



City of Lincoln, Nebraska
Flood Mitigation Master Plan
September 2023



City of Lincoln Flood Mitigation Master
Plan

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Executive Summary

Introduction

The City of Lincoln, in-partnership with the Lower Platte South Natural Resources District, has created this Flood Mitigation Master Plan (FMMP) to identify actions that can help reduce the damage caused by flooding and protect the natural and beneficial functions of the floodplains in the City. This plan was developed in accordance with the National Flood Insurance Program (NFIP) Community Rating System (CRS) Coordinator's Manual, which outlines a 10-step process to collect information pertinent to identifying and prioritizing flood mitigation strategies and actions. The CRS program gives credit to communities in the form of reduced flood insurance premium rates for steps that the community takes to reduce flood risk to its residents, visitors, and other stakeholders.

Planning Process

A Planning Committee consisting of 13 individuals representing local agencies and organizations was actively engaged in stakeholder coordination efforts and developed and reviewed content for certain sections of the plan. Public outreach was performed through a Flood Risk Questionnaire, Planning Committee meetings that were noticed and open to the public, and a plan website providing details on the plan process. A virtual public meeting was held on September 9, 2021, from 6:00PM to 7:00PM and was attended by 20 people. Public attendees were invited to provide input on flooding problems and possible solutions. (Sentence to be added here on open house and public engagement efforts.)

Risk Assessment

A flood risk assessment was performed for both urban and riverine flood hazards and flood hazards associated with dam and levee failure scenarios. The assessments provide detailed information on the projected hazard extent and frequency of occurrence, and also include analysis of the impacts the hazards have on people, property, infrastructure, and the local economy. The HAZUS-MH software published by the Federal Emergency Management Agency (FEMA) was used to perform the risk assessments. Assessments were performed using the regulatory flood hazard data published by FEMA for the city, all including Urban Growth Areas. Based on this assessment, it is expected that nearly \$330M in total flood losses could occur throughout the city during a 1%-annual-chance (100-year) flooding event. This regulatory information is outdated and may be underestimating the flooding and loss potential in and around the City of Lincoln; therefore, when updated flood hazard information is produced, an updated risk assessment can be performed, and it is anticipated that the expected losses from flooding will increase.

City of Lincoln Flood Mitigation Master Plan

Action Plan

The action plan created for this FMMP considers the goals determined by the Planning Committee as well as other factors such as cost and benefit to the community or specific property owners to identify and prioritize flood mitigation actions to pursue and implement in the city. These actions also consider community capabilities as well as existing programs and requirements in-place in the city and how those existing elements might be updated and/or improved to increase flood resilience. Actions can include structural flood protection measures, non-structural programs, policies, and efforts, as well as administrative and support efforts for flood preparedness, response, and recovery. The actions identified through the planning process for the FMMP are summarized in the table below.

- Goal 1:** Protect the Health and Safety of Residents and Visitors
- Goal 2:** Reduce Future Losses from Flood Events
- Goal 3:** Increase Public Awareness and Education Regarding Vulnerability to Flood Hazards
- Goal 4:** Ensure Coordinated Efforts to Increase Flood Resilience and Promote Sustainability

Structural Projects
Flood Reduction within Deadmans Run Watershed
Stormwater Drainage System Improvements
Public Information
Public Education on Flood Risk Reduction
Public Information Officer (PIO) Training
Enhanced Stakeholder Engagement- comms staff contact list, etc.
Flood Warning System (911) Improvements
Property Protection
Develop and Implement a Repetitive Loss Structure/High Risk Property Plan
Develop and Implement a Property Acquisition Program
Develop and Implement a Home Elevation Program
Make updates to LID/Green Infrastructure/Local Detention Requirements
Adopt Community-Wide No Adverse Impact Language
Preventative Activities
Investigate and Obtain Dam Failure Modeling/Mapping/Risk Assessment
Develop and Implement Stormwater/Wastewater Inflow and Infiltration Reduction Program
Future Conditions Flood Hazard Modeling and Mapping
Update Compensatory Storage Code/Policy
Update Final Plat Requirements Code/Policy
Fluvial Hazard Zone Modeling/Mapping
Natural Resource Protection
Adopt Cluster Development Regulations
Deed Restrictions for Current/Future Open Space Parcels
Adopt Native/Natural Vegetation Policy/Requirements
Emergency Services
Create Weather Radio Inventory/Replacement Program
Civil Service Improvements: Vehicles and Training
Develop Emergency Action Plans for Transportation & Utilities Divisions

City of Lincoln Flood Mitigation Master Plan

Plan Adoption and Maintenance

This FMMP provides a framework for guiding implementation of flood risk reduction activities over a 5-year period. The Planning Committee will lead plan implementation, monitoring, evaluation, and plan update efforts, including public efforts to report on progress, request feedback, and solicit input for future updates to the FMMP. Plan updates will account for any new flood vulnerabilities, special circumstances, or new information that becomes available, and will include updated risk assessment(s) to help focus and/or re-prioritize mitigation strategies.

City of Lincoln Flood Mitigation Master Plan

Table of Contents

1	Introduction	11
1.1	Purpose of Plan	11
1.2	Plan Organization and CRS Steps for Floodplain Management	11
1.3	Defining the Planning Area	12
2	Planning Process	13
2.1	Planning Committee	13
2.2	Public Involvement Strategy	14
2.3	Public Involvement Tactics	14
2.3.1	Website	14
2.3.2	Flood Risk Questionnaire	14
2.3.3	Outreach Materials	14
2.3.4	Public Information Meetings	16
2.3.5	Public Webcast	17
2.4	Chronology of Plan Development Events	18
2.5	Coordination with other organizations	18
2.6	Review of Existing Programs	18
3	Risk Assessment	20
3.1	Methodology	20
3.1.1	Approach	20
3.1.2	Limitations	20
3.2	Summary of Flood Types, Map Availability, and Historic Events	21
3.2.1	Introduction	21
3.2.2	Types of Flooding in Lincoln	21
3.2.3	Flood Hazard Map Availability	23
3.2.4	Historical Flood Disaster Events	23
3.3	Flood Hazard – Riverine Flooding and Urban and Flash Flooding	24
3.3.1	General Description of Riverine Flooding and Urban and Flash Flooding	24
3.3.2	Location and Source of Riverine Flooding and Urban and Flash Flooding	25
3.3.3	Extent of Riverine Flooding and Urban and Flash Flooding	30
3.3.4	Frequency of Riverine Flooding and Urban and Flash Flooding	35
3.3.5	Summary of Vulnerability to Riverine Flooding and Urban and Flash Flooding	42
3.3.6	Impacts of Riverine Flooding and Urban and Flash Flooding	46
3.4	Flood Hazard – Dam and Levee Failure	47

City of Lincoln Flood Mitigation Master Plan

3.4.1	General Description of Dam and Levee Failure.....	47
3.4.2	Location of Potential Dam or Levee Failure	48
3.4.3	Extent of Dam and Levee Failure.....	55
3.4.4	Frequency of Dam and Levee Failure	58
3.4.5	Summary of City of Lincoln’s Vulnerability to Dam and Levee Failure	59
	<i>Dam Failure Vulnerability</i>	59
	<i>Levee Failure Vulnerability</i>	60
3.4.6	Impacts of Dam and Levee Failure	62
3.5	Repetitive Loss Properties Profile	63
3.5.1	Repetitive Loss in Lincoln, Nebraska	63
3.5.2	Map of Repetitive Loss Areas in City of Lincoln	65
	List of Addresses of All Insurable Properties within the Repetitive Loss Area.....	66
3.5.4	Annual Outreach Project.....	66
3.5.3		
3.6	Critical Facilities.....	69
3.7	Future Conditions	71
3.7.1	Changes in Floodplain Development and Demographics.....	71
3.7.2	Development in the Watershed.....	71
3.7.3	Climate Change	73
3.8	Hazard and Risk Assessment Conclusion.....	75
4	Action Plan.....	76
4.1	Goals and Objectives.....	76
4.2	City of Lincoln Capability Assessment.....	77
4.3	Review of Existing Activities.....	82
4.4	Review of Possible Strategies for Inclusion in the Action Plan	88
4.5	Action Plan	89
4.5.1	Cost-Benefit and Action Prioritization.....	89
5	Plan Adoption and Maintenance	99
5.1	Plan Adoption	99
5.2	Plan Implementation, Evaluation, and Revision	99
5.3	Plan Update.....	99
6	References	102
	Appendix A – Adoption Resolution.....	104
	Appendix B – Planning Process Documentation	107
	Appendix C – Regulatory Peak Discharge Data.....	167

City of Lincoln Flood Mitigation Master Plan

Appendix D – HAZUS Reports	174
Appendix E – Possible Strategies	177

Table of Figures

Figure 1-1 CRS Planning Process.....	12
Figure 2-1 City of Lincoln FMMP Public Website.....	15
Figure 2-2 City of Lincoln FMMP Project Brochure.....	16
Figure 2-3 Public Meeting #1 Notice	17
Figure 3-1 Diagram Depicting a Special Flood Hazard Area	24
Figure 3-2 City of Lincoln 100-Year and 500-Year Floodplain	26
Figure 3-3 Urban Areas Vulnerable to Flash Flooding in City of Lincoln	27
Figure 3-4 HAZUS Flood Depth Grid for Future Conditions on Salt Creek Only	32
Figure 3-5 HAZUS Flood Depth Grid for Existing Conditions on Salt Creek Only	33
Figure 3-6 HAZUS Flood Depth Grid for Existing Conditions on All Currently Effective Floodplains in the City of Lincoln.....	34
Figure 3-7 High Hazard Dams in and Around the City of Lincoln.....	50
Figure 3-8 Levees and Leveed Areas in City of Lincoln.....	52
Figure 3-9 Repetitive Loss Areas in Lincoln	65
Figure 3-10 Lincoln-Lancaster County 2040 Comprehensive Plan Tiered Future Growth Areas	72

City of Lincoln Flood Mitigation Master Plan

Table of Tables

Table 1-1 Lincoln Demographic Profile, US Census Bureau 2020.....	12
Table 2-1 Lincoln 2022 FMMP Planning Committee Members.....	13
Table 3-1 FEMA Disaster Declarations for Flooding in Lancaster County	23
Table 3-2 FEMA Flood Zones in City of Lincoln	30
Table 3-3 Calculated Land Area by FEMA Flood Zone (in square miles)	31
Table 3-4 Summary of Flood and Urban Flash Flood Events in City of Lincoln	35
Table 3-5 Flood and Urban Flash Flood Event History in City of Lincoln	35
Table 3-6 Flood Categories for Salt Creek At Pioneers Boulevard	39
Table 3-7 Highest Historical Crests on Salt Creek at Pioneers Boulevard	39
Table 3-8 Highest Historical Crests for Stevens Creek Near Lincoln	40
Table 3-9 Flood Categories for Oak Creek at Lincoln (Air Park Road)	40
Table 3-10 Highest Historical Crests for Oak Creek at Lincoln (Air Park Road).....	40
Table 3-11 Flood Categories for Middle Creek at Lincoln (SW 23 rd Street).....	40
Table 3-12 Highest Historical Crests on Middle Creek at Lincoln (SW 23 rd Street)	41
Table 3-13 Flood Categories for Antelope Creek at Lincoln (27 th Street).....	41
Table 3-14 Highest Historical Crests on Antelope Creek at Lincoln (27 th Street)	41
Table 3-15 Flood Categories for Haines Branch at Lincoln (SW 56 th Street)	41
Table 3-16 Highest Historical Crests for Haines Branch at Lincoln (SW 56 th Street).....	41
Table 3-17 HAZUS Estimated Losses.....	44
Table 3-18 Summary of Total Losses from HAZUS Scenarios	45
Table 3-19 Critical Facilities Located in the Floodplain in City of Lincoln	47
Table 3-20 Dams Located in or near City of Lincoln	49
Table 3-21 Levees Located in City of Lincoln	51
Table 3-22 USACE Dam Information for City of Lincoln Dams	56
Table 3-23 USACE Levee Risk Classification System.....	57
Table 3-24 National Inventory of Dams Maximum High Pool Breach Scenario	60
Table 3-25 Assets at Risk from Levee Failure, National Levee Database	61
Table 3-26 Repetitive Loss Zones in City of Lincoln	66
Table 3-27 Critical Facilities in City of Lincoln	69
Table 3-28 Projected Increase in Flood Discharges Caused by Projected Development, Salt Creek Floodplain Resiliency Study.....	73
Table 3-29 1% Annual Chance Existing, Updated, and Future Conditions Discharges by Subbasin.....	74
Table 3-30 Future Conditions on Salt Creek Hydraulic Study.....	75
Table 4-1 Planning and Regulatory Capabilities.....	78
Table 4-2 Administrative and Technical Capabilities	79
Table 4-3 Fiscal Capabilities	79
Table 4-4 City of Lincoln’s Overall Degree of Capability	82
Table 4-5 City of Lincoln, NE Current Regulations, Policies, and Programs Related to Floodplain Management and Flood Risk Reduction	83

City of Lincoln Flood Mitigation Master
Plan

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1 Introduction

1.1 Purpose of Plan

The City of Lincoln is committed to protecting the well-being of residents, safety of homes and neighborhoods, and the prosperity of the community. Understanding how flood risk affects the community and taking steps now to reduce the risk of floods can help the community continue to grow and thrive together. Floodplain management planning is an important part of proactively addressing flood risk. The City of Lincoln Flood Mitigation Master Plan (FMMP) identifies actions that can help reduce the damage caused by flooding and protect the natural and beneficial functions of the City's floodplains.

While flood disasters cannot be prevented from occurring, the effects can be reduced or eliminated through well-organized efforts such as public education and awareness campaigns, preparedness activities and mitigation actions. After flood disasters, repairs and reconstruction are often completed in such a way as to simply restore to pre-disaster conditions. Such efforts expedite a return to normalcy; however, the replication of pre-disaster conditions results in a cycle of damage, reconstruction, and repeated damage. Floodplain management ensures that such cycles are broken and that post-disaster repairs and reconstruction result in increased resiliency for Lincoln.

The FMMP does not supersede current plans and strategies. It incorporates information and actions from different planning efforts to help coordinate staff and community members in acting to reduce the risk and cost of flood response and recovery to the City and its residents, workers, and visitors by protecting critical facilities, reducing liability exposure, and minimizing overall impacts and disruptions.

1.2 Plan Organization and CRS Steps for Floodplain Management

This plan was developed in accordance with the National Flood Insurance Program (NFIP) Community Rating System (CRS) Coordinator's Manual, published in 2017 with an addendum completed in 2021.

