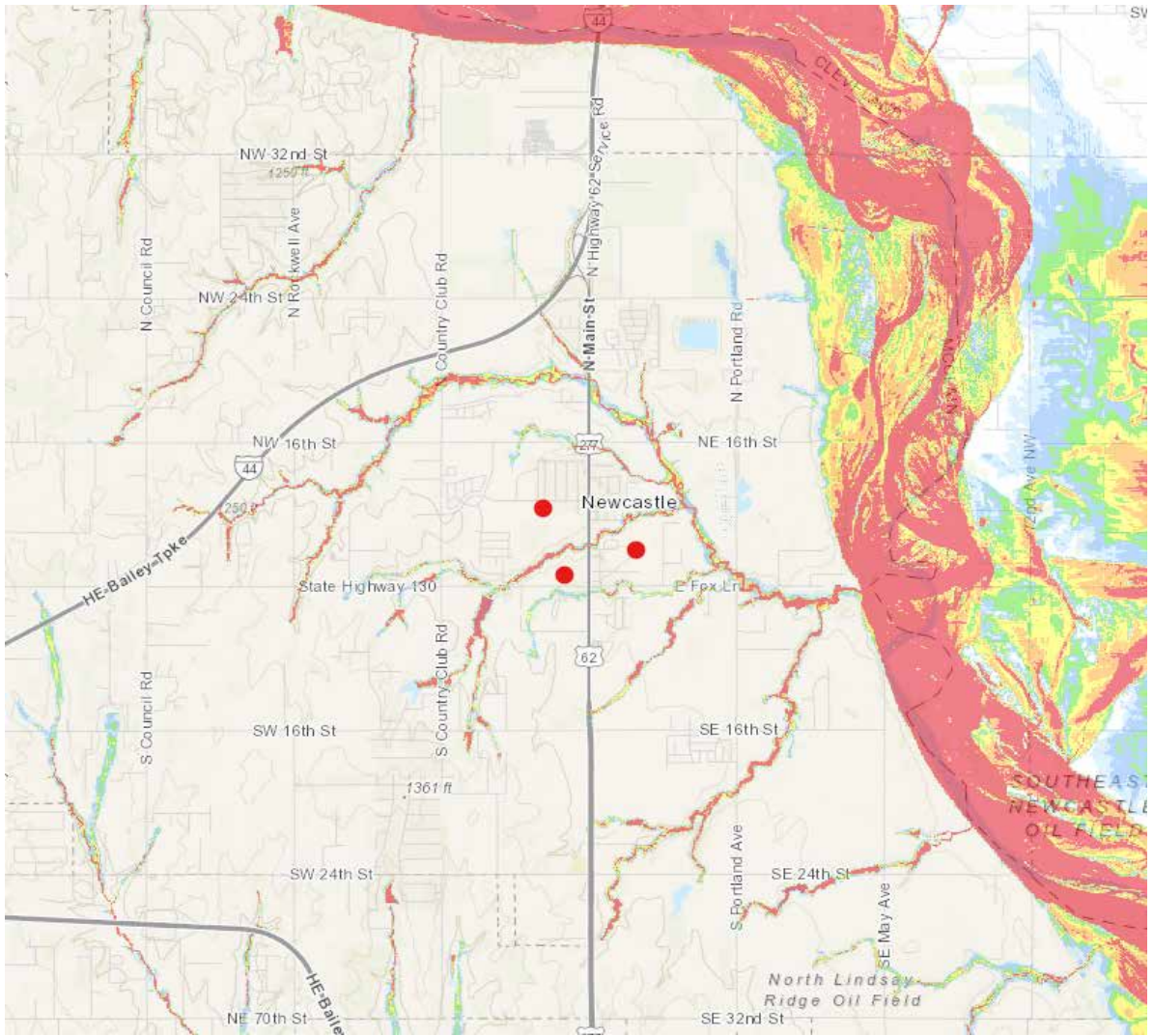
Table 3-3: City of Newcastle Streams and Corresponding Drainage Areas

Basin	Total Drainage Area (sq. mi.)
Bishop Creek- Canadian River	2.29
Boggy Creek- Canadian River	11.69
Coal Creek- Canadian River	11.70
Lower North Fork- Walnut Creek	11.02
Middle Walnut Creek	0.09
Pond Creek- Canadian River	24.09
Total	60.88

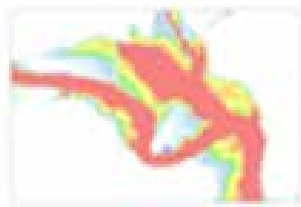
Extent/Severity







The City of Newcastle and Newcastle Public Schools consider a flood when special flood hazard areas exceed the base flood elevation. Floods will generally further be considered when areas of greater than two acres of normally dry land or greater than two properties have become inundated with water. Based on the information from the flood depth map, the entire planning area could experience < 1 feet to > 5 feet of flood depth. The red dots indicate the location of Newcastle Public Schools.

Base Flood Elevation Map [FEMA's Estimated Base Flood Elevation \(BFE\) Viewer \(usgs.gov\)](https://www.fema.gov/estimated-base-flood-elevation-viewer)



Flood Depth (1%)



- | | |
|---|---|
|  ≤ 1 foot |  > 3 to 4 feet |
|  > 1 to 2 feet |  > 4 to 5 feet |
|  > 2 to 3 feet |  > 5 feet |

Structures

FEMA and this study have identified those areas within the watersheds of the streams within Newcastle that have a one-percent chance of flooding in any given year. These areas, commonly referred to as the 100-year floodplain, are designated as the SFHA on FEMA's Flood Insurance Rate Maps (FIRM).

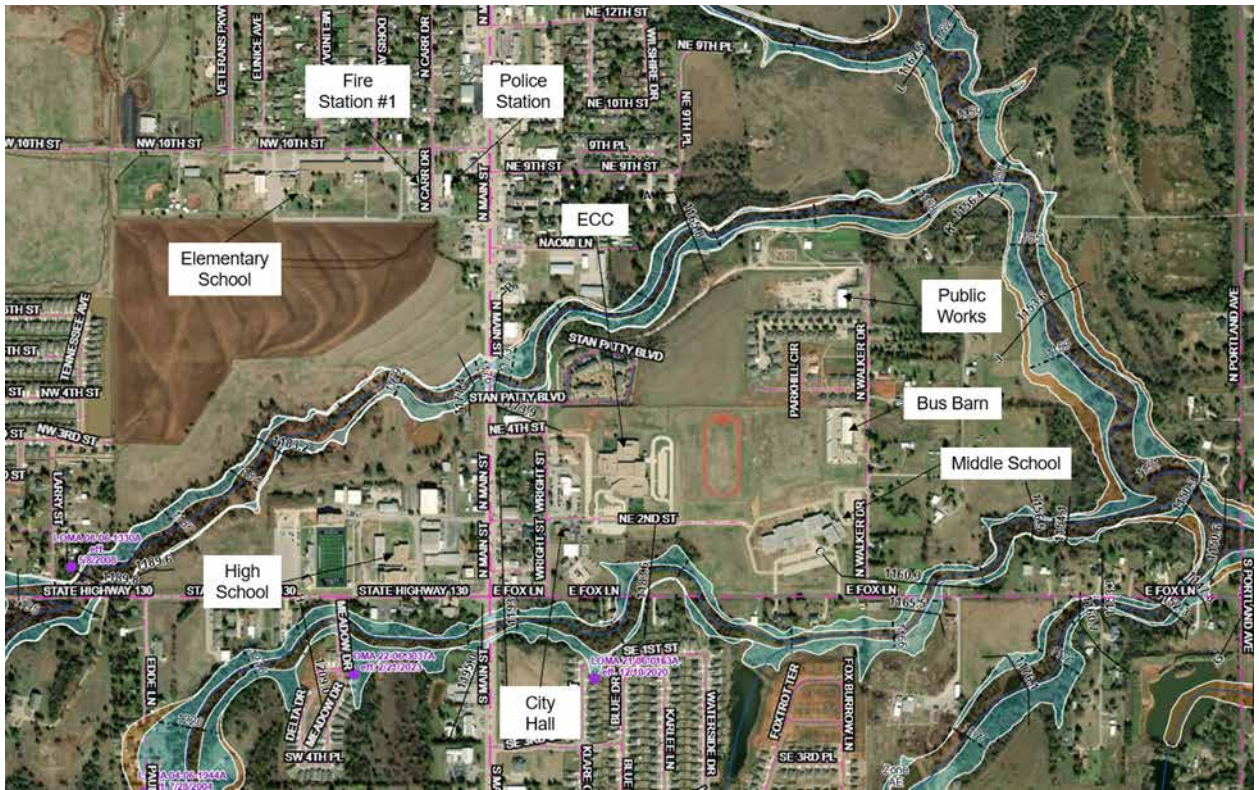
Although it is subject to occasional street flooding, Newcastle is not exposed to major flood risks at this time. Even homes flooded in the past have had very minimal damage. However, future urbanization and development will cause an increase in urban stormwater runoff, raise flood depths, widen floodplains, increase the Base Flood Elevation (BFE), and in some instances double the amount of discharge in streams.

The Federal Emergency Management Agency's (FEMA) Special Flood Hazard Area (SFHA) is Newcastle's regulatory floodplain. The SFHA, the national minimum standard, deals with existing conditions and does not take the impacts of future urbanization into account in its modeling or floodplain map delineations. The City of Newcastle regulates the FEMA SFHA, ensuring that no insurable structure will be built with its first finished floor below the Base Flood Elevation (BFE). However, buildings that have been permitted and built in accordance with the National Flood Insurance Program's (NFIP) minimum standards may flood in the future as the basins develop.

As development in new areas and revitalization of existing parcels occur, locations and building techniques should be closely examined. Areas that are currently flood-prone will likely be impacted by future development. Particularly vulnerable is the Pond Creek drainage. Increasing the urban footprint can potentially create water run-off to other areas that were previously at low or no risk of flooding. An aggressive and ongoing public awareness program should be maintained to ensure that new and existing developments remain in compliance with flood ordinances and policies.

Without the detailed modeling and analysis provided by a basin-wide Master Drainage Plan, it is not possible to accurately predict the effects of future development on flooding, or its impact on future buildings or existing development that has been permitted to the minimum standard.

Image 1: City of Newcastle and Newcastle Public School’s Structure Proximity to SFHA



Critical Facilities

The City of Newcastle has three critical facilities located in or adjacent to floodplains, listed in Table 3-4. Any renovations or improvements made to existing critical facilities should be evaluated to ensure they eliminate or mitigate future flood risk or damage.

Table 3-4: Newcastle Critical Facilities in Floodplain

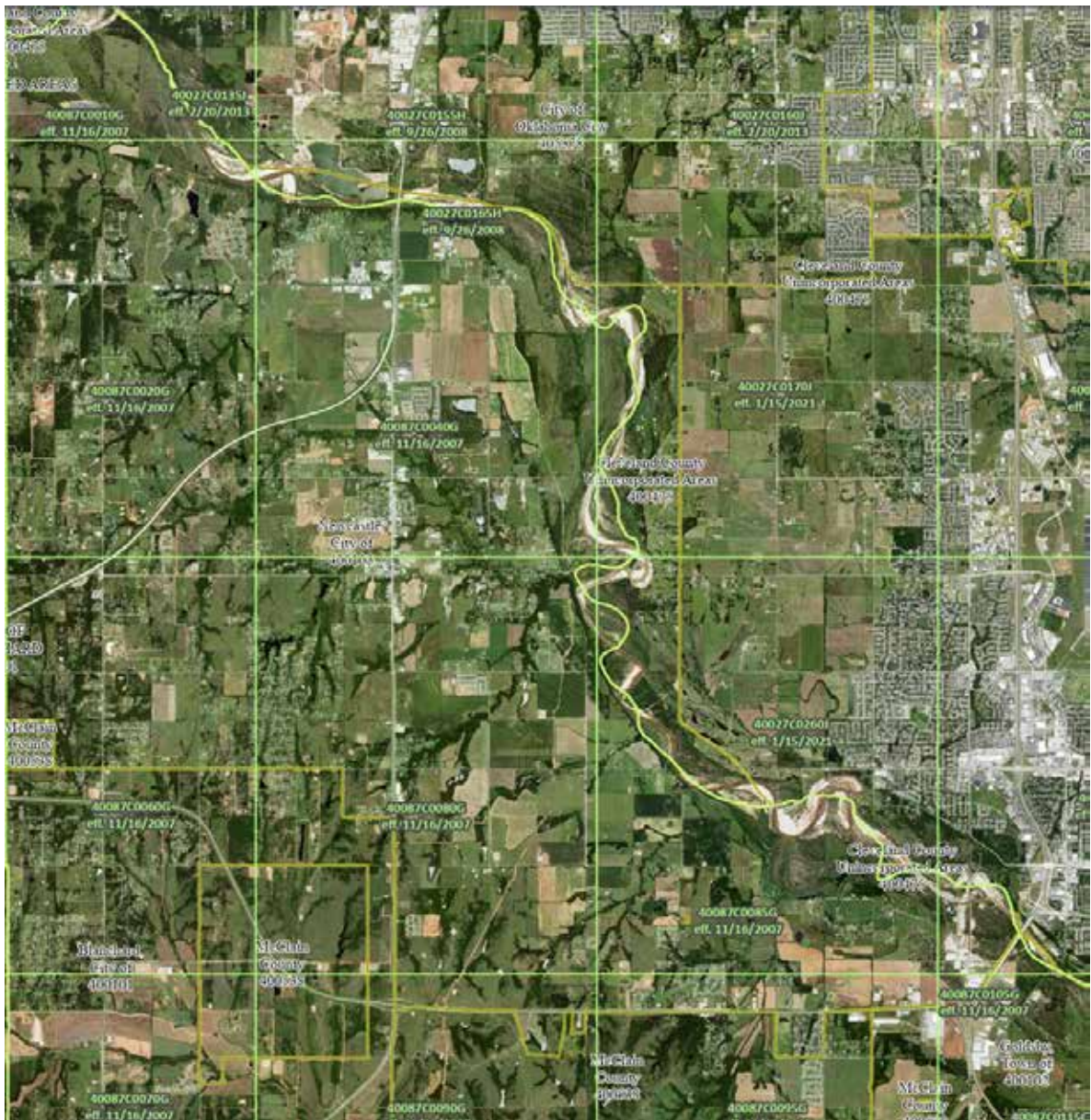
ID	Facility Name	Address	Type
3	Newcastle Water Dept.	717 N Walker Dr	City
4	Newcastle Water Treatment Plant	3900 NW 40th	City
12	Newcastle Senior Citizens Center	504 Hwy 130	Social Services

Infrastructure

Past flood events have had a minimal impact on the City’s infrastructure. Other than surface drainage overtopping roads, the City of Newcastle’s infrastructure has a very low vulnerability to flooding events. Newcastle’s most likely ongoing threat from flooding

would be an event that closes several highways, and floods several city streets and intersections. Any plans being developed or implemented for utility and street/roadway improvements within the jurisdiction should seek to mitigate or eliminate future flood damage or risk.