By following the 10-step planning process, the City of Lincoln commits to a rigorous and participatory planning process that results in a floodplain management plan. The plan will guide mitigation efforts and provide benefits in the form of reduced flood insurance rates.

The ten-step planning process is detailed below:

Introduction: purpose of the plan, authority for development of the plan, CRS steps

Planning Process

Step 1, *Organize*: City of Lincoln's organization to undertake the planning process.

Step 2, *Involve the Public*: meetings and outreach activities to engage the public in development of the FMP.

Step 3, *Coordinate*: incorporation of other plans and agencies' efforts into the plan.

Risk Assessment

Step 4, *Assess the Hazard*: all flood hazards affecting the City of Lincoln.



City of Lincoln Flood Mitigation Master Plan

Step 5, *Asses the Problem*: vulnerabilities from the identified hazards.

Action Plan

Step 6, *Set Goals*: goals to guide identification of actions to reduce impacts of hazards.

Step 7, *Review of Possible Actions*: comprehensive list of actions that the City of Lincoln considered for implementation through the FMMP as well as a capability assessment capturing the City’s regulatory, administrative, and fiscal resources that can be utilized to further floodplain management.

Step 8, *Action Plan*: floodplain management actions that the City of Lincoln has chosen to implement during the 5-year lifespan of the FMMP

Plan Maintenance

Step 9, *Plan Adoption*: details adoption of the plan by the City Council

Step 10, *Implement, Evaluate, Revise*: provides framework for implementing the plan, evaluating its effectiveness and updating the plan to keep it current.

Figure 1-1 CRS Planning Process



1.3 Defining the Planning Area

The planning area is defined as all areas within Lincoln City limits. The City’s total population is 291,082 (US Census 2020). With a land total of 89.11 square miles, the population density is 3,266.55 people per square mile.

The following table is a comprehensive list that details the Census population count in Lincoln in 2010, the US Census population count in 2020, the population change in population between 2010 and 2020, the total number of housing units, the number of housing units occupied, and the area (in square miles) for the municipality.

Table 1-1 Lincoln Demographic Profile, US Census Bureau 2020

Demographic	Total Count
2010 Population	258,379
2020 Population	291,082
Population Change 2010 – 2020	12.66%
Total Housing Units	123,819
Occupied Housing Units	116,701
Vacant Housing Units	7,118
Land Area (sq. miles)	89.11

Step 1, Organize

2 Planning Process

The City of Lincoln Watershed Management Division initiated and led the planning process. The firms of Michael Baker International and Olsson were hired to assist with the development of the FMMP.

2.1 Planning Committee

A Planning Committee was formed to oversee the planning effort. The Committee consists of 13 individuals that represent local agencies and organizations. Committee members were actively engaged in the planning process. They participated in meetings, coordinated with stakeholders, and wrote and reviewed draft sections of the plan.

The Planning Committee first met on August 5, 2021 to organize the planning process. They met an additional 5 times between October 2021 and August 2022 to assess the hazards and problems, set goals, review possible mitigation actions, and draft an Action Plan.

A complete list of Planning Committee members and their relevant expertise is below:

Table 2-1 Lincoln 2022 FMMP Planning Committee Members

Planning Committee Members		
Name	Agency / Organization	Primary area of expertise
Rachel Christopher	Planning Department	Land use and comprehensive planning
Terry Kathe	Building and Safety	Codes, regulations and other preventative measures
Mike Middendorf	Watershed Management Division	Property protection
Mark Hosking	Lincoln/Lancaster Emergency Management	Emergency services
Ben Higgins	Watershed Management Division	Infrastructure management
Erika Hill	Public Information Office	Public Information
Lexy Hindt	NDNR	Structural flood control projects
Jamie Reinke	NDNR	Structural flood control projects
Adele Phillips	NDNR	Structural flood control projects
Tim Zach	Watershed Management Division	Infrastructure management
Jared Nelson	Watershed Management Division	Structural flood control projects
Mark Lindemann	Lower Platte South NRD	Natural resource protection
David Potter	Lower Platte South NRD	Natural resource protection
Grant Daily	South Salt Creek Community Organization	Non-governmental community interests



Step 2, *Involve the Public*

2.2 Public Involvement Strategy

The goal of the public involvement process was to both inform and seek input regarding Lincoln's flood risk. The process included opportunities for the public to comment on the FMMP during its development and before its approval. Because the City and its partners are involved in a range of proactive flood mitigation measures, the committee also used this opportunity to frame those disparate projects as part of a unified effort to reduce flood risk. This was intended to build support for future projects, as well as to reinforce flooding as a problem that should, and can, be addressed.

Much of the planning process took place while COVID-19 social distancing protocols were still in force. To overcome those limitations, the committee used a variety of tools to reach the broadest audience possible.

2.3 Public Involvement Tactics

2.3.1 Website

The City created and maintains a [website](#) to provide details about the planning process to the public and invite the public to participate in the planning process. The website includes an overview of the planning process, schedule of committee meetings, contact information for key committee members, and links to important flood-related resources. The website was publicized in a press release announcing the start of the planning process, in all project communications and at public meetings. The website will remain active and to keep the public informed about successful mitigation projects and future plan updates.

2.3.2 Flood Risk Questionnaire

A short (6 question) digital questionnaire was made available to everyone in the community through a link publicized on the City's website and shared at the initial public engagement meeting. Participants were asked about their personal history with flooding, perception of the City's flood risk and problems, and their priorities for flood reduction projects. Although a relatively small group (n=14) responded to the survey, the group represented a range of stakeholders, including both residential and commercial floodplain property owners, developers, and those who lived outside of the floodplain. The majority of participants took the opportunity to add written comments. Questionnaire results and insights were shared with the public at a Planning Committee meeting and informed development of the plan development. Survey responses can be found in Appendix B.

2.3.3 Outreach Materials

The Planning Committee conducted both traditional and digital outreach to raise awareness about the project, invite participation in the planning process, and detail upcoming events, including the schedule of committee and public meetings.

- News Release announced planning effort and inviting public participation on September, 1, 2021.
- Project information shared on the Lincoln Transportation & Utilities (LTU) website.
- Public meeting announcements on City of Lincoln and NRD social media accounts.

City of Lincoln Flood Mitigation Master Plan

- A public survey/questionnaire was hosted on the City's website.
- Project brochure mailed to 139 developers and 34 community organizations/businesses.

Figure 2-1 City of Lincoln FMMP Public Website

Home / City Information / Departments / Transportation and Utilities / LTU Projects / Watershed Management Projects / **Flood Mitigation Master Plan**

Flood Mitigation Master Plan

The City of Lincoln is always looking for ways to reduce flood risk. The Flood Mitigation Master Plan is just one of several initiatives that focuses on flood risk reduction measures that will reduce damage to homes, businesses, and infrastructure in future flood events. Each initiative has a different area of focus, but all have the same goal: **A safer Lincoln.**

The plan will help identify ways that the city can reduce flood risk for residents and businesses. This plan builds on the [2020 Lower Platte South Natural Resources District Multi-Jurisdictional Hazard Mitigation Plan](#), and it will be created following guidelines outlined in FEMA's Community Rating System (CRS). The City is already enrolled in the CRS as a Class 5 community. Participating in the program has reduced flood insurance rates for businesses and residents by 25%.

The Flood Mitigation Master Plan will assess risk and identify actions that can reduce long term flood risk to human life, local properties, and the environment. Through the planning process, the City of Lincoln will promote public awareness of flood hazards and the community's response to flooding. To assist with the identification of flood hazards and mitigation opportunities, the City and project partners are seeking technical assistance from the community, and state and federal agencies.



PUBLIC INVOLVEMENT

We are committed to involving the public in this process in meaningful ways, and to developing materials and engagement strategies that will best meet the needs of the community and the individuals that are impacted by flooding.



The Planning Team will be led by the City of Lincoln with support from the Lower Platte South Natural Resources District. The team will meet six times over the course of a year.



There will be at least two public meetings held at locations within the floodplain, as well as other outreach efforts, such as webcasts, mailings, and surveys.

Figure 2-2 City of Lincoln FMMP Project Brochure

LINCOLN FLOOD MITIGATION MASTER PLAN

The Planning Process Overview

The City of Lincoln is always looking for ways to reduce flood risk. The Flood Mitigation Master Plan is just one of several initiatives that focuses on flood risk reduction measures that will reduce damage to homes, businesses, and infrastructure in future flood events. Each initiative has a different area of focus, but all have the same goal:

A safer Lincoln.

The Process

PHASE 1: PLANNING PROCESS

- Organize
- Involve the Public
- Coordinate

PHASE 2: RISK ASSESSMENT

- Assess the Hazard
- Assess the Problem

PHASE 3: MITIGATION STRATEGY

- Set Goals
- Review Possible Activities
- Draft Action Plan
- Adopt Plan
- Implement, Evaluate, Revise

The Planning Team

- The Planning Team will be led by the City of Lincoln with support from the Lower Platte South Natural Resources District. The team will meet six times over the course of a year.
- There will be at least two public meetings held at locations within the floodplain, as well as other outreach efforts, such as webcasts, mailings, and surveys.

The Outcome

FLOOD RISK REDUCTION

Whether you live, work, or play within the Lincoln city limits, you are impacted by flooding. In addition to physical damage caused by flooding, economic damages and loss of tax revenue can be massive burdens on future services and infrastructure investment within the community. The purpose of the plan is to understand Lincoln's flood risk and to identify mitigation actions and projects that can lower risk.

FLOOD INSURANCE SAVINGS

The City of Lincoln participates in the Community Rating System, a program that rewards efforts to reduce flood risk by lowering flood insurance rates for residents and businesses. The city can earn points toward lower rates from the planning process. Carrying out the projects that will be identified in the plan can assist with lowering rates even further in the future. Lower rates make it easier for Lincoln residents to get and keep flood insurance on their properties.

2.3.4 Public Information Meetings

In addition to all committee meetings being open to the public, two public information meetings were held.

City of Lincoln Flood Mitigation Master Plan

Public Meeting #1

The first public meeting was held on Thursday, September 9, 2021, from 6:00 to 7:00 PM. The City intended to hold the meeting at the Jayne Snyder Trails Center (228 N 21st St, Lincoln, NE 68503), but the meeting was held virtually due to COVID-social distancing restrictions. There were 20 people in attendance, including individuals from the Planning Committee. The meeting was noticed on the project website. Additionally, an invitation was mailed to 173 citizens, organizations, and businesses within the community. Both the City and the NRD advertised the meeting on their social media accounts.

During the meeting, members of the Planning Committee presented information regarding the project, history of the flooding in Lincoln and the benefits this master plan could provide the community. There was also an opportunity for members of the public to ask questions in a Q&A segment and provide input on the hazards, problems, and possible solutions. Individuals were also given contact information to follow up with additional input after the meeting.

No public comments were received following the public meeting.

Public Meeting #2

The second meeting was held on [insert date] to review the draft plan and invite public comment. The meeting was held at [Insert location], an area of the city affected by flooding. Public input was incorporated into the plan, and the plan was submitted for adoption by City Council on [xx].

2.3.5 Public Webcast

The two public meetings were webcast and made available on the City's website.

Figure 2-3 Public Meeting #1 Notice



2.4 Chronology of Plan Development Events

Date	Event	Description
August 5, 2021	Steering Committee Meeting #1	<ul style="list-style-type: none"> Project Overview Timeline Milestones Steering Committee Role/Responsibilities
October 21, 2021	Steering Committee Meeting #2	<ul style="list-style-type: none"> Past and in-flight flood risk reduction activities Organizations with vested interest in flood risk reduction Historic and Future Flood Risk Data
February 22, 2022	Steering Committee Meeting #3	<ul style="list-style-type: none"> HAZUS findings and hazard risk assessment
April 19, 2022	Steering Committee Meeting #4	<ul style="list-style-type: none"> Interagency goals to guide development of Action Plan
June 30, 2022	Steering Committee Meeting #5	<ul style="list-style-type: none"> Projects identified in previous planning efforts New actions that support interagency goals
August 17, 2022	Steering Committee Meeting #6	<ul style="list-style-type: none"> Actions for inclusion in Action Plan

Step 3, *Coordinate*

2.5 Coordination with other organizations

Fifty organizations, including businesses, neighborhood and community organizations, agencies, institutions, and elected officials, were contacted by the City via email on September 13, 2022. These organizations were asked to share studies, plans, or information pertinent to the floodplain management plan, help determine if their programs or initiatives may affect the plan and invited to support the planning effort.

A copy of the email communication and list of recipients is included in Appendix B.

2.6 Review of Existing Programs

The following studies, plans and technical information were consulted and incorporated into the Plan, as appropriate:

- Community Rating System Coordinator’s Manual, 2017
- Lower Platte South Natural Resources District Multi-Jurisdictional Hazard Mitigation Plan Update, 2020
- PlanForward, Lincoln-Lancaster County 2050 Comprehensive Plan
- National Centers for Environmental Information (NCEI) Storm Events Database
- Lancaster County, Nebraska and Incorporated Areas Flood Insurance Study (FIS), April 16, 2013
- FEMA Disaster Declarations for States and Counties, Lancaster County, Nebraska

City of Lincoln Flood Mitigation Master Plan

- Nebraska Department of Natural Resources, Nebraska Flooding: March 2019
- City of Lincoln, Nebraska Watershed Management Division
- USACE National Levee Database
- 2021 – 2027 Climate Action Plan, City of Lincoln, Nebraska
- USACE Deadmans Run Section 205
- Salt Creek Floodplain Resiliency Study Recommendations Report, 2020
- City of Lincoln Drainage Criteria Manual, now the Flood & Water Quality Protection Manual, Updated, May November 2022
- State of Nebraska Flood Hazard Mitigation Plan, 2022
- Comprehensive Watershed Master Plan, 2022

In addition to the resources that were referenced, a HAZUS 5.1 vulnerability assessment was performed using user defined facilities (UDF) data developed from GIS structure and parcel data from the City of Lincoln (Lancaster County), user defined depth grids representing both the FEMA Regulatory 1-Percent Annual Chance Flood and an Existing Conditions Future Precipitation 1-Percent Annual Chance Flood for Salt Creek. The FEMA Regulatory depth grid was developed using current effective National Flood Hazard Layer (NFHL) data for the project area, and the Existing Conditions Future Precipitation depth grid was developed using data from the Salt Creek Floodplain Resiliency Study.

Section 4.2.1 of this plan includes an assessment of the City of Lincoln’s planning and regulatory, administrative/technical, and fiscal capabilities to implement floodplain management actions.

Step 4, Assess the Hazard

Step 5, Assess the Problem

3 Risk Assessment

3.1 Methodology

Risk assessment is the process of identifying the natural hazards such as flooding that can affect a community, as well as the impacts those threats and hazards would have on a community if they were to occur. Understanding flood risk is important because it allows a community to prioritize actions that can protect vulnerable populations and infrastructure.

The City of Lincoln is vulnerable to the following flooding types:

- Riverine Flooding
- Urban and Flash Flooding
- Dam Failure
- Levee Failure

3.1.1 Approach

This risk assessment describes the different types of flooding that occur within the City of Lincoln and provides detailed information on the source of the hazard, extent, and frequency of occurrence. The assessment also includes analysis of the impacts of identified flood hazards on people, property, infrastructure, the local economy and natural floodplain functions.

This risk assessment uses the best available data and tools, including Geographic Information System (GIS) and FEMA's risk assessment platform, HAZUS-MH. HAZUS-MH estimates potential losses from natural disasters. It also relies on input from the public stakeholders.

3.1.2 Limitations

In data-driven analyses, there is the chance that the data sets used have limitations in the form of missing entries, approximations of data entries, and incomplete data entries. Specific data limitations that were identified during the development of the Risk Assessment are as follows:

- Interior flooding due to levees is a flooding hazard to the City. However, the location and extent of interior flooding due to levees is mostly accounted for in the current floodplain maps, and there is no additional information to support this flood hazard. Because of these limitations, this flood hazard is captured under the profiled flood hazards in this plan.
- The NFIP Effective FIRM Panels for the City of Lincoln were last updated in February 2011 and April 2013. The maps do not accurately reflect the current 1% annual chance flood event due to the physical changes at many locations since the panels were developed. The current risks from flooding are not portrayed in the FIRM panels for the city, and the areas that are likely to flood are generally unknown.
- The Lancaster County Flood Insurance Study (FIS), effective April 13, 2013, does not provide separate data sets for Stevens Creek, Oak Creek, Middle Creek, or Haines Branch. Flood records for the Salt Creek basin are combined data from these areas. The City of Lincoln and LPSNRD Stevens Creek Watershed Master Plan, March 2005,

provided data for the waterway. Additionally, there is limited previous occurrence flooding data for geographic areas other than Salt Creek, Oak Creek, and Antelope Creek.

- The NOAA NCEI Storm Events Database does not have flooding events on record prior to 1996.
- The NOAA NCEI Database offers complete data sets at the county level while citing approximate flooding locations. Approximate locations may not encompass the entire area impacted by the flooding event, and event narratives that are often included may not provide parcel-level data to incorporate into the flooding profile.
- All dollar amounts that have been identified as a result of losses from the hazard events in the risk assessment are from the time of the event. Financial losses and impact numbers have not been edited for inflation.
- Emergency Action Plans (EAP) developed for dams in Nebraska are protected by the Nebraska Department of Natural Resources Dam Safety and are not released to the public due to state policy.

The data limitations identified above present an opportunity for future studies that could strengthen the understanding of flood hazards and vulnerability in the City of Lincoln. Currently, the city is undergoing a regulatory floodplain mapping update with the NFIP and will also be updating all Hydrologic and Hydraulic (H&H) studies. As a result, more up-to-date floodplain mapping information and understanding of how water moves through the identified floodplains will be available for incorporation. As additional new and updated flood data becomes available, the City of Lincoln Flood Mitigation Master Plan will be reviewed and updated, if necessary, to ensure it remains a living document.

3.2 Summary of Flood Types, Map Availability, and Historic Events

3.2.1 Introduction

The City of Lincoln is likely to experience the following flood hazards: riverine flooding, urban and flash flooding, dam failure, and levee failure. Lincoln's Watershed Management Division identifies the following eleven waterways as flood sources: Salt Creek, Stevens Creek, Oak Creek, Middle Creek, Antelope Creek, Beal Slough, Haines Branch, Cardwell Branch, Lynn Creek, Deadmans Run, and Little Salt Creek.

3.2.2 Types of Flooding in Lincoln

Riverine Flooding – Riverine flooding typically originates when rising water levels from a river, creek, or stream spread onto normally dry land. Extra water from snowmelt, rainfall, freezing streams, and/or ice flows causes the river or stream to overflow into adjacent floodplains. Winter flooding usually occurs when ice creates dams or streams freeze from the bottom up during extreme cold spells. Spring flooding is usually the direct result of melting winter snowpack, heavy spring rains, or both.

Urban and Flash Flooding – Urban and flash flooding may occur in developed areas when the amount of water generated from rainfall and runoff exceeds a stormwater system's capability to remove it. Urban and flash floods can occur anywhere that a large volume of water falls or melts over a short time period, generating runoff that exceeds the drainage system capacity. According to the City of Lincoln Flood and Water Quality Protection Manual, March 2023, culverts and bridges are designed to transport, at a minimum, the 50-year flood waters with one foot of freeboard from the center of the roadway to the water surface elevation. Arterial roadways are designed to support the 100-year flood event without overtopping the roadway. Storm drains in

the City of Lincoln are designed to support the 5-year flood event in residential areas, the 10-year flood event in commercial, downtown, and industrial areas, and the 10-year flood event for residential areas that are located downstream of commercial, downtown, and industrial areas. Inlets in the City are also designed to support the 5-year flood event in residential areas and the 10-year flood event in downtown, industrial, commercial, and arterial roads. The detention and retention storage facilities in the City of Lincoln support the 2-year, 10-year, and 100-year flood events. They are usually caused by slow-moving thunderstorms or rapid snowmelt. Because flash floods are so localized, their hazard areas are difficult to clearly define. They often occur with little warning and have significant impacts. Urban and flash flooding can also be exacerbated by the development of natural fields or woodlands into roads, parking lots, and structures. In general, urbanization can increase runoff, which is two to six times higher volume in urban areas than on natural terrain (National Oceanic and Atmospheric Administration, 1992). Rapidly moving water only a few inches deep can lift people off their feet, and a depth of only a foot or two is needed to sweep cars away. Most flood deaths result from urban flash floods.

Dam Failure – A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams are typically constructed of earth, rock, concrete, or mine tailings. A dam failure (a collapse, breach, or other failure) often results in downstream flooding.

Dam failures typically occur when spillway capacity is inadequate and excess flow overtops the dam, or when the dam or foundation is internally eroded (piping). Complete failure occurs if the internal erosion or overtopping results in a complete structural breach. A complete failure of a dam releases a high-velocity wall of debris-laden water that rushes downstream.

Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, which cause most failures;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leaks or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage, replace lost material from the cross section of the dam and abutments, or maintain gates, valves, and other operational components;
- Improper design, including the use of improper construction materials and construction practices;
- Negligent operation, including the failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway;
- Landslides into reservoirs, which cause surges that result in overtopping;
- High winds, which can cause significant wave action and result in substantial erosion; and
- Earthquakes, which typically cause longitudinal cracks at the tops of the embankments and weaken entire structures.

Levee Failure – A levee is usually an earthen berm or wall built along a river's floodplain to prevent flooding in nearby population areas. Typically, these run parallel to a river. Levee failures generally occur from one or more of the following causes:

- Overtopping due to flows exceeding the levee's capacity;
- Internal erosion; and
- Lack of regular maintenance.

3.2.3 Flood Hazard Map Availability

In addition to the maps presented in the City of Lincoln Flood Mitigation Master Plan, the City of Lincoln and Lancaster County has developed a floodplain online mapping tool that can be referenced at any time. The City of Lincoln/Lancaster Interactive Floodplain Map displays the floodplain boundaries as well as the observed river stage (Major Flooding, Moderate Flooding, Minor Flooding, Near Flood, No Flooding, Flood Category Not Defined, At or Below Low Water Threshold, Observations Are Not Current, and Out of Service). Stream gage sites can also be clicked on to display the current water level as well as flooding depth stages and their categories.

The City of Lincoln also offers a general floodplain map with property information embedded in the online map. [The City of Lincoln/Lancaster County, NE Public GIS Viewer](#) allows users to explore the City and County parcel information and the parcel’s location in relation to the floodplains throughout the mapped area.

The floodplain layer featured in both mapping tools is based on the effective Flood Insurance Rate Map (FIRM). The City of Lincoln’s FIRM was updated effective February 18, 2011, and April 16, 2013.

3.2.4 Historical Flood Disaster Events

According to FEMA’s Disaster Declarations for States and Counties, Lancaster County has experienced 5 flooding events since 1953 for which federal disaster declarations were issued. Federal disaster declarations are often multi-county or regional disasters.

Table 3-1 FEMA Disaster Declarations for Flooding in Lancaster County

Disaster Number	Hazard Event	Incident Date	Declaration Date
DR-228-NE	Severe Storms & Flooding	7/18/1967	7/18/1967
DR-406-NE	Severe Storms & Flooding	10/20/1973	10/20/1973
DR-998-NE	Severe Storms & Flooding	6/23/1993-8/5/1993	7/19/1993
DR-1902-NE	Severe Storms, Ice Jams, & Flooding	3/6/2010-4/3/2010	4/21/2010
DR-4420-NE	Severe Winter Storm, Straight-Line Winds, & Flooding	3/9/2019-7/14/2019	3/21/2019

More localized hazard disaster events, such as the 2015 flooding event that occurred in the City of Lincoln, have not received a federal disaster declaration. Heavy rainfall ranging from 6-11 inches occurred in and around Lincoln from May 6-7, 2015, and resulted in widespread flooding, including record flood levels on Salt Creek, Turkey Creek, and both the Little and Big Blue Rivers. Flood damages totaled over \$13M from the event.

3.3 Flood Hazard – Riverine Flooding and Urban and Flash Flooding

The assessment of the riverine flood and urban and flash flood hazard in the City of Lincoln is presented in the following profile. Within the profile there are subsections that address the following:

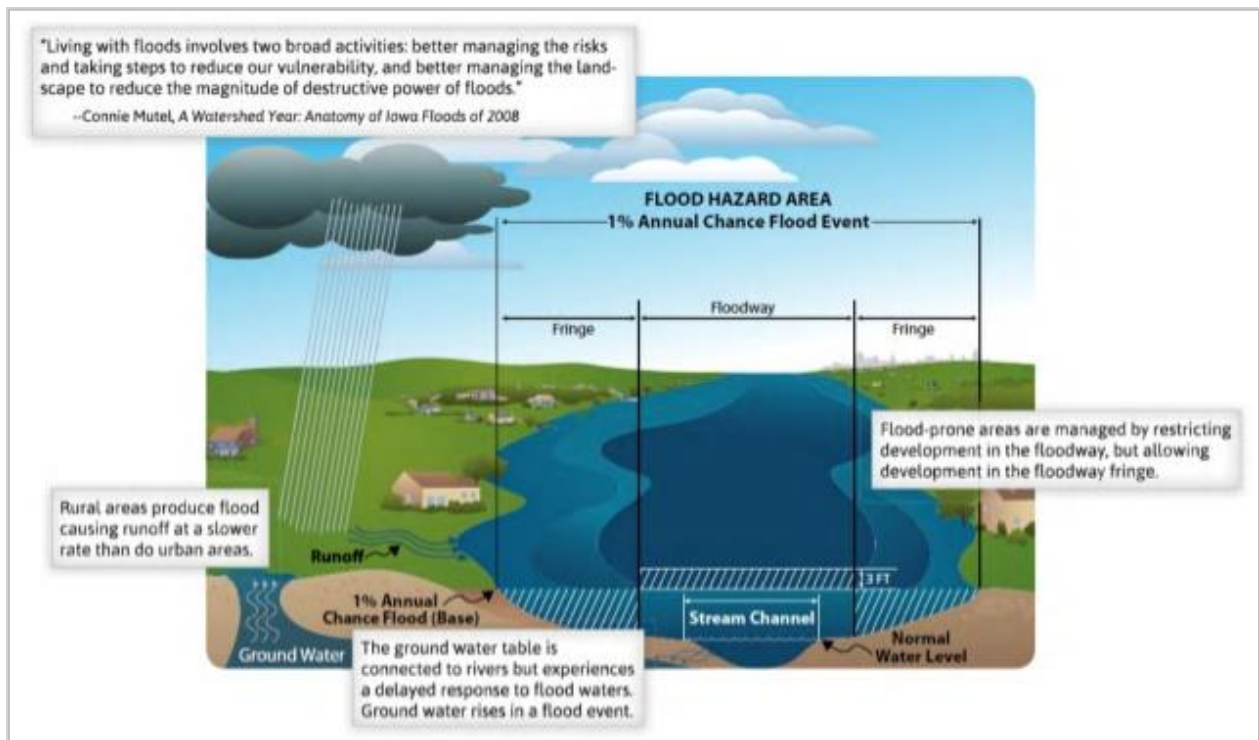
- General description of the hazard
- Location and source of hazard
- Extent of the hazard
- Frequency of the hazard
- Hazard impacts on the community
- Summary of vulnerability to the hazard

3.3.1 General Description of Riverine Flooding and Urban and Flash Flooding

A flood is a natural event for rivers and streams and occurs when a normally dry area is inundated with water. Excess water from snowmelt or rainfall accumulates and overflows onto the stream banks and adjacent floodplains. Floodplains are lowlands, adjacent to rivers, streams, and creeks that are subject to recurrent floods. Flash floods, usually resulting from heavy rains or rapid snowmelt, can flood areas not typically subject to flooding, including urban areas. Extreme cold temperatures can cause streams and rivers to freeze, causing ice jams, and creating flood conditions.

FEMA develops Flood Insurance Rate Maps (FIRMs) to identify the 1% annual chance flood zone for land use planning and the National Flood Insurance Program (NFIP). This 1% annual chance flood zone is used to delineate the Special Flood Hazard Area (SFHA) and identify Base Flood Elevations. The figure below illustrates these terms.

Figure 3-1 Diagram Depicting a Special Flood Hazard Area



Floods are considered hazards when people and property are affected. Nationwide, hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories. In Lincoln, flooding occurs commonly and can occur during any season of the year from flooding of SFHAs and urban and flash flooding. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water. Fast-moving water can wash buildings off their foundations and sweep vehicles downstream. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can cause extensive damage. Flooding can cause extensive damage to crop lands and bring about the loss of livestock. Several factors determine the severity of floods, including rainfall intensity and duration, topography and ground cover.

3.3.2 Location and Source of Riverine Flooding and Urban and Flash Flooding

Approximately 14% of the City of Lincoln is currently in a floodplain according to the Lincoln-Lancaster 2050 Comprehensive Plan. There is a “no adverse impact” policy for the City and Lancaster County that requires development in the floodplain to meet no net fill and no-rise criteria in undeveloped areas around the perimeter of the city, identified as “new growth areas”. Smaller-scale flooding can also occur outside of the identified flood zones. When it rains in Lincoln, stormwater flows into drainage inlets, gutters, and underground pipes before reaching Salt Creek, which drains into the Platte River. Lincoln occasionally gets more rain than the storm drain system or streams can adequately convey, which can lead to flash and urban flooding.