Image 2: Active FIRMs within Newcastle, OK



Previous Occurrences

Flood Events, 2010-2023

From the NOAA National Centers for Environmental Information
<https://www.ncdc.noaa.gov/stormevents>

Date	Event Narrative
July 8, 2010	Flooding was reported along North Rockwell Avenue between NW 24th and 28th Streets. Additional flooding was reported along the 800 block of East Fox Lane (Walker Dr.) and near the Bradford housing addition around NE 24 th St. Several roads had at least two to three feet of water over the top of them.
April 17, 2013	Persistent heavy rainfall from training supercell thunderstorms led to localized flash flooding in the Newcastle area. No major damage was reported, and no injuries or fatalities occurred.
May 31, 2013	Numerous roads closed in and around Newcastle. No damage was reported.
May 6, 2015	Water over several roads and flowing out of ditches along highway 62.
May 19, 2015	High water closed the 1800 block of Portland Avenue.
May 23, 2015	Rockwell Ave between NW 24th and Highway 37 closed due to flooding
June 28, 2021	A very moist airmass and slow-moving storms led to a multi-day heavy rainfall event for much of the area. 6 to 8+ inches fell in a swath from southwest Ok northeast along I-44 corridor. Several storms also produced isolated severe weather with hail and strong winds reported.

Source: NCDL Storm Events Database

Probability/Future Events

Based on historical data, the probability of future Flooding and Flash-flooding events in the Planning Area is MEDIUM.

Future Climatological Trends

Newcastle and its schools are facing a growing threat from floods due to changing climate patterns. Over the past 13 years, the city has experienced 7 flood/flashflood events, indicating a concerning trend. With climate change causing more intense and unpredictable weather, the risk of severe floods is on the rise. This poses a significant challenge to infrastructure, including schools, affecting public safety and community well-being. It's crucial for Newcastle and its schools to prioritize simple and effective measures to prepare for and adapt to these increasing flood risks.

Vulnerability and Impact

Flooding is a destructive force in the Planning Area, whether it occurs from rivers, streams, or flash floods transpiring from overtaxed drainage systems. Many roadways around Newcastle often become flooded. Flooded roads and bridges block the only access into and out of residential areas. Flood currents can sweep vehicles from the roadway into inundated ditches or rivers or wash them downstream when motorists unknowingly drive into water covering "hidden" washed-out roadway.

In 2010, 2013, 2015, 2010, and 2013 numerous roadways were closed to through traffic due to flooding events. In 2015 several areas along State Highway (62) were closed due to high water. This State Highway is a major traffic route into and out of the city. Streets in the South and Northwest sections were closed. Limited response time and access to life-sustaining facilities is a major concern.

Impacts from climatological changes, land use development, and population patterns.

Newcastle's remarkable population growth over the last five years shows no signs of slowing down, especially with significant infrastructure projects like the turnpike linking it to North Norman and the planned construction of the nation's largest Tribal Hospital in Newcastle. Such developments will undoubtedly spur further urbanization and population influx. However, alongside this growth comes increased vulnerability to flooding. Climatological changes, including more intense precipitation patterns and altered rainfall distributions, increase the risk of flooding. Moreover, rapid land use development, marked by the expansion of impermeable surfaces, reduces natural water absorption, exacerbating runoff and flooding. As more people settle in flood-prone areas, the impact of flooding on both property and public safety intensifies. With Newcastle poised for continued growth and development, proactive measures must be taken to mitigate the hazards of flooding, including resilient infrastructure planning, comprehensive floodplain management, and community awareness initiatives.

Jurisdiction	Vulnerability	Impact
City of Newcastle	During riverine, flash, and urban flooding events, roads, bridges, critical infrastructure, businesses, and residential homes are susceptible to damage. Areas particularly close to Pond Creek, Walnut Creek, Coal Creek, Bishop Creek, Boggy Creek, and Candian River are more susceptible to damages during a flooding event. Farms and ranches on the outskirts of Newcastle are	Roads become impassible, homes and businesses are inaccessible, and response to an emergency becomes limited or impossible. Roads that become impassible create a financial and time hardship to residents, school districts, and others in that they must find alternate routes around flooded areas. A loss of farm and ranch revenue negatively affects Newcastle's economy. In addition to the

	vulnerable to flooding when water overruns their fields.	farming and ranching economy, it also affects secondary businesses that supply goods and services to agricultural businesses.
Newcastle Public School District	Northwest 10 th Street between State Highway 62 and Veterans Parkway, and portions of State Highway 130, flood often when heavy rainfall causes flash flooding. These roadways provide the most direct route for staff, students, and buses traveling to Newcastle High School and Newcastle Elementary.	Closure of main transportation routes forces staff, students, and buses to drive 10 additional miles to access alternative roadways to get to the High School. A flooding event that affects transportation routes can directly affect school operations, and result in school closures until flood waters recede. If flooding causes a partial closure of roads, alternative routes can become congested.

3.4.6 Hail

Description

Hail is a form of solid precipitation that consists of balls or irregular lumps of ice, which are individually called hailstones. Hail formation requires an atmospheric environment of strong, upward moving air, called an updraft, within the subfreezing region of a thunderstorm cloud. Large hail stones greater than an inch in diameter (quarter size), can result from a severe thunderstorm and require a very powerful updraft to form. Most large hail is the product of supercell thunderstorms, which have a sustained rotating updraft that moves growing hailstones through the height of the cloud before falling to the ground.

Location

The entire Planning Area is affected by Hail.

Extent

Hail occurs most often during severe thunderstorms and usually affects small portions of the Planning Area. Depending on size, Hail is destructive to roofs, vehicles, building siding, windows, and crops as well as other materials that sustain damage from hard objects. The Planning Area uses the Hail Description Scale to categorize Hail and can experience any hail size on that scale.

Hail Diameter/Description Scale

Hail Diameter (Inches)	Description
1/4"	Pea
1/2"	Small Marble
3/4"	Penny or Large Marble
7/8"	Nickel

Hail Diameter (Inches)	Description
1”	Quarter
1 1/4”	Half Dollar
1 1/2”	Walnut or Ping Pong Ball
1 3/4”	Golf Ball
2”	Hen’s Egg
2 1/2”	Tennis Ball
2 3/4”	Baseball
3”	Teacup Size
4”	Grapefruit
4 1/2”	Softball

Previous Occurrences

Between 2013 and 2023 there were seventy-six hail events in McClain County. Thirteen of these events occurred in Newcastle. The table below represents some notable events that affected the Planning Area.

Hail Events, 2013-2023

From the NOAA National Centers for Environmental Information

<https://www.ncdc.noaa.gov/stormevents>

Date	Description
May 2013	A moist and very unstable airmass was in place over the eastern two-thirds of Oklahoma, to the east of a dryline. Additionally, strong wind shear was present as a mid-level jet streak carved into the southern Plains. Several supercells developed along the dryline during the mid and late afternoon hours, producing large hail. Two supercells in central Oklahoma also produced tornadoes, including a few significant, damaging tornadoes.
May 2013	Thunderstorms developed producing tornadoes and hail up to the size of half dollar was reported.
May 2015	Storms developed across the Texas panhandle and developed into a line as it moved eastward across southern Oklahoma producing hail up to 1”.
June 2015	Storms formed along a southward moving cold front producing hail up to 1”.
March 2017	Storms formed across central and south central Oklahoma and hail was the primary hazard producing hail up to the size of 1.25”
April 2017	A cold front swept through into abundant moisture causing storms to form producing hail up to the size of 1.25”.
August 2018	Storms formed ahead of a front across Oklahoma producing flash flooding and hail up to the size of 1.75”.
March 2019	A slow-moving cold front produced multiple rounds of thunderstorms that produced hail up to the size of 1”.
May 2019	Thunderstorms moved into the area late in the evening producing hail up to the size of 1”.
April 2020	Numerous severe thunderstorms formed along a cold front in northern Oklahoma and swept southward across the state producing hail up to the size of 1”.
August 2020	A stalled frontal boundary and anomalous moisture led to the development of numerous thunderstorms which produced large hail up to the size of 1.75”.

April 2021	Later in the day, renewed storm development led to an isolated supercell which tracked across southern portions of the OKC metro area with 2-3" diameter hail and damaging winds. Extensive damage was reported with this storm, with most significant damage concentrated in Norman. Damage estimates are easily into the hundreds of millions of dollars. 1.75" hail was reported in Newcastle.
October 2021	Numerous severe thunderstorms developed across Oklahoma and Texas during the afternoon and evening producing the size of hail up to 1.75".

Probability of Future Events

Based on historical data, the probability of future Hail events in the Planning Area is HIGH.

Future Climatological Trends

In the future, Newcastle is likely to experience more hailstorms due to changing climate patterns. As global temperatures rise, the risk of intense hail events in the region increases. This could have significant impacts on infrastructure and agriculture. To cope with these changes, it's important for the community and policymakers in Newcastle to be prepared and adopt sustainable practices that can withstand the challenges posed by the evolving climate.

Vulnerability and Impact

Newcastle faces vulnerabilities and significant impacts when it comes to hailstorms. The city's infrastructure, including buildings, vehicles, and public spaces, is at risk of damage from hail, potentially leading to increased maintenance costs and disruptions. Agriculture may suffer, affecting local crops and farmers. Furthermore, the economic implications extend to insurance claims and the potential for increased premiums. In terms of public safety, hailstorms can pose risks to residents and visitors alike. Therefore, Newcastle must prioritize strategies for building resilience, implementing protective measures for structures, and ensuring emergency response capabilities to mitigate the potential consequences of hailstorms on both the urban landscape and the local economy.

Newcastle Public Schools also face vulnerabilities and impacts during hailstorms, as these weather events can affect school buildings, buses, and outdoor facilities. The potential for property damage and disruptions to the learning environment may necessitate additional resources for repairs and maintenance. Furthermore, the safety of students and staff is paramount during severe weather, requiring well-defined emergency protocols to ensure their well-being. The financial strain on the school system, including potential budget adjustments for repairs and replacements, adds an extra layer of concern. Collaborative efforts between city officials and the education sector are essential to develop comprehensive plans that prioritize the resilience of Newcastle's public schools in the face of hailstorm vulnerabilities.

Impacts from climatological changes, land use development, and population patterns.

Newcastle's rapid population growth over the past 5 years, combined with infrastructure projects like the turnpike to North Norman and the forthcoming nation's largest Tribal

Hospital, raises concerns about hail hazards. Climate change exacerbates these issues, potentially leading to more frequent and severe hailstorms. As urbanization and land development reshape the landscape, they can influence hail hazards by altering surface conditions and local climate dynamics. The growing population further compounds the impact of hail events, increasing the density of property and infrastructure at risk of damage. These factors collectively heighten the vulnerability of Newcastle to hailstorms and underscore the urgent need for proactive measures to mitigate risks and enhance resilience in the face of changing climatic and demographic conditions.

Jurisdiction	Vulnerability	Impact
City of Newcastle	<p>Police, Fire, and Utility vehicles do not have covered parking and are open to hail damage.</p> <p>The Water Treatment Plant, City Hall, City Maintenance Facility, and Fire Station 1 are older structures and may have weak roofing.</p> <p>Farms in the planning area are vulnerable to hail damage.</p>	<p>Damage to city response vehicles may result in inoperability and may cause a delayed response for first responders.</p> <p>Damage to critical city facilities can cause disruption of services and prevent life threatening return of services.</p> <p>A loss of farm revenue negatively affects Newcastle’s economy. In addition to the farming economy, it also affects secondary businesses that supply goods and services to agricultural businesses.</p>
Newcastle Public School District	<p>Newcastle Public Schools have no covered parking for school transportation vehicles.</p> <p>The schools do not have covered walkways for students and faculty to move between buildings.</p> <p>Protective film is not present on school windows.</p>	<p>Damage to transportation equipment can result in economic and capability loss to schools and potentially cause a disruption of operations and the burden of unexpected costs, not covered by insurance, for repairs and replacement.</p> <p>Unprotected walkways can injure students and staffs during Hail events.</p> <p>Broken windows can injure students and staff during Hail events.</p>

3.4.7 High Winds

Description

High winds can result from thunderstorms, strong cold front passages, or gradient winds between high and low pressure. Damaging winds are often called “straight-line” winds to differentiate the damage they cause from tornado damage. Downdraft winds are a small-scale column of air that rapidly sinks toward the ground, usually accompanied by precipitation as in a shower or thunderstorm. A downburst is the result of a strong downdraft associated with a thunderstorm that causes damaging winds near the ground.

Location

The entire Planning Area is affected by High Winds.

Extent

During strong thunderstorms, the Planning Area may experience straight-line and high winds that cause damage to more solid buildings and utility services. The Planning Area uses the Beaufort Wind Chart to categorize High Winds. The Planning Area can experience any category of wind speed on this chart.

Beaufort Wind Chart – Estimating Winds Speeds

Beaufort Number	MPH		Terminology	Description
	Range	Average		
0	0	0	Calm	Calm. Smoke rises vertically.
1	1-3	2	Light air	Wind motion visible in smoke.
2	4-7	6	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8-12	11	Gentle breeze	Leaves and smaller twigs in constant motion.
4	13-18	15	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	19-24	22	Fresh breeze	Smaller trees sway.
6	25-31	27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	32-38	35	Near gale	Whole trees in motion. Some difficulty when walking into the wind.
8	39-46	42	Gale	Twigs broken from trees. Cars veer on road.
9	47-54	50	Severe gale	Light structure damage.
10	55-63	60	Storm	Trees uprooted. Considerable structural damage.
11	64-73	70	Violent storm	Widespread structural damage.
12	74-95	90	Hurricane	Considerable and widespread damage to structures.



Webpage: <http://www.weather.gov/iwx>

Twitter: @nwsiwx

Facebook: NWSNorthernIndiana



Previous Occurrences

Data retrieved from the National Weather Service office in Norman, Oklahoma ranging from 1/1/2013 - 1/1/2023, reveals a significant number of wind events at the McClain County Mesonet site. Specifically, records indicate 427 instances where wind speeds surpassed 35 mph, with certain events registering gusts exceeding 80 mph.

The following table represents High Wind examples that caused damage in the Planning Area. The Planning Area gets High Winds annually, but they may not be reported.