The Lancaster County, NE and Incorporated Areas FIRM was initially published in county-wide format on 9/21/2001. It was revised in its entirety on 2/18/2011, and portions were revised again on 4/16/2013. All effective flood hazard data shown on the FIRM is also available from FEMA’s National Flood Hazard Layer viewer here: <https://www.fema.gov/flood-maps/national-flood-hazard-layer>.

The City of Lincoln and Lancaster County maintains a public GIS mapping application that shows the 100-year and 500-year floodplain. The GIS Viewer can be found here: <https://maps.lincoln.ne.gov/default/index.html?viewer=GISViewer>.

The LPSNRD 2020 Hazard Mitigation Plan identified thirteen areas in the City of Lincoln that are vulnerable to urban and flash flooding in the Lancaster County Appendix of the regional 2020 Hazard Mitigation Plan, as reported by the participants for the City of Lincoln:

- 52nd and O St.
- Cornhusker Hwy, particularly near N 14th St.
- West O St
- North and South Bottoms
- 14th to 27th on Saltillo
- 27th St – north of Saltillo
- 84th Street – Havelock to Fletcher Ave
- 48th and 56th Underpasses off Cornhusker (have pumps)
- 49th & Rentworth
- Old Cheney, near 7th Street
- Fletcher, near N 57th St.

City of Lincoln Flood Mitigation Master Plan

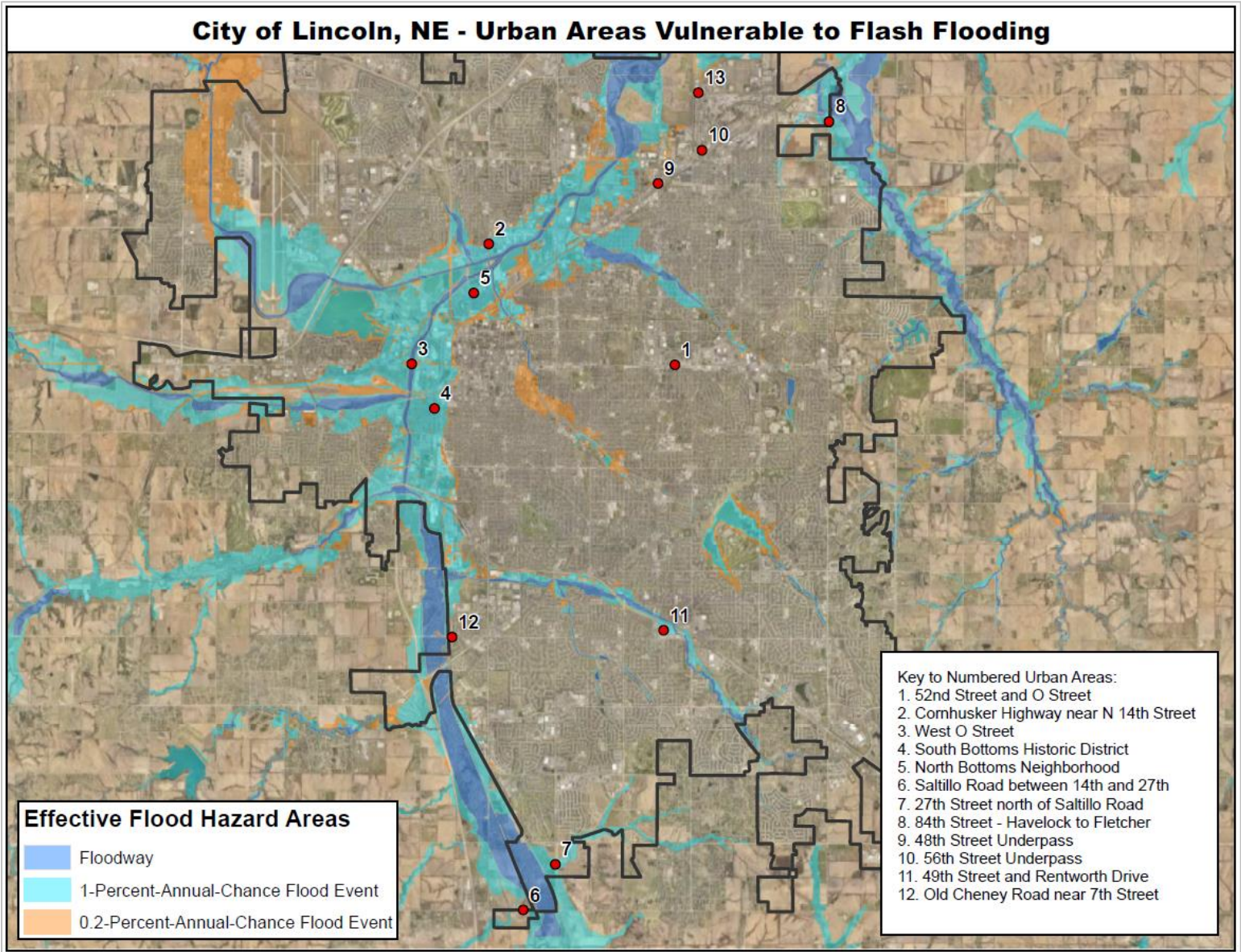
Figure 3-2 City of Lincoln 100-Year and 500-Year Floodplain



- |  Floodplain-500 yr
- |  Floodplain-100 yr & Floodway

City of Lincoln Flood Mitigation Master Plan

Figure 3-3 Urban Areas Vulnerable to Flash Flooding in City of Lincoln



City of Lincoln Flood Mitigation Master Plan

The Flood Insurance Study (FIS) for the City of Lincoln was revised on April 16, 2013. The riverine flooding sources identified in the study are as follows:

Salt Creek is a major right bank tributary to the Platte River, with a drainage area at its mouth of 1,621 square miles. The drainage area of Salt Creek at the downstream County line is approximately 1,036 square miles. Surface soils within the Salt Creek basin include glacial till, loess, clay, silt, and sand alluvium, and relatively small areas of exposed bedrock. The glacial till is moderately clayey and contains a few granite and quartzite boulders, some cobbles, and numerous pebbles. Peorian loess covers much of the uplands and is the principal parent material for the soils in the watershed basin. The upper few feet of the loess have been transformed into productive soil by the natural additions of organic matter. Deposits within the valleys are geologically recent accumulations of dark, silty to clayey sediment washed from the uplands. This alluvium has been enriched by the natural addition of organic matter and is some of the most productive farmland in the region. Some of the valley farmland is less productive because of a higher concentration of salt in the soils. These areas of high soil salinity tend to be small and isolated. Bedrock in the study area is Pennsylvanian and Permian age limestone with interbedded shale and shaley limestone and interbedded shale and sandstone of the Dakota Group of the Cretaceous age. Numerous small outcrops of rusty brown Dakota sandstone exist southwest of Lincoln, north of Lincoln along Little Salt Creek, and north of Waverly along Rock Creek.

Salt Creek originates in southern Lancaster County where several tributaries meet near Sprague and Roca. Downstream of this point, Salt Creek flows generally northward to Lincoln, then northeastward to its confluence with the Platte River near Ashland. Ground elevations in the basin vary from approximately 1,500 feet North American Vertical Datum of 1988 (NAVD) in the upper basin to approximately 1,050 feet NAVD at the mouth near Ashland. The total drainage area at the downstream study limit is approximately 825 square miles. The Salt Creek floodplain within the zoning jurisdiction of Lincoln is used for agricultural, commercial, industrial, residential, and recreational purposes.

Stevens Creek is a tributary to Salt Creek, which originates near Cheney, Nebraska, at 98th and Highway 2. It drains 55 square miles of rolling hills east of Lincoln and flows in a northerly direction. Elevations in the basin range from 1,400 feet NAVD in the upper basin to 1,120 feet NAVD at the mouth. The floodplain is mostly rural.

Oak Creek, a tributary to Salt Creek, originates in Butler County approximately 2 miles north of Brainard, and flows in a southeasterly direction to its confluence with Salt Creek near Innovation Campus in Lincoln. The total drainage area of Oak Creek is approximately 263 square miles; 88.7 square miles are controlled by Branched Oak Reservoir. The elevations in the basin range from approximately 1,650 feet NAVD in the upper basin to approximately 1,120 feet NAVD at the mouth. The Oak Creek floodplain within the Lincoln zoning jurisdiction is used for agricultural, commercial, industrial, residential, and recreational purposes.

Middle Creek is a tributary to Salt Creek. It begins in eastern Seward County near Garland and flows in an easterly direction to its confluence with Salt Creek near the BNR yards, south of West O Street. Elevations in the basin range from approximately 1,550 feet NAVD in the upper basin to approximately 1,130 feet NAVD at the mouth. The total drainage area of Middle Creek is approximately 102 square miles, including 49.6 square miles controlled by Pawnee Lake. The Middle Creek floodplain within the Lincoln zoning jurisdiction is used primarily for

agricultural and industrial purposes. It is also used for some residential and commercial purposes.

Antelope Creek is a tributary to Salt Creek. It originates near Cheney and flows in a northwesterly direction to join Salt Creek near the old State fairgrounds in Lincoln, the current home to the Nebraska Innovation Campus. Elevations in the basin range from approximately 1,350 feet NAVD in the upper basin to approximately 1,120 feet NAVD at the mouth. Antelope Creek has a total drainage area of approximately 13 square miles, including 5.4 square miles controlled by Holmes Lake. Antelope Creek floodplain development ranges from highly urbanized to rural areas. The floodplain is used for agricultural, commercial, residential, and recreational purposes.

Beal Slough is a tributary to Salt Creek. It originates near Cheney and flows northwesterly to its confluence with Salt Creek near the State penitentiary in Lincoln. Beal Slough drains approximately 13 square miles. Elevations range from approximately 1,350 feet NAVD in the upper basin to approximately 1,135 feet NAVD at the mouth. The floodplain is used for agricultural, commercial, and residential purposes.

Haines Branch is a left-bank tributary to Salt Creek. Haines Branch begins approximately 2 miles north of Denton, where Haines Creek and Cheese Creek join to form its main channel. It then flows generally eastward to join Salt Creek just downstream of Van Dorn Street in Lincoln. Elevations range from approximately 1,500 feet NAVD in the upper basin to approximately 1,135 feet NAVD at the mouth. The total drainage area is approximately 68 square miles, including 15.1 square miles controlled by Conestoga Lake. The floodplain is used primarily for agricultural and recreational purposes.

Cardwell Branch is a tributary to Salt Creek. It originates approximately 3.5 miles northwest of Martell and flows in a northeasterly direction to its confluence with Salt Creek just upstream of U.S. Highway 77 south of Lincoln. Cardwell Branch drains an area of approximately 16 square miles, including 8.4 square miles controlled by Yankee Hill Lake. Elevations range from approximately 1,300 feet NAVD in the upper basin to approximately 1,160 feet NAVD at the mouth. The Cardwell Branch floodplain is used primarily for agriculture.

Lynn Creek is a tributary to Oak Creek. It originates in Fallbrook in the northwest part of Lincoln and flows in a southeasterly direction joining Oak Creek just upstream of its mouth. Elevations range from approximately 1,200 feet NAVD to approximately 1,125 feet NAVD. Lynn Creek drains an area of approximately 4 square miles. The floodplain of Lynn Creek within the study limits is used for recreational, commercial, and residential purposes.

The **Deadmans Run watershed** is located in the City of Lincoln and is a mostly urbanized right bank tributary of Salt Creek. According to USACE Section 205, the watershed drains a 9.6 square mile area which lies entirely within Lancaster County and the limits of the City of Lincoln. Deadmans Run begins in the gently rolling hills of suburban eastern Lincoln, located between the Stevens Creek watershed to the east and Antelope Creek watershed to the west. The soils are generally clay or clay loam with modest infiltration rates.

Deadmans Run flows northward before entering Wedgewood Lake, a private lake surrounded by homes. Wedgewood Lake has no designated flood storage and limited capacity to attenuate streamflow. From Wedgewood Lake, Deadmans Run flows northwesterly under O

Street and through shopping centers where its channel is lined by gabions and concrete. Below Cotner Boulevard, the channel slope becomes milder and the floodplain broader.

Land use is primarily residential, with limited open space. The channel is lined with gabions with undersized bridge crossings by residential streets. At 48th Street, the channel becomes more natural, flowing through the East Campus of the University of Nebraska and the floodplain in this reach is not highly urbanized. At Huntington Avenue, the floodplain transitions to primarily industrial land use, and the channel is constricted by a series of road and rail bridges. This lower reach of the watershed is also subject to flooding by Salt Creek backwater. Flooding on both Deadmans Run and Salt Creek is primarily the result of warm season thunderstorms, with flooding or significant high water possible from April into October. Rapid snow melts have historically remained in bank and ice jam flooding has not been a problem within the historical range of information.

According to the Little Salt Creek Watershed Master Plan, the **Little Salt Creek Watershed** is located north of the City of Lincoln with much of the watershed north of I-80. The watershed drains approximately 45.8 square miles from the headwaters near just north of West Ashland Road to its confluence with Salt Creek located just southeast of I-80 at 27th Street. The watershed is approximately 14.25 miles in length with a maximum width of about 5.5 miles.

3.3.3 Extent of Riverine Flooding and Urban and Flash Flooding

Extent means the strength or magnitude of the hazard. It can be described in terms of the specific measurement of an occurrence on a scientific scale or other hazard factors, such as duration and speed of onset.

Flood Zones

FEMA defines flood-prone areas and their associated risk through zone designation. The following table includes the different flood zone designations as well as the description of the flood zone. Zones A, AE, and X are present within the City of Lincoln.

Table 3-2 FEMA Flood Zones in City of Lincoln

Zone	Description
Moderate to Low-Risk Areas	
X-shaded	Area of moderate flood hazard, usually the area between the limits of the 100- year and 500-year floods. B Zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile
X-unshaded	Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level. Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100- year flood
High Risk Areas	
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.

City of Lincoln Flood Mitigation Master Plan

The following table shows the total number of land area in miles that are located in each FEMA flood zone in the City of Lincoln.

Table 3-3 Calculated Land Area by FEMA Flood Zone (in square miles)

Jurisdiction Type	Floodway (Zone AE)	Zone AE	Zone A	Zone X (0.2 PCT)	Zone X (Area of Minimal Hazard)
City Limits	7.4	21.8	0.2	8.5	147.0
Extraterritorial Jurisdiction Limits	22.2	20.6	25.3	5.1	336.4
Unincorporated Area Limits	5.5	5.4	79.0	1.3	786.0
Grand Total	35.1	47.8	104.5	14.9	1,269.4

Warning Time, Duration, and Peak Discharges

The City of Lincoln’s Be Flood Smart public information website describes the durations of flooding and warning time for each riverine flooding source in the city. Flooding along Salt Creek and Oak Creek has longer durations with a few hours of warning time prior to peak flows. Little Salt Creek, Middle Creek, Stevens Creek and Haines Branch have smaller drainage basins with a shorter flood duration and less warning time prior to peak flows. Flooding along Antelope Creek, Beal Slough, Cardwell Branch, Lynn Creek, and Deadmans Run have relatively short durations with little warning time prior to peak flows.

Flash and urban flooding can occur within minutes of a heavy rainfall, dam or levee failure, or an ice jam release. The rapid occurrence of flash and urban flooding gives very little warning time to prepare for a flash or urban flooding event.

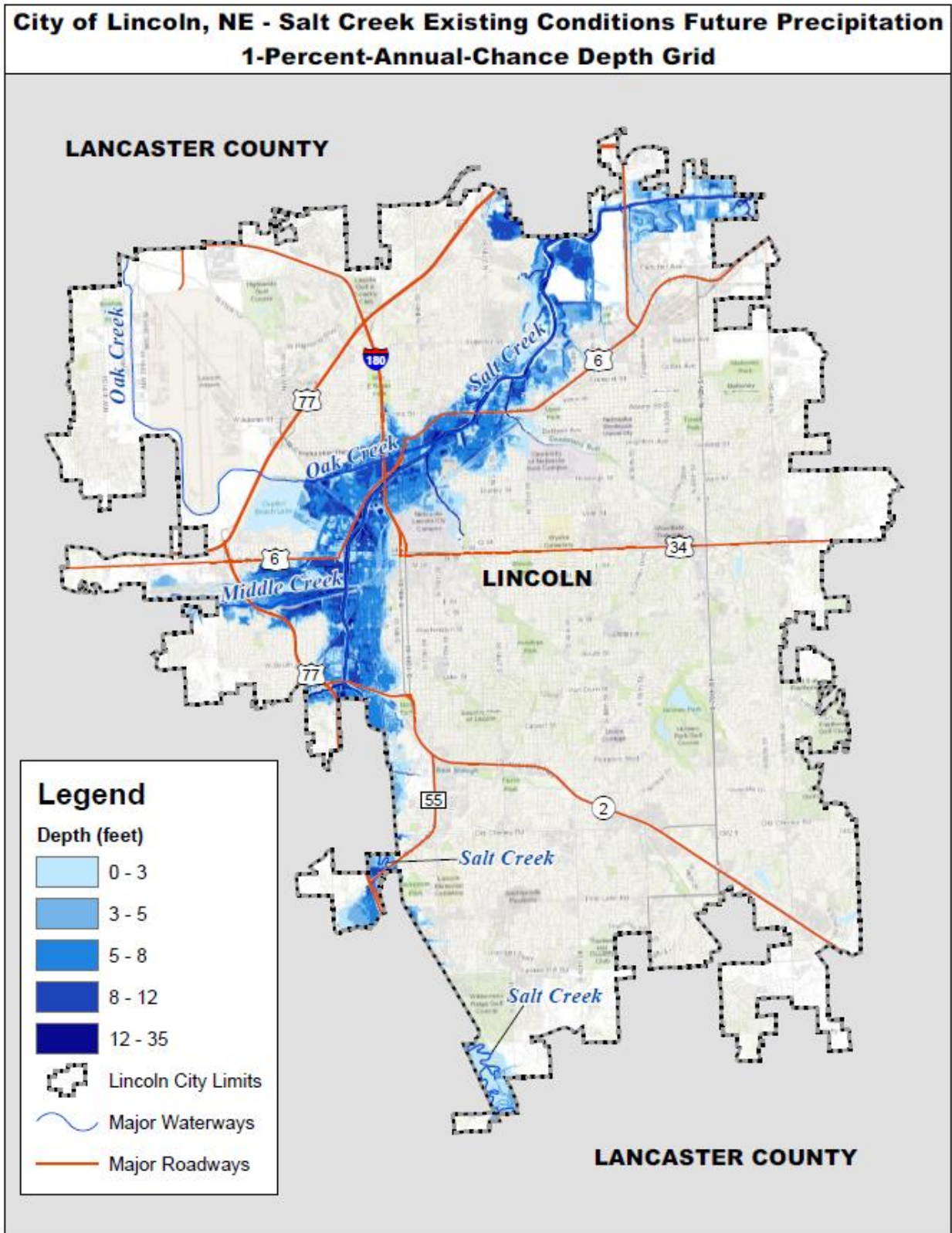
The peak discharge data from the current Lancaster County Flood Insurance Study, Salt Creek Floodplain Resiliency Study, and Stevens Creek Watershed Master Plan can be found in Appendix C.

Depth Grids

The following figures display the depth grids used during the three HAZUS analyses that were conducted for the City of Lincoln Flood Mitigation Master Plan. While the depth grids are only from modeled scenarios, they show the depth of water within the flood locations during the identified flood event.

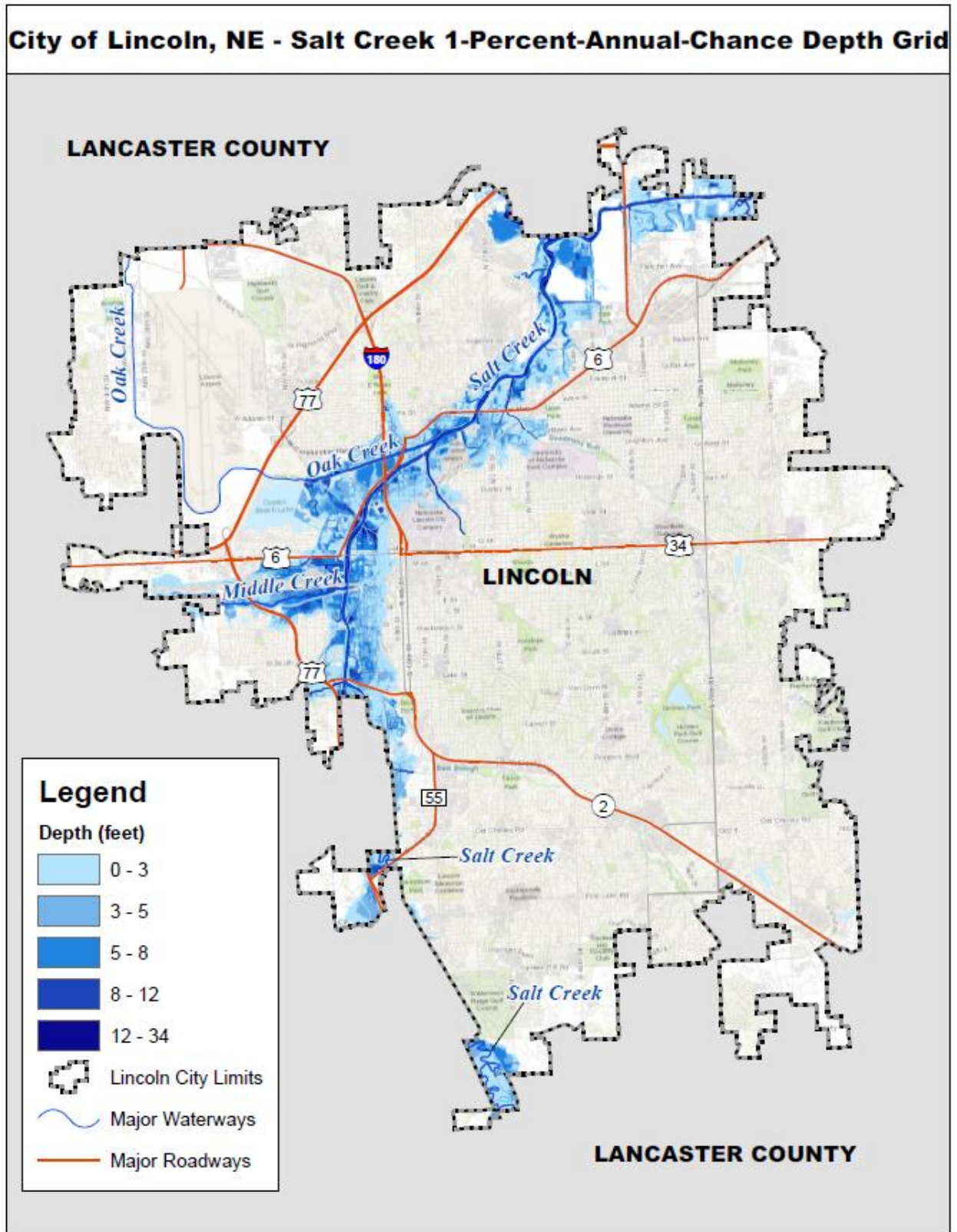
City of Lincoln Flood Mitigation Master Plan

Figure 3-4 HAZUS Flood Depth Grid for Future Conditions on Salt Creek Only



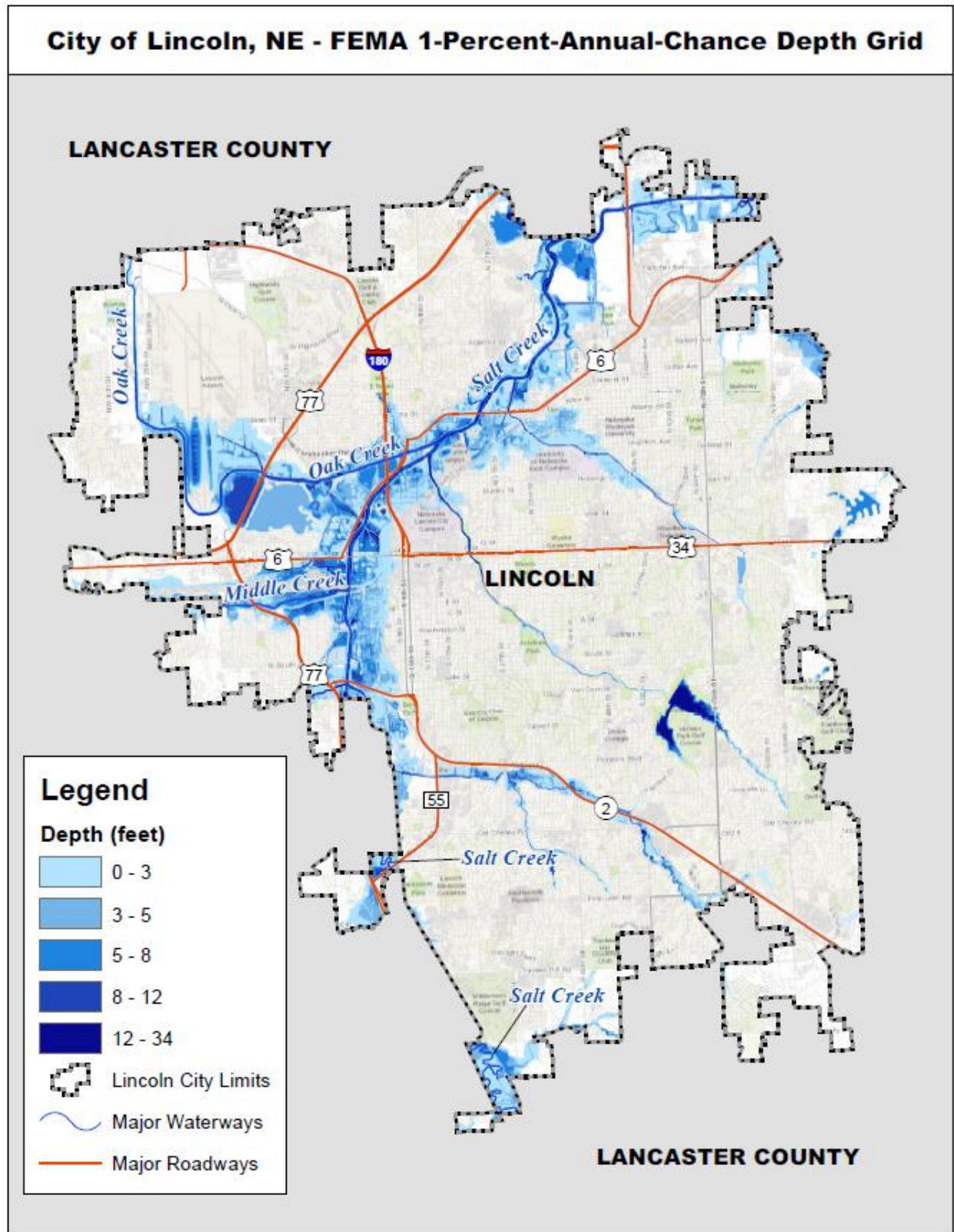
City of Lincoln Flood Mitigation Master Plan

Figure 3-5 HAZUS Flood Depth Grid for Existing Conditions on Salt Creek Only



City of Lincoln Flood Mitigation Master Plan

Figure 3-6 HAZUS Flood Depth Grid for Existing Conditions on All Currently Effective Floodplains in the City of Lincoln



City of Lincoln Flood Mitigation Master Plan

3.3.4 Frequency of Riverine Flooding and Urban and Flash Flooding

Frequency of riverine flooding and urban and flash flooding can be extrapolated through review of previous occurrences.

Previous Occurrence Data

The following table summarizes the previous occurrence data from the NCEI Storm Events Database, 2020 Lower Platte South Natural Resources District Multi-Jurisdictional Hazard Mitigation Plan Update, Nebraska Department of Natural Resources, Lancaster County Flood Insurance Study, and local news outlets. It is a summarized version of Table 3-5 which includes further information on each flood event, such as the date, specific data source, and description of the event. The event count reported injuries and deaths, and reported property and crop damages are approximations, as not all events, injuries, deaths, property damage, and crop damage may not have been reported.