High Wind Events, 2013-2023

From the NOAA National Centers for Environmental Information

<https://www.ncdc.noaa.gov/stormevents>

Date	Description
May 2013	A tornado outbreak occurred during the afternoon and evening hours of the 20th. Several tornadoes occurred from central Oklahoma down through south central Oklahoma near the Red River. The strongest tornado touched down near Newcastle and traveled through Moore and south Oklahoma City. This tornado caused catastrophic damage in these areas, with a maximum rating of EF-5. The tornado claimed 24 lives and caused billions of dollars in damage. In addition to the tornadoes, large hail and damaging winds cause damage in many areas.
June 2015	Storms formed along a southward moving cold front on the 29th, with several of these storms becoming severe in central Oklahoma. A two and a half foot diameter tree was blown down onto the road on Sara road between Fox lane and Tecumseh road.
July 2016	Scattered storms began to form along a front through central Oklahoma on the evening of the 25th, with a few of the early storms producing severe winds. Fences were blown down on highway 37. A large tree and several small to medium branches were also blown down. The tree took out a power line.
May 2017	Storms formed along the dryline in the Texas panhandle on the afternoon of the 16th before moving eastward. As a cold front caught up to the storms, convection increased and storms began to form into a line. This line continued eastward across the state overnight into the 17th.
October 2017	Severe thunderstorms developed late in the evening along and just ahead of a cold front in unstable and uncapped air. Damaging wind gusts were the severe threat with this storm.
May 2018	Several discrete supercells formed off a dryline in the eastern parts of the panhandles in the late afternoon of the 2nd. These storms moved eastward through the evening, eventually congealing into a line before coming across central Oklahoma. QLCS tornadoes became a significant hazard at this point. After this round of storms made its way out of the area, scattered storms began to form from central Texas up into south western Oklahoma overnight, moving generally northeast into the early morning hours.
June 2018	A line of storms coming off the Rockies swept through Oklahoma late on the 22nd, producing numerous severe wind gusts.
May-June 2019	An extremely unstable environment led to widespread severe weather across Texas and Oklahoma on the 20th into the morning of the 21st.
July-August 2020	A convective system dropped southward through northern and central Oklahoma during the morning of the 10th, with numerous severe wind reports received. Estimated severe wind gust.
April 2021	Storms continued into the 28th as a slow moving trough approached. Early morning convection produced numerous flood reports. Later in the day, renewed storm development led to an isolated supercell which tracked across southern

	portions of the OKC metro area with 2-3 diameter hail and damaging winds. Extensive damage was reported with this storm, with the most significant damage concentrated in Norman. In Cleveland County, the hail and wind caused over 2 million dollars in damage just to county-owned buildings. While exact numbers for private homes, businesses and vehicles are not available, damage estimates are easily into the hundreds of millions of dollars. Estimated severe wind gusts.
August 2021	Isolated pulse thunderstorms developed during the late afternoon and early evening of the 16th, with an isolated report of severe wind received. Estimated severe wind gust.
October 2021	Strong winds were observed across portions of Oklahoma behind a strong storm system exiting to the east during the late morning through the afternoon of the 28 th of October.
December 2021	A powerful storm system tracked across the southern and central plains on the 15 th of December, bringing extreme wind speeds and multiple wildfires to the area.
January 2022	Strong winds occurred behind a cold front during the afternoon and evening of January 14 th , with occasional gusts to 60 mph recorded.
April 2022	Widespread strong winds occurred across western Oklahoma and western north Texas in the wake of a cold front on the evening of April 5 th . Strong winds then continued during the afternoon of the 6 th and 7 th on the backside of the system, helping fuel several large wildfires in the region.

Probability of Future Events

Based on historical data, the probability of future High Wind events in the Planning Area is HIGH.

Future Climatological Trends

In the planning area of Newcastle, future climatological trends are indicating a heightened risk of high wind hazards. Scientists and researchers are observing an escalation in the frequency and intensity of wind events due to shifting climate patterns. These trends suggest that Newcastle may experience more frequent bouts of strong winds, potentially accompanied by severe storms or cyclones. Such conditions could pose significant challenges to the region's infrastructure, agriculture, and ecosystem. Understanding these climatological trends is crucial for Newcastle to develop effective strategies for adaptation and resilience in the face of increasing high wind hazards.

Impacts from climatological changes, land use development, and population patterns.

In the face of climate change, rapid land development, and population growth, the planning area of Newcastle faces heightened susceptibility to the impacts of high wind hazards. Climate change models predict an escalation in the intensity and frequency of wind events, exacerbating the risk of destructive storms and tornadoes. The expanding urban landscape and increasing infrastructure alter natural wind patterns, creating potential wind tunnels and funneling gusts through developed areas. Over the past five years, Newcastle has experienced a significant population increase and has been recognized as the fastest growing city in Oklahoma for the past two years. With future developments such as the turnpike connecting Newcastle to Norman and the construction

of the nation's largest tribal hospital in 2026, population growth and land development show no signs of slowing down.

Vulnerability and Impact

High Wind is a destructive force in the entire Planning Area. High Wind can cause flying debris, downed trees, damage to utility services and can lift roofs and siding from buildings.

Jurisdiction	Vulnerability	Impact
City of Newcastle	<p>Newcastle only has above ground utility lines served by Oklahoma Electric Cooperative. During a high wind events these utilities and communication towers are vulnerable to being damaged. This damage could result in frequent power outages.</p> <p>The Water Treatment Plant, City Hall, City Maintenance Facility, and Fire Station 1 are older structures and may have weak roofing and siding.</p> <p>Farms in the planning area are vulnerable to high wind damage.</p>	<p>Damage to utilities can cause disruption of services and prevent life altering services to those that depend on electricity for health sustaining services.</p> <p>Damage to roadways from downed trees or power lines disrupt communications and impede emergency response.</p> <p>Damage to critical city facilities can cause disruption of services and prevent life threatening return of services.</p> <p>A loss of farm revenue negatively affects Newcastle's economy. In addition to the farming economy, it also affects secondary businesses that supply goods and services to agricultural businesses.</p>
Newcastle Public School District	<p>Newcastle Public Schools are served by Oklahoma Electric Cooperative utilities and are subject to the same vulnerable loss of power during school hours.</p> <p>None of the schools have film to prevent windows from shattering from flying debris.</p>	<p>Damage to utilities can cause disruption to any school facility that depends on services for their students and faculty.</p> <p>Damage to equipment can result in an economic and capability loss to schools, potentially causing a disruption to school operations and the burden of</p>

	Transportation vehicles without enclosed covering can be rendered inoperable.	unexpected costs for repair and replacement.
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3.4.9 Lightning

Description

Lightning is a discharge of intense atmospheric electricity, accompanied by a vivid flash of light, from one cloud to another or from a cloud to the ground. Lightning is formed by the separation of positive and negative charges that occur when ice crystals collide high up in a thunderstorm cloud. As lightning passes through the atmosphere the air immediately surrounding it is heated, causing the air to expand rapidly. The resulting sound wave produces thunder.

Location

The entire Planning Area is affected by Lightning.

Extent

The planning area uses the Lightning Activity Level (LAL) Chart to describe lightning activity that the planning area may experience.

Lightning Activity Level (LAL)	
Is a scale which describes lightning activity. Values are labeled 1-6:	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a five minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5 minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced Lightning is frequent, 11 to 15 cloud to ground strikes in a 5 minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5 minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

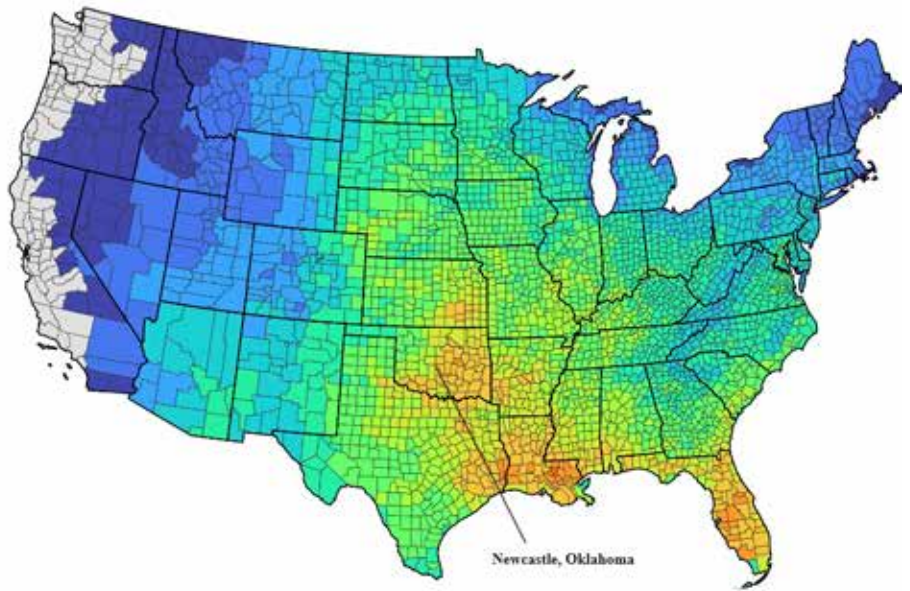
The planning area may experience an activity level range of all levels LAL 1-6 during severe weather events.

Previous Occurrences

The Planning Area receives Lightning frequently throughout the year. According to the data in the Vaisala Cloud-to-Ground Lightning Flash Density Maps included in the Extent section, the Planning Area has received approximately 8-10 Lightning flashes per square km/per year from 2016-2022. During that period, utility infrastructure damage due to Lightning events has caused power interruptions, but no financial impact has been reported.

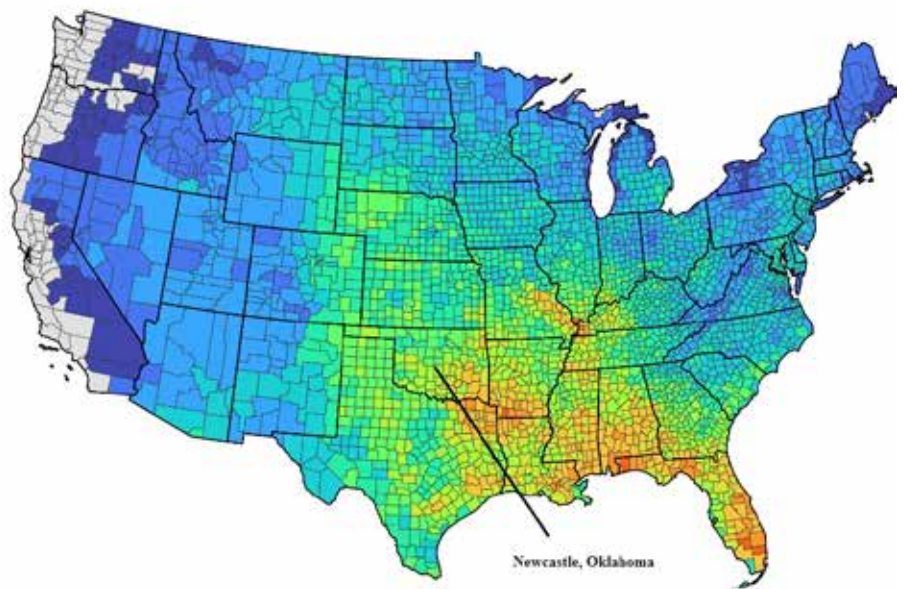
Cloud-to-ground flash density in the U.S.

2023 GRIDDED 2016-2022
2023 COUNTY 2016-2022



Cloud-to-ground flash density in the U.S.

2023 GRIDDED 2016-2022
2023 COUNTY 2016-2022



VAISALA Xweather

ABOUT US

MENU 1

Probability of Future Events

Based on historical data, the probability of future Lightning events in the Planning Area is HIGH.

Future Climatological Trends

As Newcastle, Oklahoma emerges as one of the fastest-growing cities in the state, its expansion inevitably intertwines with future trends of climate change, particularly in relation to lightning activity. With increasing infrastructure development and residential homes, alongside expansions like the sports complex and Veteran's park, the city's footprint expands, altering local environmental dynamics. Climate change can intensify weather patterns, potentially leading to increased frequency and severity of thunderstorms, which are often accompanied by lightning strikes. As urbanization progresses, it can modify local atmospheric conditions, potentially influencing lightning occurrence and distribution. Thus, as Newcastle continues to grow, understanding the intricate relationship between urbanization, climate change, and lightning activity becomes crucial for informed planning, risk management, and ensuring the safety and resilience of the community.

Impacts from climatological changes, land use development, and population patterns.

The effects of climate change, population growth, and urban development can significantly impact lightning activity in places like Newcastle, Oklahoma. Climate change alters weather patterns, making thunderstorms more frequent and intense, which often means more lightning strikes. As Newcastle expands with more people and development, changes in land use can alter local weather conditions, potentially affecting where and how lightning occurs. For instance, deforestation or building construction can change wind patterns and heat distribution, influencing lightning activity. Given these changes, it's crucial to install lightning detector warning devices in places like parks and

sports complexes. These devices can help alert people to approaching lightning storms, providing valuable time to seek shelter and stay safe during outdoor activities. In growing communities like Newcastle, where outdoor recreation is popular, such precautions have become increasingly important to protect residents and visitors from the dangers of lightning strikes.

Vulnerability and Impact

Lightning events pose significant challenges to Newcastle's critical infrastructure, including power outages at water and wastewater treatment plants, utility stations, and substations, impacting essential services like schools and emergency responders. Damage to transformers, downed power lines, and staff shortages hinder electric and gas service providers' ability to meet demand. Transportation systems and emergency services also face disruptions, with communication interruptions and potential dangers to workers. Despite some safety measures, facilities like the police and fire departments remain vulnerable without lightning protection. Ensuring comprehensive lightning safety measures across all vital infrastructure is crucial to mitigating risks and maintaining essential services during such events.

Jurisdiction	Vulnerability	Impact
City of Newcastle	<p>Newcastle only has above ground utility lines served by Oklahoma Electric Cooperative. During lightning events these utilities are vulnerable to being damaged. This damage could result in frequent power outages.</p> <p>Lightning events pose significant challenges to Newcastle's critical infrastructure, including power outages at water and wastewater treatment plants, utility stations, and substations, impacting essential services like schools and emergency responders.</p> <p>The sports complex and local parks do not have lightning detection systems. Staff and citizens have no definitive way of knowing when lightning is within a 10-mile range.</p>	<p>Damage to utilities can cause disruption of services and prevent life altering services to those that depend on electricity for health sustaining services.</p> <p>Damage to roadways from downed trees or power lines disrupt communications and impede emergency response.</p> <p>Damage to critical city facilities can cause disruption of services and prevent life threatening return of services.</p> <p>Lack of the ability to detect lightning within a 10-mile range would prevent staff and citizens from vacating the area and cause injury or even loss of life.</p>

Newcastle Public School District	<p>Newcastle Public Schools are served by Oklahoma Electric Cooperative utilities and are subject to the same vulnerable loss of power during school hours.</p> <p>None of the schools have backup generators to keep power on in case of power outages.</p> <p>The school does not have any lightning detection systems. Staff have no definitive way of knowing when lightning is within a 10-mile range.</p>	<p>Damage to utilities can cause disruption to any school facility that depends on services for their students and faculty.</p> <p>Damage to equipment can result in an economic and capability loss to schools, potentially causing a disruption to school operations and the burden of unexpected costs for repair and replacement.</p> <p>Without proper detection methods, staff must rely on personal judgement and anecdotal evidence to determine if an outdoor activity should be cancelled due to Lightning. This judgement is often inconsistent and puts students and staff at risk for injury/death.</p>

3.4.9 Tornado

Description

Tornados are violently rotating columns of air that reach from the bottom of a cumulonimbus cloud to the ground. Tornados are found in severe thunderstorms, but not all severe thunderstorms produce tornados. While all tornados touch the ground and the bottom of a cloud, only part of the tornado can be visible. A tornado may be on the ground for only a few seconds, or last for over an hour. They can appear in a variety of shapes and sizes, ranging from thin, rope-like circulations to large, wedge-shapes greater than one mile in width. However, a tornado's size is not necessarily related to its wind speed. The strongest tornados can have wind speeds over 200mph. In Oklahoma, most tornados occur between 3 PM and 9 PM, from March through May, but may occur anytime the necessary atmospheric conditions of wind shear, lift, instability, and moisture are present.