Table 3-4 Summary of Flood and Urban Flash Flood Events in City of Lincoln

Type	Count	Injuries	Deaths	Property Damage	Crop Damage
Flood	17	0	13	\$ 7,278,800	\$ 0
Urban Flash Flood	11	0	0	\$ 3,140,000	\$ 0
Total	28	0	13	\$ 10,418,800	\$ 0

Table 3-5 Flood and Urban Flash Flood Event History in City of Lincoln

Hazard Event	Date	Data Source	Description
Riverine Flood	1892	Lincoln Journal Star	Extensive flooding drove 300 people from their homes.
Riverine Flood	1900-1952	2015 LPSNRD HMP	Salt Creek flooded 136 times between 1900 and 1952. Of these events, 22 were considered major.
Riverine Flood	July 6, 1908	History Nebraska	Approximately seven inches of rain fell in Nebraska, with a recorded 2.5 inches falling within a two-hour period. The Nebraska Department of Natural Resources noted that the peak discharge of Salt Creek was 30,650 cubic feet per second – the average flow for early April is 140 cubic feet per second. The North Bottoms neighborhood had the most damage from the flood. O Street, from 8 th Street to 24 th Street was flooded, and Antelope valley was flooded. The flood left 1,000 residents homeless, caused 9 deaths, and destroyed countless homes.
Riverine Flood	May 8, 1950	2015 LPSNRD HMP	Salt Creek peaked at a height of 26.05 feet with a flow of 27,800 cfs. This occurred after 5.5 inches of rain fell in six hours and accumulated to 14 inches. 20,000 acres of land was flooded including 600 homes and 80 businesses. The total damage incurred amounted to \$1,643,000 and nine deaths.
Riverine Flood	June 2, 1951	2015 LPSNRD HMP	Antelope Creek flooded. Water was waist deep at 28th and D streets, and one foot deep at 33rd and Normal. Salt Creek peaked at 26.15 feet with a flow of 28,200 cfs.

City of Lincoln Flood Mitigation Master Plan

Hazard Event	Date	Data Source	Description
Riverine Flood	June 14, 1951	2015 LPSNRD HMP	Antelope Creek flooded. Eight inches of rain fell and caused \$2,000,000 worth of damage. 92 businesses, 298 homes and the railroad were all damaged in the area.
Riverine Flood	June 1952	2015 LPSNRD HMP	Another Antelope Creek flood occurred when 2.18 inches fell, causing \$63,000 in damage.
Riverine Flood	1962-1993	2015 LPSNRD HMP	Between 1962 and 1993, a series of eight floods occurred on Salt Creek. The total amount of federal funds contributed was \$668,800, with the largest lump sum contribution of \$487,185 in 1993.
Riverine Flood	June 15, 1982	Lincoln Journal Star	Stevens Creek peaked at a height of 18.85 feet with a flow of 3,820 cfs. Up to five inches of rain blocked roads, threatened homes, and left cars stranded in high water. There was a police advisory encouraging Lincoln residents not to drive and at one point during the downpour, the police were instructed to park their cruisers unless they were needed somewhere. Lincoln Electric System reported several power outages, one of which was the result of flooded underground cables.
Riverine Flood	June 13, 1984	2015 LPSNRD HMP	Little Salt Creek flooded when three to four inches of rain caused the creek to peak at 16.20 feet and flow 7,500 cfs. The flood was classified as a 10-year flood.
Riverine Flood	June 13, 1984	Lincoln Journal Star	Stevens Creek flooded with a peak of 19.57 feet and a flow of 4,620 cfs. The flood was classified as a 10-year flood and it claimed two lives when a car was swept off Highway 34.
Riverine Flood	July 4, 1984	Lincoln Journal Star	Water back log from Beal's Slough caused damage to local area businesses. One business reported damage of \$4,000.
Urban Flash Flood	September 13, 1989	Lincoln Journal Star	Heavy rains caused \$20,000 in damage to Lancaster County rock and gravel roads.
Urban Flash Flood	July 25, 1990	Lincoln Journal Star	Five inches of rain washed out roads, flooded basements, damaged businesses, and flooded parking lots.
Riverine Flood	March 1993	2015 LPSNRD HMP	The Lincoln Water System reports an ice jam on the Platte River that caused severe flooding along Salt Creek and Highway 6. The flood waters eroded embankments and exposed a 48-inch and 54-inch water transmission line from one of the Lincoln Water System's well fields. This exposure caused sections of the pipeline to break and float away.
Riverine Flood	July 23, 1993	Lincoln Journal Star	Little Salt Creek peaked at 4 feet over flood stage. Lynn and Stevens Creek tributaries left their banks flooding streets, parking lots, businesses, and homes. The City received \$823,997 from the Federal Emergency Management Agency for partial damage reimbursement. The total damage to public property was \$2.9 million.
Riverine Flood	July 24, 1993	2015 LPSNRD HMP	Flooding resulted when Lincoln received three times the normal amount of rain for July.

City of Lincoln Flood Mitigation Master Plan

Hazard Event	Date	Data Source	Description
Riverine Flood	July 20, 1996	2015 LPSNRD HMP	Beal Slough flooded when over five inches of rain fell in south Lincoln over an 18-hour period. Flooding occurred on a number of roadways including Highway 2. Residential basements and recreational areas were flooded. Flooding also occurred near 33rd Street and Pioneers Boulevard as well as in many areas along the Tierra Branch in the Tierra, Williamsburg, Seven Oaks, and Cripple Creek Subdivisions. A similar incident occurred in 1989 when heavy rains filled and overtopped the creek. The waters spread to Tierra and Briarhurst Parks, and other nearby open spaces.
Urban Flash Flood	August 14, 1996	NCEI	\$60,000 in reported property damage was caused by four inches of rain that produced a flash flood. Local businesses and homes were also damaged.
Urban Flash Flood	May 15, 1998	NCEI	Heavy rain from thunderstorms generated significant street flooding in the southeast part of the City of Lincoln. Water rose to car headlights in low lying areas.
Urban Flash Flood	August 28, 2002	NCEI	A slow-moving thunderstorm dumped torrential rain over mostly the northern and eastern parts of Lincoln. Rainfall amounts varied from 1.66 inches to upwards of 4 inches over a short period of time. The water overwhelmed the sewer system in mainly northeast Lincoln and caused Antelope Creek and Dead Man's Run to become bank full. There were numerous reports of cars flooded up to their roofs in various intersections. Water that came up through the sewage system flooded parts of Gateway Mall in northeast Lincoln as water surged several inches deep in several stores.
Urban Flash Flood	April 14, 2012	NCEI	Rainfall of two to three inches caused flash flooding across several streets in Lincoln and along Antelope Creek. Damage was apparently minimal.
Riverine Flooding; Urban Flash Flood	May 6, 2015	NCEI, 2020 LPSNRD HMP	Rainfall of three to seven inches fell across a large portion of Lancaster County. Numerous reports of flash flooding were received, especially in and around Lincoln. There were a large number of flooded streets as well as a few water rescues that took place. The local planning team indicated that Fire Station #3 required sandbagging during the 2015 flood event; however, water did not enter or damage the property. In Lincoln, Salt Creek saw its highest crest in over 100 years. The levee system in Lincoln was pushed to the limit but held the water back. The LPSNRD HMP referenced the May 2015 event, noting that the stream gauge on Salt Creek in Lincoln rose over 12 feet in approximately two hours and continued to rise. By the afternoon of May 7, 2015, Salt Creek crested at 28.87 feet, the highest crest recorded at the 27 th Street Bridge.
Urban Flash Flood	May 16, 2016	NCEI	There was \$1.5 million in reported property damage due to over 5 inches of rainfall in the region. This along with areas of several inches accumulation of hail led to widespread street flooding in the area. Small streams and creeks in the area also overflowed. Water was flowing over the bridge where Holdridge Street crosses

City of Lincoln Flood Mitigation Master Plan

Hazard Event	Date	Data Source	Description
			Stevens Creek. Several water rescues were performed for stranded motorists.
Urban Flash Flood	May 26, 2016	NCEI	Several reports of flash flooding were received. This led to several road closures due to high water, including US Highway 77, which had debris filled water flowing across the road. Other roadways impacted were State Highway 2 and Cornhusker Road.
Urban Flash Flood	September 4, 2018	NCEI	Flash flooding was reported near 73rd and O Street. People were stranded in a flooded vehicle and needed to be rescued.
Riverine Flood	January-March 2019	NE DNR, City of Lincoln Officials	Lincoln saw 23.2 inches of snow fall in February – the most snowfall the City has seen since 1965. Compared to the average snowfall accumulation for the City – 5.6 inches – when the temperatures rapidly changed in March, snow and ice melt occurred at an accelerated rate for the region. On March 3 rd , Lincoln had a high temperature of 8°F; on March 13 th , Lincoln had a high temperature of 63°F. As rapid snow and ice melt was occurring, Winter Storm Ulmer was developing and brought wind, rain, and heavy snow to the region. The combination of heavy rain and rapid snow melt flooded waterways, washed out bridges and roads, destroyed levees, and breached dams throughout the entire state of Nebraska. Cascading impacts included the destruction of homes and entire communities near or downstream of waterways. Lincoln saw power outages in and around well fields that supply the community’s water. City of Lincoln officials reported that the March 14, 2019 event damaged the Salt Creek Levee System. USACE repaired 14 locations at a cost of nearly \$5,000,000.
Urban Flash Flood	October 24, 2021	10/11 Now News	A flash flood warning was issued after thunderstorms that produced heavy rain. Flash flooding occurred in eastern Lincoln in the early afternoon after a reported 2-3” of rain fell. Lincoln Electric System reported over 400 households lost power during the storm.

Previous Occurrence Narratives from the Lancaster County FIS

The Flood Insurance Study for Lancaster County, which includes the City of Lincoln, states that since 1900, 100 floods have been recorded along Salt Creek and its tributaries in Lincoln and vicinity. Of these, 17 are classed as major, 30 as moderate, and 49 as minor. Two floods, those of July 6, 1908, and May 8 and 9, 1950, reached catastrophic proportions in Lincoln, and four others inflicted heavy damage. Reliable records on loss of life, available only since 1942, indicate 13 deaths have been attributed to flooding; one in 1942, nine in 1950, and three in 1963. Lives were reported lost in the 1908 flood, but accurate data on the number and circumstances are not available. Salt Creek is the only flooding source for which discharge data is available within the Salt Creek Watershed. 30,650 cubic feet per second (cfs) is the maximum discharge on Salt Creek in Lincoln. It is the estimated discharge from the July 6, 1908 flood. Recorded peak discharges are 27,800 cfs for the May 8 and 9, 1950, flood; 28,200 cfs for the June 1 and 2, 1951, flood; and 21,600 cfs for the June 24 and 25, 1963, flood.

City of Lincoln Flood Mitigation Master Plan

The Salt Creek flood of May 8 and 9, 1950, is typical of the extreme floods occurring in the study areas. This flood resulted from a severe storm over southeastern Nebraska. Rainfall in excess of 11 inches was recorded in the southern portion of the basin, and a 64-hour accumulation exceeding 5.5 inches was reported over a 1,000-square-mile area. Nearly 20,000 acres of basin lands were flooded, and nine lives were lost. In Lincoln, approximately 600 homes, 80 commercial establishments, railroad yards, and other improvements were flooded. Basin damages were estimated at \$2,880,000, including \$1,643,000 occurring within Lincoln. A repeat of this storm, with the present development in the basin, would result in greater damages and possibly a greater loss of life.

Specific flood records on Oak Creek are confined to two minor floods on June 15, 1945, and June 1, 1947. The damage from each flood occurred mainly to crops, farmsteads, roads, bridges, and railroads. Other floods have occurred on Oak Creek; however, because of the rural nature of Oak Creek prior to the construction of flood control works in the Oak Creek basin, floods on Oak Creek were not documented.

Floods on Antelope Creek are known to have occurred in 1908, 1910, 1940, 1950, 1951, 1952, 1957, and 1958. The floods of June 14, 1951, and July 9 and 10, 1958, caused significant residential and commercial property damage in the Antelope Creek floodplain.

Historical Crests

Information on historical crests for the identified waterways in the City of Lincoln was obtained from stream gauging stations maintained by NOAA. The following tables show the flood stage categories and top five highest historical crests for the waterways within Lincoln as determined by the National Oceanic and Atmospheric Administration and the National Weather Service (NWS). There is no hydrograph information available for Beal Slough, Cardwell Branch, Deadmans Run, or Lynn Creek in the City of Lincoln at this point in time.

Table 3-6 Flood Categories for Salt Creek At Pioneers Boulevard

Flood Category	Crest (ft)
Action Stage	15.5
Flood Stage	28
Moderate Flood Stage	29.5
Major Flood Stage	31.5

Table 3-7 Highest Historical Crests on Salt Creek at Pioneers Boulevard

Crest (ft)	Date of Crest
30.08	5/07/2015
22.92	7/20/1996
21.84	6/05/2008
20.87	10/01/2014
19.70	5/54/2004

City of Lincoln Flood Mitigation Master Plan

Table 4-8 Flood Categories for Stevens Creek Near Lincoln

Flood Category	Crest (ft)
Action Stage	15
Flood Stage	16.5
Moderate Flood Stage	20
Major Flood Stage	21.5

Table 3-8 Highest Historical Crests for Stevens Creek Near Lincoln

Crest (ft)	Date of Crest
21.57	6/13/1984
21.42	9/08/1989
20.85	6/15/1982
20.59	7/24/1993
20.50	10/11/1986

Table 3-9 Flood Categories for Oak Creek at Lincoln (Air Park Road)

Flood Category	Crest (ft)
Action Stage	13.5
Flood Stage	22
Moderate Flood Stage	24
Major Flood Stage	25.5

Table 3-10 Highest Historical Crests for Oak Creek at Lincoln (Air Park Road)

Crest (ft)	Date of Crest
22.66	7/24/1993
18.37	3/13/2019
18.04	5/07/2015
18.01	6/14/1998
17.38	7/26/1990

Table 3-11 Flood Categories for Middle Creek at Lincoln (SW 23rd Street)

Flood Category	Crest (ft)
Action Stage	12
Flood Stage	19
Moderate Flood Stage	25
Major Flood Stage	27

City of Lincoln Flood Mitigation Master Plan

Table 3-12 Highest Historical Crests on Middle Creek at Lincoln (SW 23rd Street)

Crest (ft)	Date of Crest
23.21	5/07/2015
17.73	3/13/2019
17.39	5/05/2007
17.14	10/01/2014
17.12	5/30/2013

Table 3-13 Flood Categories for Antelope Creek at Lincoln (27th Street)

Flood Category	Crest (ft)
Action Stage	14.3
Flood Stage	20

Table 3-14 Highest Historical Crests on Antelope Creek at Lincoln (27th Street)

Crest (ft)	Date of Crest
13.20	10/01/2014
12.91	5/06/2015
12.38	7/07/2016
11.94	5/28/2019
11.32	6/30/2018

Table 3-15 Flood Categories for Haines Branch at Lincoln (SW 56th Street)

Flood Category	Crest (ft)
Action Stage	11
Flood Stage	17
Moderate Flood Stage	20.5
Major Flood Stage	24.5

Table 3-16 Highest Historical Crests for Haines Branch at Lincoln (SW 56th Street)

Crest (ft)	Date of Crest
20.75	5/07/2015
16.94	5/06/2007
16.40	10/01/2014
16.13	5/20/2017
15.88	10/02/2019

3.3.5 Summary of Vulnerability to Riverine Flooding and Urban and Flash Flooding

Severe flooding has the potential to cause significant damage along the Special Flood Hazard Areas that run throughout the city as well as localized urban and flash flooding. Assessing flood damage requires residents throughout the city to remain alert and notify local officials of potential flood prone areas near infrastructure such as roads, bridges, and buildings. While flooding remains a highly likely occurrence for the City of Lincoln, smaller floods caused by heavy rains and inadequate drainage capacity will be more frequent, but not as costly as the large-scale floods which may occur at much less frequent intervals.

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

A buildings dataset was prepared for the analyses using structure locations and parcel data acquired from the City of Lincoln (Lancaster County) GIS hub. Building values, building types, square footage, and year built were tied to each structure using the parcel data and GIS techniques, and the points were loaded into HAZUS as **User Defined Facilities** data (UDF). FEMA's HAZUS v 5.1 software was used to run analysis on flood depth grids paired with the UDF data for four distinct flood scenarios to determine the potential losses associated with each scenario. The four flood scenarios are:

Existing Conditions on Salt Creek Only. This HAZUS run uses the 1-percent-annual-chance (100 year) flood event, as shown on the currently effective Flood Insurance Study on Salt Creek. The purpose of this HAZUS run is to show the estimated building losses that would occur on Salt Creek during a major flood event in the near term.

Updated Conditions on Salt Creek Only. A sensitivity analysis performed as a part of the [Salt Creek Floodplain Resiliency Study](#) indicated that a longer period of record for collection of precipitation data does affect the precipitation frequency estimates, and that the current regulatory flood hazard data may be under-predicting flood hazards as a result. Therefore, a HAZUS scenario using the NOAA Atlas 14 updated precipitation data was performed, paired with existing conditions terrain and building data.

Future Conditions on Salt Creek Only. This HAZUS run uses the future conditions scenario analysis performed as a part of the Salt Creek Floodplain Resiliency Study, representing the 1-percent-annual-chance (100 year) event in the year 2100. The purpose of this HAZUS run is to show the estimated building loss that could occur in the future, based on the likelihood of increasing flood risk as a result of climate change and future land use changes.

Existing Conditions on All Currently Effective Floodplains in the City of Lincoln. The purpose of this HAZUS run is to show the estimated building losses that would occur during a 1-percent-annual-chance (100-year) flood event on all currently mapped flooding sources in the City of Lincoln.

A brief summary of the potential building loss determined from these four analyses is shown in the tables below, with a full report of the HAZUS data included as an appendix to this report. Notably, building losses would be expected to be quite high during a near-term 1-percent-annual-

City of Lincoln Flood Mitigation Master Plan

chance flood event: **around \$427 million dollars in the City of Lincoln based on the modeled scenario from the Existing Conditions on All Currently Effective Floodplains in the City of Lincoln, including \$328 million dollars along Salt Creek alone according to the Existing Conditions on Salt Creek Only scenario.** These losses are anticipated to grow substantially as a result of climate change and land use changes in the future, with potential losses in the year 2100 of approximately \$862 million dollars on Salt Creek alone.

In addition to the HAZUS scenarios using the UDF data, the same four scenarios were run using the General Building Stock (GBS) data available within the HAZUS software (see Appendix D for the GBS results). The GBS analysis applies census-defined valuations built in to HAZUS, while the UDF analysis is more refined and applies parcel-specific/assessor valuations. The UDF is useful at a smaller scale and/or when there is good building data available for a particular area, and the GBS is more useful when doing larger areas or comparing one area to another. For Lincoln, the UDF used current parcel data with accompanying structure values and therefore represents a more accurate output than the GBS.

It is important to note that the HAZUS data included in the Hazard and Risk Assessment is a modeled *estimate* of impacts that the City of Lincoln would experience if the modeled event were to occur – all HAZUS data is hypothetical. The City of Lincoln has not experienced the magnitude of impacts that the modeled HAZUS event predicts, and the significant difference in impacts may be due to a combination of under-reported flooding impacts, insufficient data keeping in historic years, and lack of a 1-percent-annual-chance flood event occurring in the planning area.

City of Lincoln Flood Mitigation Master Plan

Table 3-17 HAZUS Estimated Losses

Existing Conditions on Salt Creek Only

Type -- [# Buildings]	Inventory Estimated Value (Building & Contents)	% of Total	Loss Ratio ¹	Buildings (Dollar Losses)	Contents (Dollar Losses)	Inventory (Dollar Losses)	TOTAL (Dollar Losses)
Residential -- [2,306 Bldgs]	\$255,593,494	17%	27%	\$44,254,815	\$25,022,786	N/A	\$69,277,601
Commercial -- [1,028 Bldgs]	\$1,049,253,291	70%	19%	\$41,680,472	\$135,420,962	\$20,428,806	\$197,530,240
Other (Industrial & Educational) -- [90 Bldgs]	\$193,010,364	13%	32%	\$9,397,686	\$30,747,978	\$21,038,873	\$61,184,537
TOTAL -- [3,424]	\$1,497,857,149	100%	22%	\$95,332,973	\$191,191,726	\$41,467,679	\$327,992,378

Updated Conditions on Salt Creek Only

Type -- [# Buildings]	Inventory Estimated Value (Building & Contents)	% of Total	Loss Ratio ¹	Buildings (Dollar Losses)	Contents (Dollar Losses)	Inventory (Dollar Losses)	TOTAL (Dollar Losses)
Residential -- [2315 Bldgs]	\$255,526,128	17%	36%	\$58,646,771	\$32,672,347	N/A	\$91,319,118
Commercial -- [1097 Bldgs]	\$983,453,835	67%	33%	\$66,207,582	\$220,978,201	\$32,514,916	\$319,700,699
Other (Industrial & Educational) -- [97 Bldgs]	\$226,674,880	15%	44%	\$14,927,510	\$49,573,733	\$34,477,131	\$98,978,373
TOTAL -- [3509]	\$1,465,654,843	100%	35%	\$139,781,863	\$303,224,281	\$66,992,047	\$509,998,191

Future Conditions on Salt Creek Only

Type -- [# Buildings]	Inventory Estimated Value (Building & Contents)	% of Total	Loss Ratio ¹	Buildings (Dollar Losses)	Contents (Dollar Losses)	Inventory (Dollar Losses)	TOTAL (Dollar Losses)
Residential -- [2721 Bldgs]	\$372,531,090	18%	36%	\$85,656,499	\$48,200,232	N/A	\$133,856,731
Commercial -- [1294 Bldgs]	\$1,461,939,311	70%	41%	\$123,956,017	\$422,932,626	\$52,119,354	\$599,007,997
Other (Industrial & Educational) -- [112 Bldgs]	\$257,968,932	12%	50%	\$20,387,089	\$64,359,732	\$43,927,057	\$128,673,878
TOTAL -- [4127]	\$2,092,439,333	100%	41%	\$229,999,605	\$535,492,590	\$96,046,411	\$861,538,606

Source: HAZUS analysis results

¹Loss ratio = Dollar Losses ÷ Estimated Value.

The figures in this table only represent information within the City of Lincoln

City of Lincoln Flood Mitigation Master Plan

Existing Conditions on All Currently Effective Floodplains in the City of Lincoln

Type -- [# Buildings]	Inventory Estimated Value (Building & Contents)	% of Total	Loss Ratio ¹	Buildings (Dollar Losses)	Contents (Dollar Losses)	Inventory (Dollar Losses)	TOTAL (Dollar Losses)
Residential -- [3266 Bldgs]	\$389,419,087	20%	27%	\$66,322,418	\$37,656,113	N/A	\$103,978,531
Commercial -- [1299 Bldgs]	\$1,391,935,732	70%	19%	\$56,023,743	\$178,896,087	\$23,366,355	\$258,286,186
Other (Industrial & Educational) -- [98 Bldgs]	\$210,517,873	11%	31%	\$10,005,230	\$33,136,086	\$21,497,220	\$64,638,536
TOTAL -- [4663]	\$1,991,872,692	100%	21%	\$132,351,391	\$249,688,286	\$44,863,576	\$426,903,253

Source: HAZUS analysis results

¹Loss ratio = Dollar Losses ÷ Estimated Value.

The figures in this table only represent information within the City of Lincoln

Table 3-18 Summary of Total Losses from HAZUS Scenarios

HAZUS Scenario	Total Losses Estimate
Existing Conditions on Salt Creek Only	\$327,992,378
Updated Conditions on Salt Creek Only	\$509,998,191
Future Conditions on Salt Creek Only	\$861,538,606
Existing Conditions on All Currently Effective Floodplains in the City of Lincoln	\$426,903,253

3.3.6 Impacts of Riverine Flooding and Urban and Flash Flooding

Impact means the consequence or effect of the hazard on the community and its assets. Assets are determined by the community and include, for example, people, structures, facilities, systems, capabilities, and/or activities that have value to the community.

Life and Safety and Need for Flood Warning and Notification – The magnitude and severity of flood damage can be reduced with longer periods of warning time and proper notification before flood waters arrive. Warning times of 12 hours or more have proven adequate for preparing communities for flooding and reducing flood damages. More than 12 hours advance warning of a flood can reduce a community’s flood damage by approximately 40% in comparison with unprepared communities (Read Sturgess and Associates 2000). In addition, seasonal notification for flooding can enhance awareness for residents at risk, and when communicated effectively advance notification can reach target audiences on a large scale.

The life and safety of the city’s residents can be at risk during a flood event. People may try to pass through deep floodwaters with a car, boat, or by walking and be carried away by the current.

Public Health – Severe floods can kill those caught in their way. Injuries may also result. Illnesses from water-borne viruses, bacteria, or parasites if contact is made with floodwaters. During the 2019 flood event in Lincoln, the city’s well field facilities were severely damaged by flood waters. Flood events in the city can also result in sewer backup in homes located in the northern parts of the city.

Critical Facilities – There are 13 critical facilities located in the floodplain. In addition to the identified critical facilities, the Nebraska Department of Environment and Energy have identified that there are 45 chemical storage fixed sites located in the floodplain. The following table identifies the critical facilities that are located in the floodplain, including the type of floodplain the critical facility is located in. Including the following list, there is a fire station near 66th and Old Cheney that is not in the floodplain and a fire station at 66th and Pine Lake, but the facilities are surrounded by floodplains. If the floodplains were to become inundated with water, the stranded fire stations would block emergency access in many locations throughout Lincoln.

Additionally, the Nebraska Emergency Management headquarters, is located on the Nebraska Air Guard Base in Lincoln. The headquarters building is surrounded by water during a 100-year flood event, limiting access to the building where state disaster response is managed from.

Economy and Major Employers – Local economies can sustain the most damage. If enough disruption is caused by damage or transportation shortages, effects may be felt at a larger scale. Damages to businesses from floodwaters can be a cause of business disruption. Industrial and commercial facilities located along Salt Creek are prone to flooding, which would result in severe economic damage and loss of employment – specifically along Sun Valley Boulevard, West O Street, North 27th, and Cornhusker Highway, and near Folsom Street and Rosa Parks Way.

Buildings – Buildings can be severely damaged or destroyed. Mold can occur after flooding. A summary of the estimated potential building loss for several different scenarios, calculated with HAZUS, is included below.

Transportation – Roadways may become impassable. Affected railways can halt movement of goods. Major roadways are overtopped by Salt Creek floods, including Cornhusker Highway,

City of Lincoln Flood Mitigation Master Plan

West O Street, Sun Valley Boulevard, and North 27th. South 14th, Highway 2, Pine Lake Road, South 56th, South 70th are often overtopped and impassable due to Beal Slough floodwaters. Stevens Creek can flood Cornhusker Highway and 84th Street. Other roadways are also susceptible, and the Floodplain map should be referred to for a better impact of damages from a 100-year flood.

Natural Systems – Land may be waterlogged, destroying crops. Vegetation may be uprooted and displaced. Animals can lose habitats. As floodwaters go down, aquatic animals can become stranded from the normal waterways. Rain that falls on hard surfaces like rooftops, parking lots and other surfaces can carry pollutants into the streams and lakes.

Table 3-19 Critical Facilities Located in the Floodplain in City of Lincoln

Critical Facility	Address	Type	Floodplain
Emergency Operations/Maintenance/Lancaster County Sherriff	444 N Cherrycreek Rd	Emergency Response	0.2%
Fire Station #3	2nd and N St	Emergency Response	1%
Fire Station #16	9765 Boathouse	Emergency Response	1%
Fire Training Facility	South Street	Emergency Response	1%
Airport	2400 W Adams	Infrastructure	1%
LES	2600 Fairfield St	Infrastructure	1%
NE Treatment Plant	7000 N 70th St	Infrastructure	0.2%
Street Maintenance Facility	3200 Baldwin Ave	Infrastructure	0.2%
Wastewater Facility	2400 Theresa St	Infrastructure	1%
Water Production & Distribution	2021 N 27th St	Infrastructure	0.2%
Lincoln High School & Infant Toddler	2229 J St	School	0.2%
Southwest High School	7001 S 14Th St	School	1% – property not building
Wellfields	(not mapped – near Ashland)	Infrastructure	1%

3.4 Flood Hazard – Dam and Levee Failure

The assessment of the dam and levee failure hazard in the City of Lincoln is presented in the following profile. Within the profile there are subsections that address the following:

- General description of the hazard
- Location and source of hazard
- Extent of the hazard
- Frequency of the hazard
- Hazard impacts on the community
- Summary of vulnerability to the hazard

3.4.1 General Description of Dam and Levee Failure

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings. A dam failure is the collapse, breach, or other failure, often resulting in down-stream flooding.

A dam impounds water in the upstream area, referred to as the reservoir. The amount of water impounded is measured in acre-feet. An acre-foot is the volume of water that covers an acre of land to a depth of one foot. As a function of upstream topography, even a very small dam may

City of Lincoln Flood Mitigation Master Plan

impound or detain many acre-feet of water. Two factors influence the potential severity of a full or partial dam failure: the amount of water impounded, and the density, type, and value of development and infrastructure located downstream.

A levee, unlike a dam, is an elongated ridge constructed of fill or wall which regulates water levels. These are usually earthen hills built along a river's floodplain to prevent flooding in nearby population areas. Typically, these run parallel to a river. According to the National Levee Inventory, there are eight levee systems in Lancaster County, and all are located in the City of Lincoln.