Location

The entire Planning area is affected by a Tornado.

Extent

Tornadoes occur most often when produced by severe thunderstorms that can be in all or portions of the Planning Area. The Planning Area uses the Enhanced Fujita Scale to

categorize the Tornado Extent. The Planning Area can experience any EF value on this scale.

Enhanced F Scale for Tornado Damage

FUJITA SCALE (Used Prior to 2007)			ENHANCED FUJITA SCALE	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85
1	73-112	79-117	1	86-110
2	113-157	118-161	2	111-135
3	158-207	162-209	3	136-165
4	208-260	210-261	4	166-200
5	261-318	262-317	5	Over 200

<http://www.spc.noaa.gov/faq/tornado/ef-scale.html>

NOTE ABOUT ENHANCED F-SCALE WINDS: The Enhanced F-scale still is a set of wind estimates (not measurements) based on damage. Its uses three-second gusts estimated at the point of damage based on a judgment of 8 levels of damage to the 28 indicators listed below. These estimates vary with height and exposure. Important: The 3 second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured, "one minute mile" speed.

Previous Occurrences

There have been 13 tornadoes in McClain County from 2013-2023, occurring over 10 years, 3 of which occurred directly in the planning area with 1 being reported as an EF-4. Tornado events in the planning area from 2013-2023 that caused damage are cited in the table below.

Tornado Events, 2013-2023

From the NOAA National Centers for Environmental Information

<https://www.ncdc.noaa.gov/stormevents>

Date	Description
May 2013	A tornado outbreak occurred during the afternoon and evening hours of the 20th. Several tornadoes occurred from central Oklahoma down through south central Oklahoma near the Red River. The strongest tornado touched down near Newcastle and traveled through Moore and south Oklahoma City. This tornado caused catastrophic damage in these areas, with a maximum rating of EF-5. The tornado claimed 24 lives and caused billions of dollars in damage. In addition to the tornadoes, large hail and damaging winds cause damage in many areas. The violent Newcastle-Moore tornado was first observed developing about one-half mile south of State Highway 37 in northwest Newcastle to the east of

	<p>Rockwell Avenue. EF4 damage was observed soon after the tornado crossed State Highway 37. The tornado continued to expand in size as it approached the Canadian River and moved into Cleveland County.</p> <p>Of the 212 direct injuries documented with this tornado, 5 are estimated to have occurred in McClain County.</p>
May 2015	<p>A potent Spring storm system took shape across the Southern and Central Plains. Strong surface cyclogenesis took shape during the day, allowing ample moisture to return northward with strong southerly flow. At the same time, a strong upper level shortwave trough allowed strong mid level westerlies to overspread much of the Plains region. With large instability and wind shear, the stage was set for widespread severe storm development. Storms initiated within the open warm sector ahead of the dryline. The first storm developed near Lawton and moved northeast along I-44 into parts of central Oklahoma, resulting in several tornadoes and large hail. Additional supercells spawned tornadoes across northern Oklahoma, and the slow moving nature of storms lead to several occurrences of flash flooding. Storms continued well into the night.</p> <p>Storm chasers observed a tornado in the southeast part of Newcastle. Aerial images indicated two outbuildings lost their roofs or were destroyed (DI 1, DOD 5).</p>
May 2015	<p>Storms developed in the panhandles on the 23rd under the influence of an upper level trough. These storms merged into a line and moved eastward over Oklahoma producing widespread flooding.</p> <p>A storm chaser observed a tornado estimated to be 1 mile west-southwest of Newcastle. No damage was reported.</p>

Probability of Future Events

Based on historical data, the probability of future Tornado events in the Planning Area is **MEDIUM**.

Future Climatological Trends

As Newcastle emerges as one of Oklahoma's top three fastest-growing cities, its development intersects with future climate change trends, potentially impacting tornado activity in the region. The rapid expansion of infrastructure and residential homes alters the local landscape, which, coupled with climate change, may influence tornado patterns. Climate change can intensify weather conditions, including the formation and severity of tornadoes, due to shifts in temperature and atmospheric dynamics. As Newcastle's growth continues, it's essential to consider how urbanization and climate change might interact to affect tornado occurrences and their potential impact on the city's expanding infrastructure and residential areas.

Impacts from climatological changes, land use development, and population patterns.

The convergence of climate change, land use development, and population patterns significantly impacts Newcastle during tornado events. Climate change amplifies atmospheric instability, increasing the likelihood of severe weather conducive to tornado formation. As Newcastle experiences rapid land use development, urban sprawl replaces natural landscapes with infrastructure, altering wind patterns and atmospheric conditions, and potentially influencing tornado paths and intensities. Population growth contributes to denser urban areas, placing more lives and property at risk during tornado events. Additionally, sprawling development may exacerbate tornado-related impacts by expanding the tornado's path of destruction across a wider area. The combination of these

factors heightens Newcastle's vulnerability to tornado hazards, emphasizing the urgent need for comprehensive disaster preparedness, resilient infrastructure, and effective emergency response strategies.

Vulnerability and Impact

Tornados are a destructive force in the entire Planning Area. Tornados can cause flying debris from downed trees, lifted rooftops, structure siding, and damage to utility services. Tornados can be unpredictable and expectedly form without a warning being given. Sudden power outages may render citizens more vulnerable if there are no alternate means of information available. The City's outdoor warning system is capable of sounding a warning but as the planning area continues to grow, the outdoor warning systems do not cover all residents within the planning area.

Jurisdiction	Vulnerability	Impact
City of Newcastle	<p>Newcastle's above-ground electric lines, electric poles, and older neighborhoods with mature trees can sustain damage from tornadoes.</p> <p>Language barriers and a lack of tornado education are factors in portions of Newcastle.</p> <p>Newcastle's storm sirens and communication towers/repeaters can sustain damage from tornadoes.</p> <p>Newcastle's critical facilities Water Treatment Plant, Sewer Plant, City Hall, Fire Stations 1 & 2, and Police Department/Dispatch Center can sustain damage from tornadoes.</p>	<p>Damage to utilities can disrupt services and prevent life-altering services to those who depend on electricity for health-sustaining services.</p> <p>Damage to roadways from downed trees or power lines disrupt communications and impede emergency response.</p> <p>Newcastle's growing population of diverse nationalities with various languages causes high anxiety during tornado events. Understanding where and how to seek shelter is not often well understood.</p> <p>Damage to storm sirens and communication towers/repeaters can disrupt services to warn the public and prevent life-altering services.</p> <p>Damage to any one of these facilities can disrupt services to the public and prevent life-altering services.</p>

	<p>Newcastle's mobile home parks can sustain significant damage from high winds and tornadoes.</p> <p>Residents of Newcastle and visitors of Newcastle are not allowed to use the community shelter during school hours due to the large capacity of students and staff.</p> <p>Critical facilities such as City Hall, Water/Sewer Plant, and City Maintenance Facility do not have backup generators if power outages occur due to tornado or high wind events taking down powerlines.</p>	<p>Damage to mobile homes can cause serious injury or loss of life for homeowners.</p> <p>Residents of Newcastle and visitors of Newcastle who rely on the community shelter during tornado events that occur during school hours, will not be able to use the facility and could sustain serious injury or loss of life.</p> <p>This can lead to the closing of some critical facilities which could mean a lack of city resources for the period of time the facility is closed.</p>
Newcastle Public School District	<p>Newcastle Public Schools are served by the Oklahoma Electric Cooperative and are subject to frequent power outages with severe thunderstorms that produce tornados.</p> <p>None of the schools have backup generators to keep power on in case of power outages.</p> <p>The Newcastle Elementary School does not have storm shelters within its facility and uses the Newcastle Community Shelter as a shelter which has a capacity of 1,094 people.</p>	<p>Damage to equipment can result in economic and capability loss to schools, potentially causing disruption to school operations and the burden of unexpected costs for repair and replacement.</p> <p>Damage to equipment can result in an economic and capability loss to schools, potentially causing a disruption to school operations and the burden of unexpected costs for repair and replacement.</p> <p>Students and staff can sustain injuries or possible loss of life while walking outside to seek shelter at the Newcastle Community Shelter.</p>

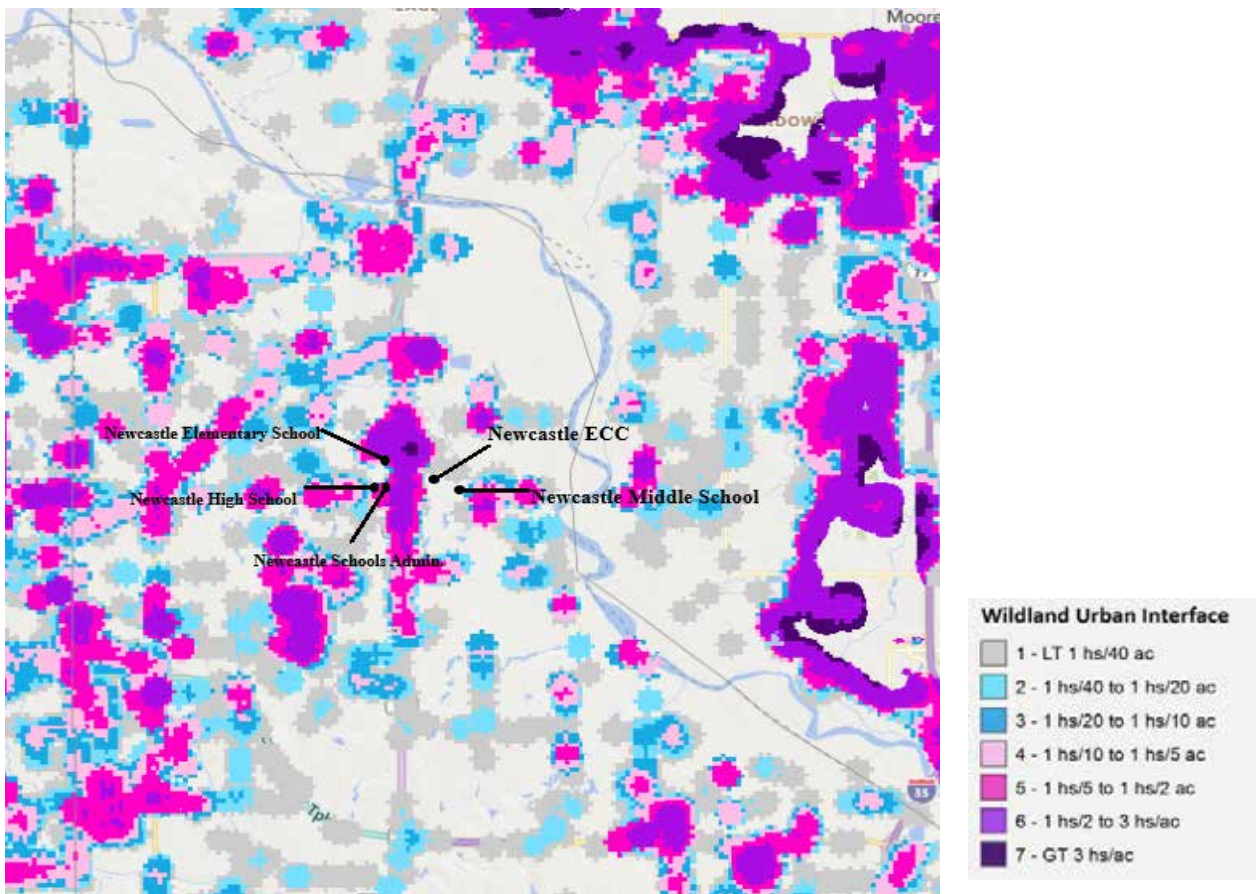
3.4.10 Wildfire

Description

A **wildfire** is an uncontrolled fire in a rural or wilderness area. The majority of wildfires occur when precipitation is low. A wildfire often begins unnoticed and can spread quickly, lighting brush, trees, and structures. There are three different classes of wildfires. A surface fire is common in grasslands, or areas with open vegetation, and can spread quickly. A ground fire is a dense, very hot fire that has a thick fuel source and significantly damages the soil health where it occurs. Crown fires are those that move by jumping along the tops of trees. Wildfires often begin unnoticed but are usually signaled by dense smoke filling the area for miles.

Location

The entire Planning Area is affected by Wildfire and can experience all ranges from 1-7 based on the WUI scale.



Extent

The Planning Area uses the Keetch-Bryan Drought Index with Fire Danger Rating Data Incorporated to categorize Wildfire Extent. The Planning Area can experience any rating value on these charts.

The Keetch-Byram Drought Index with Fire Danger Rating Data Incorporated

0 – 200	Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in spots and patches.
200 - 400	Fires more readily burn and will carry across an area with no gaps. Heavier fuels will still not readily ignite and burn. Also, expect smoldering and the resulting smoke to carry into and possibly through the night.
400 - 600	Fire intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
600 - 800	Fires will burn to mineral soil. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn thorough the night and heavier fuels will actively burn and contribute to fire intensity

Fire Danger Rating System

Rating	Basic Description	Detailed Description
CLASS 1: Low Danger (L) COLOR CODE: Green	fires not easily started	Fuels do not ignite readily from small firebrands. Fires in open or cured grassland may burn freely a few hours after rain, but wood fires spread slowly by creeping or smoldering and burn in irregular fingers. There is little danger of spotting.
CLASS 2: Moderate Danger (M) COLOR CODE: Blue	fires start easily and spread at a moderate rate	Fires can start from most accidental causes. Fires in open cured grassland will burn briskly and spread rapidly on windy days. Woods fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel – especially draped fuel -- may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
CLASS 3: High Danger (H) COLOR CODE: Yellow	fires start easily and spread at a rapid rate	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High intensity burning may develop on slopes or in concentrations of fine fuel. Fires may become serious and their control difficult, unless they are hit hard and fast while small.
CLASS 4: Very High Danger (VH) COLOR CODE: Orange	fires start very easily and spread at a very fast rate	Fires start easily from all causes and immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics - such as long-distance spotting - and fire whirlwinds, when they burn into heavier fuels. Direct attack at the head of such fires is rarely possible after they have been burning more than a few minutes.
CLASS 5: Extreme (E) COLOR CODE: Red	fire situation is explosive and can result in extensive property damage	Fires under extreme conditions start quickly, spread furiously and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the Very High Danger class (4). Direct attack is rarely possible and may be dangerous, except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions, the only effective and safe control action is on the flanks, until the weather changes or the fuel supply lessens.

Source: <http://www.wfas.net/content/view/34/51/>

Previous Occurrences

The following table represents natural vegetation, forest, woods, wildland, brush or brush/grass mixture, and grass fires reported for the City of Newcastle. The Planning Area sends reports to the National Fire Incident Reporting System (NFIRS).

Wildfire Events, 2015-2024

Newcastle “EMERGENCY REPORTING” database

<i>Incident Type</i>	<i>Description</i>			
Natural Vegetation Fire	<i>Total Count 2015-2024 = 0 with total estimates damages of \$0.00</i>			
	2015	0	2020	1
	2016	2	2021	1
	2017	1	2022	0
	2018	3	2023	1
	2019	0	2024	0
Forest, Woods, or Wildland Fire	<i>Total Count 2015-2024 = 0 with total estimates damages of \$0.00</i>			
	2015	0	2020	0
	2016	5	2021	0
	2017	1	2022	1
	2018	0	2023	1
	2019	0	2024	0
Brush or Brush/Grass Fire	<i>Total Count 2015-2024 = 1 with total estimates damages of \$2,500.00</i>			
	2015	4	2020	15
	2016	5	2021	5
	2017	12 (\$2500)	2022	21
	2018	6	2023	2
	2019	4	2024	6
Grass Fire	<i>Total Count 2015-2024 = 1 with total estimates damages of \$150.00</i>			
	2015	32	2020	26
	2016	28 (\$150)	2021	37
	2017	39	2022	40
	2018	23	2023	22
	2019	29	2024	10

Probability of Future Events

Based on historical data, the probability of future Wildfire events in the Planning Area is HIGH.

Future Climatological Trends

In the coming years, Newcastle may experience a shift in climatological trends due to wildfires. As temperatures continue to rise globally, the frequency and intensity of wildfires are likely to increase in regions like Newcastle. These fires not only pose immediate threats to lives and property but also contribute to long-term changes in the local climate. The smoke and ash produced by wildfires can worsen air quality, leading to respiratory issues and other health concerns for residents. Additionally, the release of greenhouse gases and aerosols during these events can further exacerbate climate change, potentially altering precipitation patterns and increasing the risk of drought.

Impacts from climatological changes, land use development, and population patterns.

In Newcastle, the convergence of climatological changes, land use development, and population patterns significantly influences the city's susceptibility to wildfires. As temperatures rise and weather patterns become increasingly erratic due to climate change, the risk of wildfires escalates. Concurrently, rapid land use development, driven by Newcastle's status as one of Oklahoma's fastest-growing communities, exacerbates this risk by encroaching upon natural areas susceptible to ignition. Moreover, population growth places more individuals and infrastructure in harm's way, intensifying the potential impact of wildfires on both human lives and property. The intersection of these factors underscores the urgent need for comprehensive wildfire management strategies that account for the complex interplay between climatic shifts, land development practices, and demographic trends in Newcastle. Such strategies should prioritize proactive measures like land use planning, community education, and emergency preparedness to mitigate the adverse effects of wildfires on the city and its residents.

Vulnerability and Impact

Wildfires are a destructive force in the entire Planning Area. Wildfires can cause damage to utility services when lines and poles are burned. Wildfires can be unpredictable when winds are high, and humidity is low. Newcastle has areas of open fields surrounding residential areas that is used for farming and growing grass for feed. These open spaces are a high fire fuel area during dry with low humidity conditions.

Jurisdiction	Vulnerability	Impact
City of Newcastle	<p>The water treatment plant and wastewater treatment plant are vulnerable to wildfire being surrounded by open fields and undeveloped acreage with trees and vegetation. Both of these facilities are within the WUI area.</p> <p>The planning area has above-ground utility poles.</p>	<p>Loss of electrical power burned poles, and possibly downed powerlines would disrupt services.</p> <p>The destruction/damage of power poles/lines would potentially disrupt services to residential homes, and businesses. The elderly community and daycares could be impacted by no electrical services. Downed powerlines could impede emergency response.</p>

	<p>Newcastle has 4 apartment complexes, 4 daycare facilities, 3 senior living communities, and 1 senior citizen center that are all vulnerable to wildfire being surrounded by open fields and undeveloped acreage with trees and vegetation. All of these facilities are within or surrounded by the WUI.</p>	<p>Approaching wildfires in these areas could cause the need to assist in evacuations.</p>
<p>Newcastle Public School District</p>	<p>Newcastle Public Schools ECC, Elementary, Middle, and High School are all surrounded by open fields that are often used for crops and grass for feed. All of these facilities are within or surrounded by the WUI.</p> <p>The high school is the most vulnerable with practice fields abutting open fields of grass and overgrown vegetation. A state highway also goes through this open space by the high school and the chance of cigarettes or other burning substances could cause a wildfire.</p>	<p>Damage to school structures and equipment can result in an economic and capability loss to potentially causing a disruption to school operations and the burden of unexpected costs for repair and replacement. Blowing smoke could cause the need for evacuations, rerouting bus routes, lockdown of facilities, and smoke/ash entering the facilities could cause breathing problems for students/staff.</p> <p>Newcastle Public School students and faculty are at risk during the school day from the results of a wildfire activity.</p>

3.4.11 Winter Storm

Description

Winter Storm can refer to a combination of winter precipitation, including snow, sleet and freezing rain. A severe winter storm can range from freezing rain or sleet to moderate snow over a few hours, or to blizzard conditions and extremely cold temperatures that last several days.

Blowing snow is wind-driven snow that reduces visibility and causes significant drifting. Blizzards occur when falling and blowing snow combine with winds of 35 mph or greater, reducing visibility to near zero.

Freezing rain is precipitation that falls, as liquid, into a layer of freezing air near the surface. When the precipitation makes contact with the surface, it forms into a coating or glaze of ice and even a small accumulation can cause a significant hazard.

Sleet is frozen precipitation that has melted by falling through a warm layer of the atmosphere and then refreezes into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and can accumulate like snow and become a hazard to motorists.

Ice storms are extended freezing rain events, lasting several hours to sometimes days, when the freezing rain accumulates on surfaces and damages trees, utility lines, and roads. Ice loads on overhead power lines, combined with windy conditions, may cause the lines to “gallop.” This forceful motion often causes the lines to break away from the connectors and poles, resulting in widespread power failure.

Wind Chill is used to describe the relative discomfort and danger to people from the combination of cold temperatures and wind. The wind chill chart from the National Weather Service shows the apparent temperature derived from both wind speed and temperature.

Location

The entire Planning Area is affected by Winter Storm.

Extent

The Planning Area uses the Sperry-Piltz Accumulation Index for ice damage. The Planning Area can experience any ice damage index value on this chart.

The Planning Area also uses the NOAA NWS Windchill Chart. Due to the unpredictable nature of Winter Storms, the Planning Area can experience a wide range of values on the chart. However, most Wind Chill temperatures are expected to be -34 or warmer.

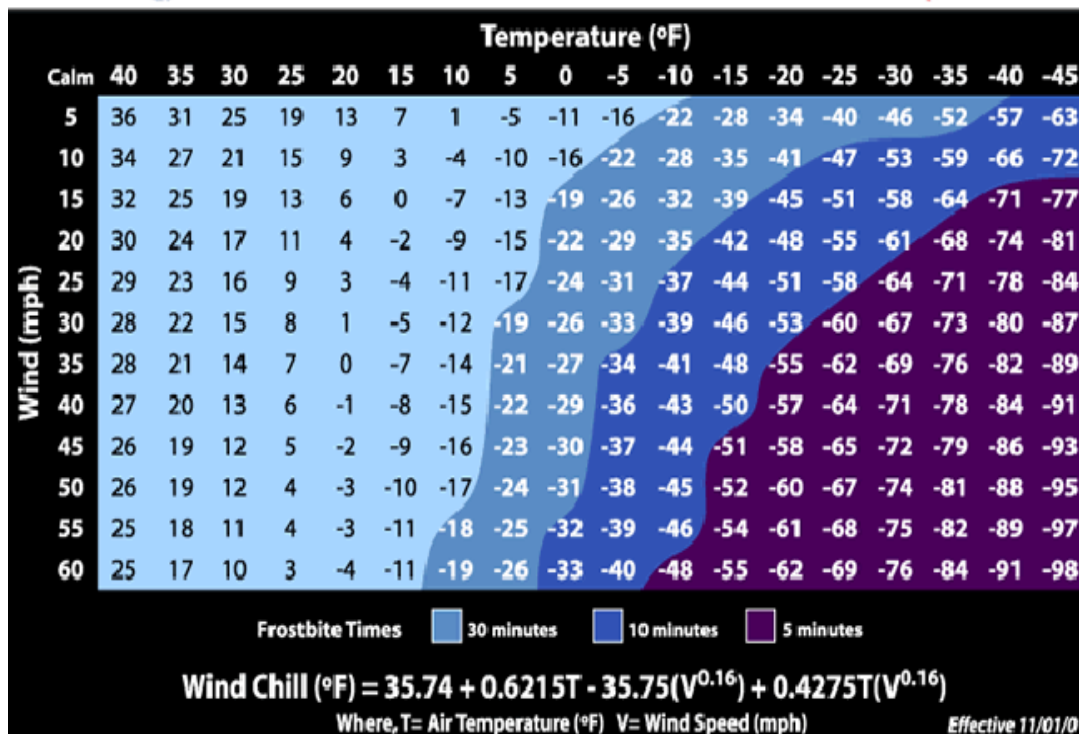
The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)



NWS Windchill Chart



Previous Occurrences

There have been twelve Winter Storm events in McClain County from 2013-2023 with seven of those directly impacting Newcastle and causing damage. The following table represents Winter Storms examples that caused damage in the Planning Area.

Winter Storm Events, 2013-2023

From the NOAA National Centers for Environmental Information

<https://www.ncdc.noaa.gov/stormevents>

Date	Description
December 2013	Freezing rain prevailed through the event with widespread 1/3 to 1/2 inch ice accumulations on trees, power lines and other elevated surfaces. Off duty NWS employee reported 1/2 inch of ice in Newcastle.
March 2015	A strong cold front surged through Oklahoma early on the 4th, bringing an Arctic airmass into much of the Southern Plains. As this occurred, a large scale upper level trough shifted eastward across the Southern and Central Plains region, resulting in widespread wintry precipitation. Several inches of snow and sleet fell, with significant impacts to travel. Widespread snow totals of 1 to 3 inches from Purcell and Dibble to Newcastle.
November 2015	Newcastle observed .5 inches of ice accumulation.
January 2019	A closed upper low and an arctic airmass combined to produce heavy snowfall across portions of Oklahoma. Maximum of 4 inches reported in Newcastle.
October 2020	A historic early season ice storm occurred over a several day period on the morning of the 26th and continuing into the evening of the 28th. Freezing rain and sleet were reported across much of central and western Oklahoma, with some snow reported as well across far northwest Oklahoma. Extreme freezing rain accumulations of at least 1.5 inches were reported in west-central Oklahoma over the 3 day period, with greater than 0.5 inch totals reported over a large area from Ponca City to Oklahoma City to Lawton to Clinton. Hundreds of thousands of people were without power by the 28th and extensive tree and powerline damage was reported across much of the area. Ice accreted 0.20 - 0.8 across the county. Partial damage estimates reached \$250,000.
February 2021	An impressively cold airmass was in place as an upper trough crossed the region, bringing heavy snow to much of the area. Widespread 4-6 totals were reported, with isolated amounts approaching 10. Reports from across the county ranged from 4 to 7 inches of snow, with a maximum of 7 inches reported in Newcastle. Extreme and record breaking cold peaked across Oklahoma and Texas during the 14th-16th, with wind chills of -20 to as low as -30 degrees reported in much of the area. Air temperatures in the -10 to -20 range were also common on the 16th, with OKC reporting its second coldest low temperature ever recorded. Below zero wind-chills were recorded for an extended period, with the coldest readings recorded on the morning of the 15th, when wind chills of -20 to -30 degrees were measured.
February 2022	A broad western trough brought lift and moisture into the region over top a frigid arctic airmass near the surface. This led to a prolonged period of mainly sleet on the 23rd and 24th, with thunder and lightning also observed at times. Some areas picked up 1-2 of sleet accumulation, with up to a tenth of an inch of freezing rain across southeast Oklahoma. The sleet and ice caused several accidents across the area, with at least 11 accidents including 4 rollover accidents reported. Up to an inch of sleet accumulation with a glaze of freezing rain was reported across the county.

Probability of Future Events

Based on historical data, the probability of future Winter Storm events in the Planning Area is HIGH.

Future Climatological Trends

In the future, climatological trends in Newcastle may exhibit heightened occurrences of winter storms, ice storms, and freezing temperatures due to the effects of climate change. As global temperatures continue to rise, the Arctic region melts, disrupting atmospheric circulation patterns and potentially leading to more frequent and intense winter weather events. Newcastle could experience increased precipitation in the form of snow and freezing rain during winter months, resulting in more severe winter storms and ice storms. Additionally, prolonged periods of freezing temperatures may become more common, posing challenges for infrastructure, transportation, and public safety. Adaptive measures and resilient infrastructure will be crucial in mitigating the impacts of these changing climatic conditions on the city and its inhabitants.

Impacts from climatological changes, land use development, and population patterns.

During winter storms, ice storms, and freezing temperatures, Newcastle will confront a range of challenges driven by climatological changes, land use development, and population patterns. Alterations in climate may intensify the severity and frequency of extreme weather events, straining infrastructure and emergency response capacities. The city's development patterns will be pivotal; poorly planned urban expansion or insufficient infrastructure resilience could heighten vulnerability to winter weather hazards. For example, unchecked urban sprawl lacking adequate drainage systems might lead to increased flooding during thaw periods post-ice storms. Additionally, population dynamics will shape Newcastle's resilience, influencing the distribution of vulnerable communities and resource availability for emergency response and recovery. Effective collaboration among urban planners, policymakers, and community stakeholders will be indispensable in mitigating the impacts of winter weather on Newcastle's infrastructure, economy, and residents' welfare.

Vulnerability and Impact

Winter Storm Events are destructive in nature in the entire Planning Area. Winter Storms can cause heavy ice accumulations that break tree limbs, to utility outages and above ground services, and can cause damage from heavy snow to older structures with weak roofs. Freezing rain and sleet causing slick surfaces make emergency response more difficult.

Jurisdiction	Vulnerability	Impact
City of Newcastle	Newcastle only has above ground utility lines and an older power infrastructure system. During a winter storm	Damage to utilities can disrupt services and prevent life altering services to those who depend on

	<p>event these utilities are vulnerable to being damaged by ice and/or heavy snow. This damage results in frequent power outages, which sometimes can occur monthly.</p> <p>City hall does not have a backup generator</p>	<p>electricity for health sustaining services.</p> <p>Slick roadways and damage from downed trees or power lines disrupt communications and impede emergency response.</p> <p>During a power outage, day-to-day services could be disrupted and pipes could freeze and potentially burst causing water damage to the facility.</p>
Newcastle Public School District	<p>Newcastle Public Schools do not have backup generators and are served by the Oklahoma Electric Cooperative and are subject to the same vulnerable results in frequent power outages which can occur monthly during the school term.</p> <p>Newcastle Public School facilities have flat roofs and outdoor awnings.</p>	<p>Damage to utilities can disrupt any school facility that depends on services for its students and faculty. Power outages could also impact heating capabilities and loss of supplies such as food and sensitive equipment. Frozen water pipes can cause serious damage to school facilities interior and sensitive electronic equipment if pipes break.</p> <p>Flat roofs and outdoor awnings that become loaded with heavy snow and/or ice accumulation are at risk of collapse causing injury or even loss of life for students/staff.</p>

3.5 Repetitive and Severe Repetitive Loss Structures in Planning Area

Repetitive Loss Properties - those properties for which two or more losses of at least \$1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978.

Severe Repetitive Loss Properties - residential properties that have at least four NFIP payments over \$5,000 each and the cumulative amount of such claims exceeds \$20,000, or at least two separate claims payments with the cumulative amount exceeding the market value of the building.

The planning area has 1 repetitive loss and it is residential.

CHAPTER FOUR: MITIGATION STRATEGY

4.1 Capabilities Assessment

The following table provides a summary of the plans, codes, policies and ordinances currently in place in each participating jurisdiction. Existing programs and policies were reviewed in order to identify those that may weaken or enhance the hazard mitigation objectives outlined in this document. This list does not necessarily reflect every plan, ordinance or other guidance document within each jurisdiction; however, this is a summary of the guidance documents known to and recommended for review by the members of the planning committee. The (Y) indicates that the jurisdiction reported having the authority to implement the specified regulatory tool and that the tool is currently in place.

As indicated in the table, the City of Newcastle has several policies, programs and capabilities, which help to prevent and minimize future damages resulting from hazards. These tools are valuable instruments in pre and post disaster mitigation as they facilitate the implementation of mitigation activities through the current legal and regulatory framework.

4.1.1 Existing Institutions, Plans, and Ordinances

The checkmark (Y) indicates that the jurisdiction reported to have the authority to implement the specified regulatory tool and that the tool is currently in place.

Jurisdiction	Building Code	Zoning Ordinance	Subdivision Ordinance	Special Purpose Ordinance	Growth Management Ordinance	Site Plan Review Requirements	Comprehensive Plan	Capital Improvement Plan	Economic Development Plan	Emergency Response Plan	Post-Disaster Recovery Plan
Newcastle	Y	Y	Y	Y		Y	Y	Y		Y	Y

4.1.2 Administrative and Technical Capability

Jurisdiction	Planner(s) or Engineer(s) with knowledge of land development and	Engineer(s) or professional(s) trained in construction practices related to buildings	Planner(s) or Engineer(s) with an understanding of natural and/or human caused	Floodplain Manager	Surveyors	Staff with education or expertise to assess the communities vulnerability to	Personnel skilled in GIS and/or HAZUS	Scientists familiar with the hazards of the community	Emergency Manager	Grant writers
Newcastle	Y	Y	Y	Y	Y	Y	Y	Y	Y	

4.1.3 Financial Capabilities

Jurisdiction	Capital Improvements Project Funding	Authority to levy taxes for specific purposes	Water, Sewer, Gas, or Electric service Fees	Incur fees for new development	Incur debt through general obligation funds and/or special tax bonds	Community Development Block Grant	Federal funding programs	State funding programs
Newcastle	Y	Y	Y	Y	Y		Y	Y

4.1.4 Education and Outreach Capabilities

Jurisdiction	Local citizen groups/Non-profit organizations willing to assist with mitigation activities	Ongoing public education or information programs	Natural disaster or safety related programs	StormReady Certification	Firewise Communities Certification	Public-Private partnership initiatives addressing disaster-related issues
Newcastle	Y	Y	Y	Y		Y

4.1.5 School District Capability Assessment

Jurisdiction	Capital Improvement Plan	Emergency Management Plan and/or procedures in place	Budget to raise funds for mitigation (bond)	Ways to raise funds through public partnerships, corporate donations etc.	Designated emergency manager (even as a secondary position)	PTO/PTA	Training for teachers to practice natural hazard response	Training for teachers/coaches to ensure consistency in evaluating lightning	Post-Disaster Recovery Plan
Newcastle Public Schools	Y	Y	Y	Y	N	Y	Y	Y	Y

In addition to the capabilities listed, please have each participating school district answer the following questions:

1. Has your school district had positive responses to bond issues? Yes
2. Based on population, is the school district population growing or declining? Growing

4.1.6 How Each Jurisdiction Can Build on Their Capabilities

The City of Newcastle can build upon its capabilities by joining the Firewise program offered through NFPA. This program would increase the ignition resistance of the community and reduce wildfire risks in the planning area.

The Newcastle Public School District can build upon its capabilities by enacting policies and procedures to require a safe room in each building in the school district.

4.2 NFIP Participation

The City of Newcastle is a current participating member of the National Flood Insurance Program (NFIP). The City of Newcastle first adopted NFIP minimum regulations and the first Flood Insurance Rate Maps (FIRM) for the city on June 12, 1995 (Ord #340). Since the first adoption of NFIP standards in 1995, the city has adopted revised ordinances on October 8, 2007 (Ord #609) and November 11, 2007 (Ord #613). Ord #613 not only adopted revised ordinances, it also adopted the most latest FIRM panels used by the city, dated November 16, 2007. There are two identified Hazard Mitigation Action Items addressed in the City of Newcastle Hazard Mitigation Plan related to floodplain activity in and the NFIP.

The city will continue maintaining the standards of the NFIP and seeks to raise the standards by becoming a Community Rating System (CRS) member in the near future. Though the City's current flood prevention standards mitigate property damage, adopting higher standards will ensure a safer, more resilient, community in the future. City Staff, appointed, and elected officials will continue to promote NFIP regulations as well as spread awareness of the dangers developing in the floodplain.

4.3 How NFIP Participants Implement Substantial Improvement/Damage Provisions

A determination of "substantial damage" applies to a severely damaged home or other structure in a Special Flood Hazard Area, regardless of the cause of damage, where the community participates in the National Flood Insurance Program (NFIP). If the cost to repair the structure is 50% or more of the structure's market value, then it is considered to be substantially damaged. This damage determination is done by a local building official or floodplain manager.

All NFIP participating communities are required to adopt floodplain regulations, as outlined in 44 CFR, and the provisions for substantial improvements can be found in sections 60.3 a (3), b (4) c (2, 3, and 5) and d. The Oklahoma Statute Title 82, Section 1608 also outlines the requirement for NFIP communities to adopt floodplain ordinance.

The City of Newcastle is a current and active participating member of the National Flood Insurance Program (NFIP). The City of Newcastle first adopted NFIP minimum regulations and

the first Flood Insurance Rate Maps (FIRM) for the city on June 12, 1995 (Ord #340). Since the first adoption of NFIP standards in 1995, the city has adopted revised ordinances on October 8, 2007 (Ord #609) and November 11, 2007 (Ord #613). Ord #613 not only adopted revised ordinances, but it also adopted the latest FIRM panels used by the city, dated November 16, 2007. There are two identified Hazard Mitigation Action Items addressed in the City of Newcastle Hazard Mitigation Plan related to floodplain activity and the NFIP.

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4.4 Mitigation Goals

The City of Newcastle Hazard Mitigation Planning Team reviewed and analyzed the goals. The goals listed below reflect the objectives of the participating jurisdictions and the State of Oklahoma in reducing the impact of hazards throughout the city.

The projects should address these listed goals.

- Goal 1: Protection of life and property.
- Goal 2: Reduction of damages caused by natural disasters.
- Goal 3: Maintain municipal and emergency services at appropriate levels.
- Goal 4: Protect the health and welfare of the community.
- Goal 5: Reduce damages caused by all hazards.

4.5 Action Items

Action Item 1	Public Education for Hazard Preparedness, Prevention, and Mitigation				
Hazard(s) Addressed	All Hazards				
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects
Jurisdiction(s)	All jurisdictions				
Action	Provide literature and public education for hazard resilience at local events, local libraries, government facilities, and other public building.				
Responsible Party	Newcastle Emergency Management Director				
Potential Implementation Timeline	1-3 years				

Cost	\$10,000
Potential Funding Sources	City of Newcastle, HMP, PDM

Action Item 2	Data base of special needs population				
Hazard(s) Addressed	All Hazards				
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects
Jurisdiction(s)	All jurisdictions				
Action	Develop an inventory, registry and database of Special Needs Populations (elderly, poor, deaf, blind, etc.) that may require special assistance, that tie in with 911, GIS Systems, etc., so that vulnerable populations within the community can be checked on, notified, or evacuated effectively in the event of disasters.				
Responsible Party	Newcastle Emergency Management Director, County Health Department				
Potential Implementation Timeline	1-4 years				
Cost	\$16,000				
Potential Funding Sources	City of Newcastle, HMP, PDM				

Action Item 3	Outdoor Early Warning System				
Hazard(s) Addressed	Tornado				
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects
Jurisdiction(s)	All Jurisdictions				
Action	Identify locations where warning siren coverage is less than adequate and add warning siren(s).				
Responsible Party	Newcastle Emergency Management Director				
Potential Implementation Timeline	1-5 years				
Cost	\$40,000 per unit				

Potential Funding Sources	HMGP, Community Budget, PDM, other grant resources as opportunities open
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Action Item 4	NOAA Weather Radio Program				
Hazard(s) Addressed	All Hazards				
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects
Jurisdiction(s)	All Jurisdictions				
Action	Acquire and distribute NOAA Weather Radios to all critical facilities and the public.				
Responsible Party	Newcastle Emergency Management Director				
Potential Implementation Timeline	1-5 years				
Cost	\$25,000				
Potential Funding Sources	HMGP, Community Budget, PDM, other grant resources as opportunities open				

Action Item 5	Develop a public information program designed to communicate the potential severity of a drought, and the appropriate responses by the local population, including voluntary water conservation measures the public can take.				
Hazard(s) Addressed	Drought				
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects
Jurisdiction(s)	All Jurisdictions				
Action	Educate the public on the severity of a drought and the appropriate measures to take.				
Responsible Party	Newcastle Emergency Management Director, Water Department Supervisor				
Potential Implementation Timeline	12-24 Months				
Cost	\$4,500				
Potential Funding Sources	Local/General budget, Federal Emergency Management Agency (FEMA), U.S. Soil Conservation Service, PDM and/or HMGP				

Action Item 6	Lightning Detection Systems					
Hazard(s) Addressed	Lightning					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Provide detection devices for events and activities within the City of Newcastle and Newcastle Public School District.					
Responsible Party	Newcastle Emergency Management Director, Parks Department Director, Newcastle Public School Superintendent					
Potential Implementation Timeline	12-60 Months					
Cost	\$50,000					
Potential Funding Sources	HMGP, Community Budget, PDM, other grant resources as opportunities open					

Action Item 7	Surge Protection Program					
Hazard(s) Addressed	Lightning, Tornado, High Winds, Winter Storms					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Develop and implement program to provide surge protection to critical facilities for the City of Newcastle and Newcastle Public School District.					
Responsible Party	Newcastle Emergency Management Director, Newcastle IT Director, Newcastle Public School Superintendent					
Potential Implementation Timeline	12-60 Months					
Cost	\$45,000					
Potential Funding Sources	HMP, Community Budget, PDA, other grant resources as opportunities open					

Action Item 8	Surge and Lightning Protection Educational Program					
Hazard(s) Addressed	Lightning, Tornado, High Wind, Winter Storm					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Educate the Public, and encourage the Utility Companies to provide information to their clients on Whole House Surge and Lightning Protection.					
Responsible Party	Emergency Management Director					
Potential Implementation Timeline	1-3 years					
Cost	Staff time					
Potential Funding Sources	City of Newcastle					

Action Item 9	Break/Shatter Resistant Glass					
Hazard(s) Addressed	Tornadoes, High Winds, Hail, Earthquakes					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	When replaced, install Break/Shatter Resistant Glass in Government Offices, Critical Facilities, and Public Schools.					
Responsible Party	Newcastle City Manager, Newcastle Facilities Manager, Newcastle Public School Superintendent					
Potential Implementation Timeline	1-5 years					
Cost	\$500/unit					
Potential Funding Sources	HMGP, City of Newcastle, Newcastle Public School, PDM, other grant resources as opportunities open					

Action Item 10	Critical Facility and Public School Safe Room Program					
Hazard(s) Addressed	Tornado, High Wind					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Provide assistance for safe room installation to critical facilities within the City of Newcastle and Newcastle Public School District.					
Responsible Party	Newcastle Emergency Management Director, Newcastle Public School Superintendent					
Potential Implementation Timeline	1-5 years					
Cost	\$750,000					
Potential Funding Sources	HMP, PDM, City of Newcastle, Newcastle Public School, other grant resources as opportunities open.					

Action Item 11	Critical Facility and Public School Hazard Assessment Evaluation Program					
Hazard(s) Addressed	Tornado, High Wind, Earthquake, Winter Storm, Wildfire					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Perform tornado, high wind, earthquake, winter storm, and wildfire evaluations of critical facilities and public school facilities to determine the best ways to retrofit or remodel buildings to make them more disaster resistant.					
Responsible Party	Newcastle Emergency Management Director, Newcastle City Manager, Newcastle Facilities Manager, Newcastle Public School Superintendent					
Potential Implementation Timeline	1-5 years					
Cost	\$20,000					
Potential Funding Sources	HMP, PDM, City of Newcastle, Newcastle Public School, other grant resources as opportunities open.					

Action Item 12	Individual Safe Room Rebate Program					
Hazard(s) Addressed	Tornado, High Wind					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	City of Newcastle					
Action	Offer invitation for voluntary participation in the Individual Safe Room rebate programs.					
Responsible Party	Newcastle Emergency Management Director					
Potential Implementation Timeline	Undetermined					
Cost	\$3,000 rebate per location					
Potential Funding Sources	HMP					

Action Item 13	Safe Room/Storm Shelter Database					
Hazard(s) Addressed	Tornado, High Wind					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	City of Newcastle					
Action	Develop and maintain a safe room database for each individual safe room, basement, or other area of approved safety.					
Responsible Party	Newcastle Emergency Management Director, Newcastle IT Director					
Potential Implementation Timeline	Ongoing					
Cost	Staff Time					
Potential Funding Sources	City of Newcastle					

Action Item 14	Educational Program for Emergency Generator Back-up					
Hazard(s) Addressed	Tornado, High Wind, Winter Storm					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Encourage Private Critical Facilities and Public School Facilities to have an emergency back-up generator in case of power outages.					
Responsible Party	Newcastle Emergency Management, Newcastle Public School Superintendent, Newcastle Planning Director					
Potential Implementation Timeline	1-5 years					
Cost	Staff Time					
Potential Funding Sources	City of Newcastle, Newcastle Public School					

Action Item 15	Covered Parking					
Hazard(s) Addressed	Hail, Winter Storms, High Wind, Tornado, Lightning					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Install covered shelter for city government vehicles and critical public school vehicles/buses to protect against hail or flying debris.					
Responsible Party	Newcastle City Manager, Newcastle Emergency Management Director, Newcastle Facilities Manager, Newcastle Public School Superintendent					
Potential Implementation Timeline	1-5 years					
Cost	\$200,000					
Potential Funding Sources	City of Newcastle					

Action Item 16	Tree Trimming and Branch Removal Program					
Hazard(s) Addressed	All Hazards					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Perform annual maintenance to cut away trees and branches from power lines and drainage areas.					
Responsible Party	Street Department Director					
Potential Implementation Timeline	Ongoing					
Cost	\$150,000					
Potential Funding Sources	HMGP, PDM, City of Newcastle, Department of Agriculture					

Action Item 17	Ordinances for foundation repair					
Hazard(s) Addressed	Expansive Soils					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Implement and enforce ordinances to require permits for foundation repair and mitigate against future expansive soil damages.					
Responsible Party	Newcastle City Manager, Newcastle Public Works Director, Newcastle Planning Director, Newcastle Public School Superintendent					
Potential Implementation Timeline	1-5 years					
Cost	Staff Time					
Potential Funding Sources	City of Newcastle, Newcastle Public Schools					

Action Item 18	Amend Building Codes					
Hazard(s) Addressed	Expansive Soils					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Review and develop amendments to building code ordinances that require builders to check for expansive soils when applying for new residential construction permits, and to consider the use of foundations that mitigate expansive soil damages when in a moderate to high risk area.					
Responsible Party	Newcastle City Manager, Newcastle Planning Director, Newcastle Code Enforcement					
Potential Implementation Timeline	Ongoing					
Cost	Staff Time					
Potential Funding Sources	City Budget					

Action Item 19	Firewise Community					
Hazard(s) Addressed	Wildfire					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Work with Forestry Service and other agencies as need to develop a Firewise Plan.					
Responsible Party	Newcastle Fire Chief, Newcastle Emergency Management Director					
Potential Implementation Timeline	1-5 years					
Cost	\$2000 - \$10,000					
Potential Funding Sources	HMP, PDM, City of Newcastle, Department of Agriculture, Department of Forestry, other grant resources as opportunities open.					

Action Item 20	Eastern Red Cedar Removal Program					
Hazard(s) Addressed	Wildfire, Drought					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Provide education and eradication of any Eastern Red Cedar. Work with local fire department and farm owners with fields within the city limits to remove wild eastern red cedar trees from property.					
Responsible Party	Newcastle Fire Chief, Newcastle Emergency Management Director					
Potential Implementation Timeline	1-5 years					
Cost	\$2,500					
Potential Funding Sources	HMP, PDA, City of Newcastle, Dept. of Agriculture, Dept. of Forestry, other grant resources as opportunities open.					

Action Item 21	NFIP Program					
Hazard(s) Addressed	Flood					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	City of Newcastle					
Action	Continue Compliance with, and Participation in the National Flood Insurance Program (NFIP) and the Community Rating System (CRS).					
Responsible Party	Newcastle Flood Plain Manager					
Potential Implementation Timeline	Annual Review					
Cost	Staff time					
Potential Funding Sources	City Budget					

Action Item 22	Emergency Exercise Training					
Hazard(s) Addressed	All Hazards					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Develop and implement annual emergency response exercises.					
Responsible Party	Newcastle Emergency Management Director					
Potential Implementation Timeline	Annual					
Cost	\$500 materials; Staff time and equipment					
Potential Funding Sources	City Budget, PDM, HMP and other grant resources.					

Action Item 23	Drain/Storm Water Management Program					
Hazard(s) Addressed	Flood					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Develop a plan to reduce and improve drainage.					
Responsible Party	Flood Plain Manager, Newcastle Emergency Management Director, Public Works Director, Street Department Director, Newcastle City Manager					
Potential Implementation Timeline	1-5 years					
Cost	\$30,000-\$60,000					
Potential Funding Sources	City Budget, PDM, HMP and other grant resources.					

Action Item 24	Promote Xeriscaping					
Hazard(s) Addressed	Drought					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Adopt policies to replace landscaping around government and school facilities to include water retention/low moisture vegetation.					
Responsible Party	Parks Director, Public Works Director, Newcastle City Manager, Newcastle Emergency Management Director, Newcastle Public School Superintendent					
Potential Implementation Timeline	1-3 years					
Cost	\$1,000 - \$25,000					
Potential Funding Sources	City Budget, PDM, HMP, Water Conservation District, Oklahoma Water Resource Board, US Corps of Engineers, and other grant resources.					

Action Item 25	Disadvantaged and Elderly Heat/Cool Program					
Hazard(s) Addressed	Extreme Heat, Winter Storm					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	City of Newcastle					
Action	Develop, promote, and implement a heating/cooling program to assist with fans, designated cooling/heated areas (specified businesses) and/or assistance with utility charges.					
Responsible Party	Newcastle Emergency Management Director					
Potential Implementation Timeline	Annual					
Cost	\$1,000 - \$15,000					
Potential Funding Sources	City Budget, Utility Coops, Faith Agencies, and other grant resources					

Action Item 26	Alternate Power Source					
Hazard(s) Addressed	Tornado, Flood, Earthquake, Hail, High Wind, Lightning, Winter Storm					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Provide backup generators for facilities critical for government operations, safety, and health.					
Responsible Party	Newcastle Emergency Management Director, Newcastle City Manager					
Potential Implementation Timeline	1-5 years					
Cost	\$125,000					
Potential Funding Sources	City Budget, HMP, PDM, and other grant resources.					

Action Item 27	Portable Motorist Information Signage					
Hazard(s) Addressed	Flood, Tornado, Wildfire, Winter Storm, Excessive Heat, Drought					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Provide portable information signs for issues during hazard events that block streets, roads, and avenues in the City of Newcastle.					
Responsible Party	Newcastle Emergency Management Director, Street Department Director					
Potential Implementation Timeline	1-5 years					
Cost	\$50,000					
Potential Funding Sources	City Budget, HMP, PDM, and other grant resources.					

Action Item 28	Tabletop Exercises					
Hazard(s) Addressed	All Hazards					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Develop tabletop exercise to educate staff, citizens, and Newcastle Public School staff on effects of hazards.					
Responsible Party	Newcastle Emergency Management Director					
Potential Implementation Timeline	1-2 years					
Cost	Staff time					
Potential Funding Sources	City Budget					

Action Item 29	Promote Drought Insurance to Farm Owners					
Hazard(s) Addressed	Drought					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	City of Newcastle					
Action	Provide and facilitate presentations on the benefits of drought insurance. Partner with local insurance agencies to provide appropriate and beneficial information.					
Responsible Party	Newcastle Emergency Management Director					
Potential Implementation Timeline	1-5 years					
Cost	\$500 materials; Staff time					
Potential Funding Sources	City Budget, HMP, PDM, and other grant resources.					

Action Item 30	Vegetation Programs					
Hazard(s) Addressed	Drought, Wildfire					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	City of Newcastle					
Action	Provide information from Fire agencies, State Forestry, Oklahoma State University Extension Office to local landowners and homeowners to develop low fuel vegetation seeding to decrease the risk of wildfires in and around the community and reduce water consumption.					
Responsible Party	Newcastle Fire Chief, Newcastle Emergency Management Director					
Potential Implementation Timeline	1-3 years					
Cost	\$500					
Potential Funding Sources	HMP, PDA, City of Newcastle, Dept. of Agriculture, Dept. of Forestry, other grant resources as opportunities open.					

Action Item 31	Educate the importance of Earthquake insurance to the public					
Hazard(s) Addressed	Earthquake					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	City of Newcastle					
Action	Provide and facilitate presentations on the benefits of earthquake insurance. Partner with local insurance agencies to provide appropriate and beneficial information.					
Responsible Party	Newcastle Emergency Management Director					
Potential Implementation Timeline	1-5 years					
Cost	\$500 materials, Staff Time					
Potential Funding Sources	City Budget, HMP, PDM, and other grant resources.					

Action Item 32	Earthquake Drills					
Hazard(s) Addressed	Earthquake					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Annually perform earthquake drills with city employees and public school staff and students.					
Responsible Party	Newcastle Emergency Management Director, Newcastle Public School Superintendent					
Potential Implementation Timeline	1 year					
Cost	Staff Time					
Potential Funding Sources	City of Newcastle, Newcastle Public Schools					

Action Item 33	Odd/Even Watering Schedule					
Hazard(s) Addressed	Drought					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Educate the public about Odd/Even watering schedule to preserve our water resources.					
Responsible Party	Newcastle Emergency Management Director, Newcastle Parks Director, Newcastle Public Works Director					
Potential Implementation Timeline	1 year					
Cost	Staff Time					
Potential Funding Sources	City of Newcastle					

Action Item 34	Protective Window Film					
Hazard(s) Addressed	Hail, High Wind, Tornado					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Install protective window film on critical facility windows.					
Responsible Party	Newcastle Facilities Manager, Newcastle Emergency Management Director, Newcastle City Manager, Newcastle Public School Superintendent					
Potential Implementation Timeline	1-3 years					
Cost	\$5,000 - \$10,000					
Potential Funding Sources	City of Newcastle, Newcastle Public School					

Action Item 35	Covered Walkways					
Hazard(s) Addressed	Winter Storm, Hail					
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects	
Jurisdiction(s)	All Jurisdictions					
Action	Install covering for walkways for critical facilities.					
Responsible Party	Newcastle Facilities Manager, Newcastle Public School Superintendent					
Potential Implementation Timeline	1-5 years					
Cost	\$100,000					
Potential Funding Sources	City of Newcastle, Newcastle Public School District					

Action Item 36	Data deficiency for expansive soil occurrences				
Hazard(s) Addressed	Expansive Soils				
Mitigation Action Type (Highlight box that applies.)	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs	5% Projects
Jurisdiction(s)	All Jurisdictions				
Action	Improve understanding and mapping of expansive soils within the region to better inform development and infrastructure projects.				
Responsible Party	Newcastle Planning Department, Newcastle Public School Superintendent				
Potential Implementation Timeline	1-5 years				
Cost	Staff Time				
Potential Funding Sources	City of Newcastle, Newcastle Public School District				

4.6 Action Item Prioritization

The action item tables contained in this plan identify who is responsible for project implementation, the potential funding sources, and the timeframe for implementation. They also identify the economic considerations and impacts of the action items by listing the estimated project costs.

When prioritizing which action items will be implemented first, the Planning Team decided to analyze the benefits of their respective projects by comparing which ones best accomplish the goals listed in this plan. The criteria include:

1. Does the project enhance public awareness and understanding of hazards specific to the Planning Area?
2. Can the project be accomplished in a way that maximizes mitigation activities between the local community, non-profit, and private business entities?
3. Will the project provide an opportunity for new construction that enhances mitigation?
4. Will the project help to educate the public on mitigation and prevention activities?

Another way action items will be prioritized is by determining which projects will provide the maximum benefit to the community, based off what each jurisdiction can afford. Each jurisdiction in the Planning Area has limited funds in which to implement action items, and projects will be implemented as jurisdictional budgets allow.

The Planning Team has also determined that flood mitigation projects will be prioritized first, as mitigating Flood hazard was determined to have the most effective benefit to cost ratio to planning jurisdiction.

CHAPTER FIVE: PLAN UPDATE PRIORITIZATION AND REVIEW

5.1 Continued Public Involvement

After the plan's approval, Newcastle will maintain active public participation by conducting regular surveys to gather community feedback and ensure the plan's relevance. The city will notify residents of upcoming plan update meetings through various channels, including social media, local news outlets, and community boards. Monitoring and evaluation results will be transparently posted on the city's official website, accompanied by a dedicated feedback link for public input. Additionally, Newcastle will organize periodic public forums and workshops to discuss progress, address concerns, and adapt strategies based on the community's evolving needs and suggestions.

5.2 Plan Monitoring, Evaluating, and Updating

Monitoring: The Newcastle Hazard Mitigation Plan will be monitored by the Emergency Management Director, who will oversee the process of tracking the progress and status of the mitigation actions identified within the Mitigation Strategy. This monitoring will occur on a quarterly basis, during which detailed progress reports will be compiled. These reports will document advancements, challenges, and any necessary adjustments, ensuring that all actions are progressing as planned and identifying areas that require additional attention or resources.

Evaluating: The effectiveness of the Newcastle Hazard Mitigation Plan will be evaluated annually by a committee led by the Emergency Management Director. This evaluation process will involve assessing whether the plan is achieving its stated purposes and goals, examining the outcomes of the mitigation actions, and identifying areas for improvement. The committee will utilize performance metrics and community feedback to conduct a comprehensive review, ensuring that the plan remains aligned with the city's hazard mitigation objectives.

Updating: The Newcastle Hazard Mitigation Plan will be reviewed and revised every five years, with the Emergency Management Director leading this process beginning at least 18 months before the expiration of the current plan. This update will include a thorough analysis of the plan's performance, incorporation of new data, and adaptation to any significant changes in local hazards, demographics, or infrastructure. Additionally, if relevant changes occur within the five-year cycle, such as new risks or significant mitigation achievements, the plan will be updated accordingly to maintain its effectiveness and relevance. The Emergency Management Director will ensure that all updates are communicated to the public and stakeholders, inviting their input and participation.

5.3 Integration of Data, Goals, and Action Items into Other Planning Mechanisms

City of Newcastle:

Capital Improvement Plan
Comprehensive Plan
Emergency Operations Plan
Post-Disaster Recovery Plan
Building Codes

The Newcastle Capital Improvement Plan is reviewed on an annual basis by city council members, city manager, and finance officers. This plan is carefully reviewed for disaster resilience and availability of revenue as analyzed by each departmental need.

The Newcastle Comprehensive Plan is reviewed on an annual basis by the Planning and Zoning Committee and City Staff. The plan is reviewed, and modifications can be identified for annual amendments if needed.

Both the **Emergency Response Plan and the Post-Disaster Recovery Plans** are reviewed by the Emergency Management Director and each department director on an annual basis. The Emergency Management Director and departmental director reviews identified hazards for prevention, preparedness, response, recovery, and mitigation.

Building Codes the City of Newcastle has adopted the following Code Ordinances found in §150.01 as the codes for construction within the city limits:

- 2018 International Building Code
- 2018 International Mechanical Code
- 2018 International Plumbing Code
- 2018 International Electrical Code
- 2018 International Fuel Gas Code
- 2020 National Electric Code
- 2018 International Fire Code
- 2018 NFPA Life Safety Code

All the above codes are adopted as amended by the City of Newcastle and the Oklahoma Uniform Building Code Commission. Please refer to the Code of Ordinances for a complete list of all local amendments or contact the Planning Department. Building codes are reviewed every five years.

The Hazard Mitigation Plan data will be incorporated into each plan listed above during each plans' review process. The Hazard Mitigation Plan data that will be incorporated into these plans will include the hazard analysis, jurisdictional capabilities, and the proposed action items. The

City of Newcastle will continue to seek opportunities to prioritize and accomplish mitigation action items as the budget allows.

Newcastle Public School District:

Capital Improvement Plan
Emergency Action Plan
Post-disaster Recovery Plan

All plans listed above are reviewed by the Newcastle Public School District Board, the Superintendent, and school support staff on an annual basis.

The **Capital Improvement Plan** contains timelines for scheduled school improvements, and is reviewed for current and future projects, disaster resilience, and availability of revenue. The action items list from the Hazard Mitigation Plan will be reviewed during these plan updates to ensure the school district continually seeks opportunities to accomplish mitigation action items. The Newcastle Public School Board has the authority to distribute school funds and issue bonds as they pertain to proposed mitigation action projects. These bonds are voted on by the public for approval.

The **Emergency Action Plan** and the **Post-disaster Recovery Plan** address all hazards that can affect the school's district. The hazard analysis data from the Hazard Mitigation Plan will be incorporated into the Capital Improvement Plan, Emergency Action Plan, and the Post-Disaster Recovery Plan to ensure school safety and disaster recovery protocols remain relevant and effective. Although these reviews are done annually, they can be accomplished more frequently as needed. These plans are approved by the Newcastle School Board, and copies of these approved plans are delivered to the Newcastle Emergency Management Director.

5.4 Previous Integration of Data, Goals, and Action Items into Other Planning Mechanisms

Incorporating the previous hazard mitigation plan into various local planning mechanisms in Newcastle has been a strategic effort to ensure a cohesive and comprehensive approach to risk reduction and community resilience. Here's how it was integrated:

1. **Comprehensive Plan:** The hazard mitigation strategies were embedded into the land use and community development sections of the comprehensive plan. This alignment ensures that future growth and development in Newcastle consider potential hazards, promoting safer land use decisions that minimize risks from natural and human-made disasters.
 2. **Capital Improvement Plan (CIP):** The CIP was revised to prioritize infrastructure projects aligned with hazard mitigation objectives. For instance, funding was secured for a new wastewater treatment plant with a capacity of 1.5 million gallons per day, significantly increasing the current plant's capacity of 500,000 gallons per day. Additionally, funding was allocated for a new generator at the Water Plant and Vehicle Maintenance Facility to ensure operational continuity during emergencies. Maintenance and upkeep of Newcastle's six tornado sirens were also funded to guarantee uninterrupted
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service. These efforts ensure that Newcastle's infrastructure investments are strategically designed with resilience and sustainability in mind.

3. **Emergency Response Plan:** The hazard mitigation plan provided a framework for updating emergency response protocols. This included identifying vulnerable areas, pre-designating evacuation routes, and ensuring that emergency services have the resources they need to respond effectively to disasters. The integration helps ensure that emergency response strategies are proactive rather than reactive.
4. **Post-Disaster Recovery Plan:** Newcastle's recovery plan was refined using the hazard mitigation plan to focus on rebuilding in ways that reduce future risks. This includes incorporating hazard-resistant building practices in reconstruction efforts and prioritizing recovery in areas that are less vulnerable to hazards. The goal is to build back better, reducing the community's vulnerability to future disasters.
5. **Building Codes:** Our planning committee conducts an annual, comprehensive review and revision of the building codes, integrating recommendations from the hazard mitigation plan. A key focus of this review is to adopt stricter standards for new construction to improve resilience against wind, seismic activity, and expansive soil conditions. By implementing these enhanced standards, Newcastle ensures that new buildings and major renovations are better prepared to withstand potential hazards. This proactive approach underscores our commitment to fostering a safer and more resilient community.

These integrations reflect Newcastle's commitment to a proactive, unified approach to hazard mitigation, enhancing the community's ability to withstand and recover from emergencies and disasters.

CHAPTER SIX: PLAN UPDATE INFORMATION

6.1 Changes in Jurisdictional Development

Population Growth:

- 2010 Census: 7,685
- 2020 Census: 10,984
- July 2023 Estimate: 14,001

Newcastle is the fastest-growing city in the state by percentage. The population grew by 43% from 2010 to 2020 and by 27.4% from April 2020 to July 2023.

Residential Development:

- Single-Family Home Permits:
 - 2024 (Jan 1 – July 31): 121
 - 2023: 217
 - 2022: 268
 - 2021: 313
 - 2020: 308

- 2019: 315
- Approximately 1,500 approved residential lots are available across 18 actively developing housing additions.

Commercial Development:

- Since 2019, 96 commercial permits have been issued, with 49 for new construction. While residential growth remains strong, commercial development is gradually increasing. Several new commercial areas are in the engineering and design phases.

Planning and Infrastructure:

- Adopted the new Comprehensive Plan 2040 in January 2024, which includes updated land use maps. [View the plan.](#)
- A firm has been hired to update development ordinances, and new building codes have been adopted to strengthen safety and construction standards.

Infrastructure and Community Enhancements:

- Completed construction of a new Animal Shelter and Fire Station in 2024.
- A new \$52 million, 1.5 MGD wastewater treatment plant is under construction and will be completed by July 2025.
- Conceptual plans for a new city hall are nearing completion, with construction expected within 3-5 years.
- A new EMS building was constructed to enhance emergency response times.
- Community amenities include a new splash pad, park restrooms, three miles of pedestrian trails, and expanded park parking areas.

Upcoming Major Projects:

- Two significant projects are in the engineering and design phases: a new turnpike and a hospital. Both are expected to begin construction within the next two years.
- The Chickasaw Nation Hospital will be a 3 million square foot facility with 7,500 employees. Infrastructure planning is underway to support this development, including street, water, and wastewater improvements.
- A large new water tower is planned to provide the hospital with 96 hours of emergency water supply. Additionally, a second wastewater treatment plant will be built to accommodate the anticipated growth in residential and commercial needs due to the hospital's presence.

Newcastle's rapid population growth and residential development, coupled with expanding commercial and infrastructure projects, have increased the planning area's vulnerability to hazards such as flooding, infrastructure strain, and emergency response challenges. The influx of residents and ongoing construction, including the development of a new hospital and a turnpike, places additional pressure on the city's water and wastewater systems, potentially heightening the risk of service disruptions. Moreover, increased impervious surfaces from new developments could exacerbate flooding risks, while the need for updated emergency response capabilities becomes critical as the city's size and complexity grow.

6.2 Changes in Jurisdictional Priorities

Since the last updated plan in 2019, Newcastle has witnessed increased concern from citizens about tornado risks. In response, the city has amplified outreach efforts to educate the community on shelter registration and mass communication sign-ups. Additionally, Newcastle

has applied for hazard mitigation funding to install more sirens. Newcastle Public Schools have made safe sheltering a top priority, conducting regular drills to ensure the safety of students and staff.

6.3 Status of Previous Mitigation Action Items

Previous Action Items Status

Action Item	Action Completed Y/N	Reason Not Accomplished, (if applicable)	Is Action Item Still Relevant and Included in Plan Update?
Develop an All-Hazard Public Information, Education, and Awareness Program, designed to communicate and/or solicit information related to potential affects from all hazards impacting the community, using social media, surveys, local newspaper, and municipal website.	Y		Y
Educate the public on the importance of a Family Disaster Plan and Supply Kit.	Y		N
Develop and Distribute a Family Emergency Preparedness Guide to all families.	Y		Y
Develop an inventory, registry and database of Special Needs Populations (elderly, poor, deaf, blind, etc.) that may require special assistance, that tie in with 9-1-1, GIS Systems, etc., so	N	Lack of Funds	Y

that vulnerable populations within the community can be checked on, notified, or evacuated effectively in the event of disasters.			
Develop distribution centers in local libraries, government facilities, and other public buildings where information and safety guidance on natural and man made hazards can be provided to citizens.	Y		Y
Evaluate, upgrade and maintain community-wide outdoor omnidirectional siren warning systems.	Y		Y
Acquire and distribute NOAA Weather Radios to all Critical Facilities and the public.	N	Lack of Funds	Y
Develop a public information program designed to communicate the potential severity of a drought, and the appropriate responses by the local population, including voluntary water conservation measures the public can take.	Y		Y
Provide lightning warning systems for Community public outdoor sports areas, pools, and parks.	N	Lack of Funds	Y

Provide surge and lightning protection for computer-reliant critical facilities (e.g. City Hall, 911 Center, EOC, Police and Fire stations, water/wastewater treatment plant and public works buildings).	Y		Y
Educate the Public, and encourage the Utility Companies to provide information to their clients on Whole House Surge and Lightning Protection.	Y		Y
When replaced, install Break/Shatter Resistant Glass in Government Offices, and Critical Facilities.	N	Lack of Funds	Y
When replaced, install Break/Shatter Resistant Glass in Schools.	N	Lack of Funds	Y
Provide employee shelters/safe-rooms at critical facilities, such as 911 Center, fire stations and police stations to protect first responders.	Y		Y
Perform tornado and high wind and earthquake evaluations of schools to determine the best ways to retrofit or remodel buildings to make them more disaster resistant.	Y		Y
Install Safe-Rooms in new schools and retrofit/construct safe rooms at existing Schools.	N	Lack of Funds	Y
Develop an Individual Safe Room Program for vulnerable populations that will withstand hazards, including home owners, special needs populations, elderly, mobile home residents, etc.	N	Lack of Funds	Y
Adopt an ordinance requiring registration of Safe Rooms, and create a data base and GIS (lat/long) map to locate Safe Rooms in the event of a disaster.	Y		Y
Obtain grants for installation of storm shelters/safe rooms in mobile home parks.	N	Work toward educating the mobile home park owner of the importance for storm shelter.	N

Adopt an Ordinance requiring new Mobile Home Parks to provide storm shelters/safe rooms for their residents.	N	Work toward educating the mobile home park owner of the importance for storm shelters.	N
Educate residents, building professionals and safe room vendors on the International Codes Council/National Storm Shelter Association's "Standard for the Design and Construction of Storm Shelters" and incorporate this Standard into current regulatory ordinances.	N	This will be continued during public education events.	N
Identify and develop public information and education programs and provide materials and mitigation measures that protect a building's roof, all outside openings, and the building envelope. Also research ways to improve quality of construction related to wind resistance. Top priority should be given to protection of the roof system, typically the most vulnerable and most expensive component to replace.	N	Lack of interest and concerns from the public	N
Identify and encourage Private Critical Facilities (Financial Institutions, Elder Care Facilities, Designated/Potential Community Emergency Shelters, etc.) to have generator pad, wiring/transfer switches and Emergency Back-Up Generators, or Reliable Contracts to provide Back-Up Generators.	Y		Y
Develop Memorandums of Understanding (MOUs) with private sector gasoline service facilities to provide priority fuel to emergency/critical vehicles (government, Police, Fire, ambulance, etc.) in times of emergency or power outage.	Y		N
Provide covered shelters for City first response/government vehicles to protect against hail damage.	Y		Y

Provide routine trimming of trees to reduce power outages during storms.	Y		Y
Develop a contingency plan for evacuating population endangered by a wildfire.	N	Lack of interest and concern from public	N
Develop a Heat Emergency Action Plan/Heat Emergency Annex to the Emergency Operations Plan for the jurisdiction.	Y		Y
Provide new/retrofit facilities for the 911 Center and the Emergency Operations Center.	N	Lack of funding	Y
Train/Educate builders, developers, architects and engineers in techniques of disaster-resistant homebuilding, such as the Fortified Home standards developed by the Institute for Business & Home Safety (IBHS), the Blueprint for Safety guidelines developed by the Federal Alliance for Safe Homes (FLASH).	N	Lack of interest and concern from public	N
Educate builders on appropriate foundation types for soils with different degrees of shrink-swell potential. For example, using "post-tensioned slab-on-grade" or "drilled pier" vs. standard "slab-on-grade" or "wall-on-grade" foundations.	Y		Y

Implement/enforce an administrative procedure/ordinance to require permits for foundation repair and mitigate against future expansive soils damages.	N	Lack of interest and concern from the public	N
Establish an administrative procedure or change in City codes that require builders to check for expansive soils when applying for new residential construction permits, and to consider the use of foundations that mitigate expansive soil damages when in a moderate to high-risk area.	N	In process	Y
Provide and maintain defensible space around structures vulnerable to wildfires.	Y		Y
Implement red cedar eradication program (NRCS to assist) to reduce red cedar trees and wild fire potential.	N	Lack of funding	Y
Continue Compliance with, and Participation in the National Flood Insurance Program (NFIP) and the Community Rating System (CRS).	Y		Y
Prepare a comprehensive basin-wide Flood and Drainage Annex to the Multi-Hazard Mitigation Plan for all watersheds within the jurisdiction. The Annex should identify all flooding problems within the jurisdiction, and recommend the most cost-effective and politically acceptable solutions.	N	Lack of interest and concern from the public	N
Continue to acquire and remove floodplain and (future) repetitive loss properties where the community's Repetitive Loss and Flood and Drainage Annex to the Multi-Hazard Mitigation Plans identify acquisition as the most cost-effective and desirable mitigation measure.	Y		Y
Develop / Review / Update the Debris Management Plan.	Y		Y

Create and maintain habitat for flora and fauna in flood control projects. Maintaining or developing wetlands may be an effective area to receive or reduce floodwaters.	N	Lack of interest and concern from the public	N
Control erosion during development with vegetation or sediment capture, reducing sedimentation which may fill in channels and lakes, reducing their ability to carry or store floodwaters.	Y		Y
Maintain natural and beneficial functions of streams and floodplains.	Y		N
Encourage the public and businesses to be trained to care for themselves, their families, their neighbors, and their neighborhoods in case of emergencies.	Y		Y