Dam and levee failures typically occur when spillway capacity is inadequate and excess flow overtops the dam, or when internal erosion (piping) through the dam or foundation occurs. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-laden water that rushes downstream.

Dam and levee failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, which cause most failures;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross section of the dam and abutments, or maintain gates, valves, and other operational component;
- Improper design, including the use of improper construction materials and construction practices;
- Negligent operation, including the failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway;
- Landslides into reservoirs, which cause surges that result in overtopping;
- High winds, which can cause significant wave action and result in substantial erosion; and
- Earthquakes, which typically cause longitudinal cracks at the tops of the embankments, which can weaken entire structures.

3.4.2 Location of Potential Dam or Levee Failure

Dam Locations

There are a total of 143 dams located in Lancaster County according to the USACE National Inventory of Dams. There are 16 high hazard dams in the City of Lincoln or upstream that could have an impact on the community if any should fail.

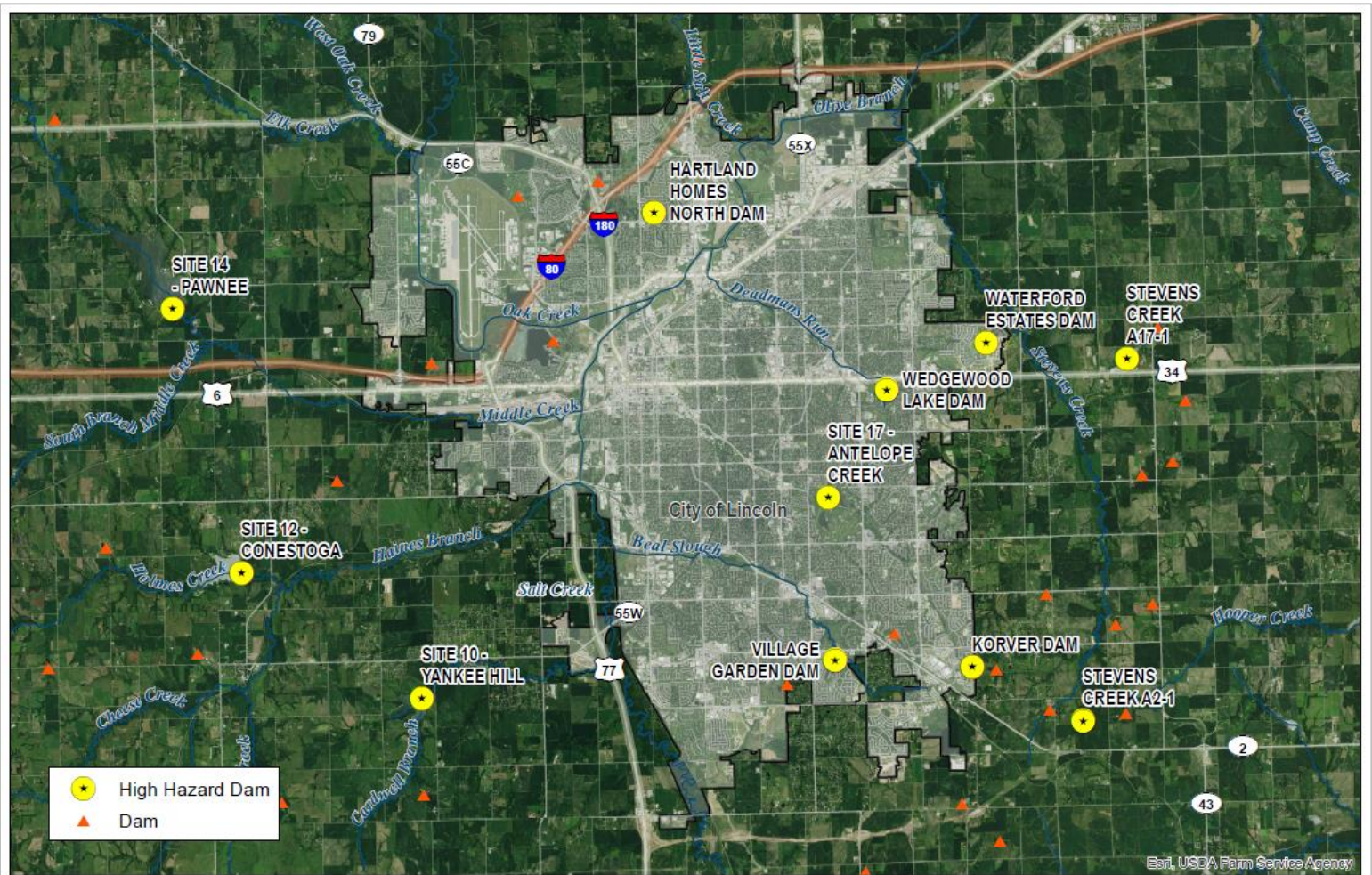
City of Lincoln Flood Mitigation Master Plan

Table 3-20 Dams Located in or near City of Lincoln

NIDID	Dam Name	Owner	Location
NE00527	Wedgewood Lake Dam	Wedgewood Manor Lake Association	Lincoln
NE01055	Salt Creek Site 12 – Conestoga Dam	CENWO	Lincoln
NE01058	Salt Creek Site 10 – Yankee Hill Dam	CENWO	Lincoln
NE01060	Salt Creek Site 13 – Twin Lakes Dam	CENWO	Lincoln (Seward)
NE01061	Salt Creek Site 17 – Antelope Creek Dam (Holmes Lake)	CENWO	Lincoln
NE02652	Korver Dam	Appian Way Lake Assoc Inc	Rural Lincoln
NE02756	Stevens Creek A2-1	LPSNRD	Rural Lincoln
NE02757	Stevens Creek A17-1	LPSNRD	Rural Lincoln
NE02805	Village Gardens Dam	Village Gardens LLC	Lincoln
NE02837	Waterford Estates Dam	LPSNRD	Lincoln
NE01063	Salt Creek Site 18 – Branched Oak	USACE	Raymond
NE01057	Salt Creek Site 14 – Pawnee Dam	CENWO	Emerald
NE01062	Salt Creek Site 2 – Olive Creek	USACE	Sprague
NE01064	Salt Creek Site 4 – Bluestem	USACE	Sprague
NE01056	Salt Creek Site 8 – Wagon Train	USACE	Hickman
NE01059	Salt Creek Site 9 – Stagecoach	USACE	Hickman

City of Lincoln Flood Mitigation Master Plan

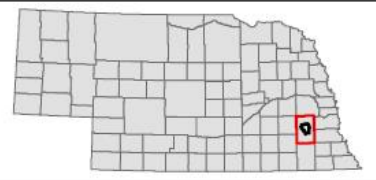
Figure 3-7 High Hazard Dams in and Around the City of Lincoln



Michael Baker
INTERNATIONAL

Local Dam Locations (City of Lincoln)

Date: 3/23/2022



City of Lincoln Flood Mitigation Master Plan

Levee Locations

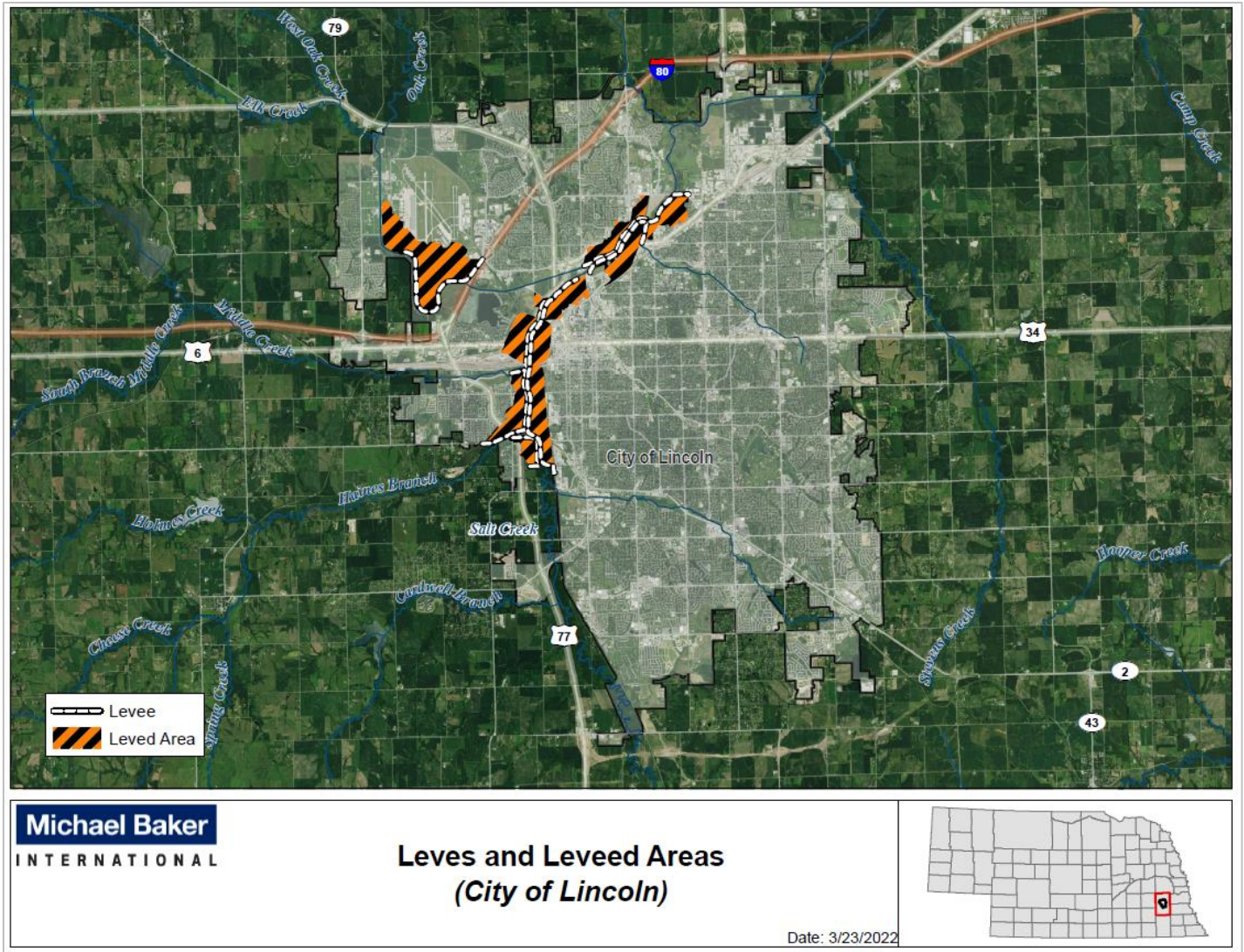
There are a total of eight levees located in Lancaster County according to the USACE National Levee Database. All eight levee systems are located in the City of Lincoln. The eight levees located in the City are built to withstand the 2% annual chance flood.

Table 3-21 Levees Located in City of Lincoln

Levee Name	Levee Location	Total Miles	Length of Flood wall	Length of Embankment	Max Height (feet)	FIRM Status	Risk Classification Rating and Assessment Date
Lincoln – Salt Creek LB & Haines LB & Middle Cr RB	Lincoln, Lancaster County, NE	2.49 miles	0 miles	1.26 miles	25	Non-Accredited Levee System	Low, 11/29/2018
Lincoln – Salt Creek LB & Haines RB	Yankee Hill, Lancaster County, NE	1.25 miles	0 miles	1.25 miles	17	Non-Accredited Levee System	Low, 11/21/2017
Lincoln – Salt Creek LB & Middle Creek LB	Lincoln, Lancaster County, NE	1.5 miles	0 miles	1.5 miles	15	Non-Accredited Levee System	Moderate, 11/21/2017
Lincoln – Salt Creek LB & Oak Creek LB	Lincoln, Lancaster County, NE	1.72 miles	0 miles	1.72 miles	20	Non-Accredited Levee System	Low, 11/21/2017
Lincoln – Salt Creek RB	Lincoln, Lancaster County, NE	4.71 miles	0 miles	4.71 miles	15	Non-Accredited Levee System	Moderate, 2/28/2018
Lincoln – Salt Creek RB & Dead Man’s Run RB	Lincoln, Lancaster County, NE	1.6 miles	0 miles	1.29 miles	12	Non-Accredited Levee System	Low, 11/29/2018
Lincoln – Salt Creek RB to Dead Mans Run	Lincoln, Lancaster County, NE	1.62 miles	0 miles	1.62 miles	10	Non-Accredited Levee System	Low, 11/21/2017
Oak Creek Levee 1	Lincoln, Lancaster County, NE	3.32 miles	0 miles	3.32 miles	0	Non-Accredited Levee System	Not Screened, No date applicable

City of Lincoln Flood Mitigation Master Plan

Figure 3-8 Levees and Leveed Areas in City of Lincoln



City of Lincoln Flood Mitigation Master Plan

The following narratives pertain to each levee system in the City of Lincoln and are from the National Levee Database's Overview for:

Salt Creek LB & Haines LB & Middle Cr RB – The Salt Creek LB & Haines LB & Middle Creek RB levees are located on the southwest side of Lincoln, Lancaster County, Nebraska. Lower Platte South Natural Resources District is the current non-federal levee sponsor. The project was authorized by Public Law 500, 85th Congress, essentially in accordance with the report of the Chief of Engineers contained in House Document 396, 84th Congress, 2nd Session. Construction of the project took place in three stages; the three stages being completed in January 1966, December 1967, and June 1968. The Salt Creek LB levee starts at the confluence with Haines Branch Creek and follows Salt Creek to the confluence of Middle Creek. The Haines LB levee was replaced by the roadway embankment of the Van Dorn By-Pass. The Middle Creek RB levee was replaced by the embankment for Rosa Parks Way. As originally constructed, the levee is approximately 2.42 miles long, has a crown width of 10 feet, 1V:3H (Vertical:Horizontal) side slopes, and an average height of 10 feet. The levee provides protection for 411 people and 201 structures. Project features include gravity drainage structures to conduct drainage into adjacent channels.

Salt Creek LB & Haines RB – The Salt Creek Left Bank and Haines Right Bank levees are located on the southwest side of Lincoln, Lancaster County, Nebraska. The Salt Creek Left Bank levee starts at Calvert Street, extends east approximately 590 feet and then north to northwest about 3,453 feet. The Haines Right Bank levee starts at Folsom Street and extends east to southeast approximately 2,580 feet where it ties in with the Salt Creek Left Bank levee. The project was authorized by Public Law 500, 85th Congress, essentially in accordance with the report of the Chief of Engineers contained in House Document 396, 84th Congress, 2nd Session. Construction of the project took place in three stages. Construction of the three stages was completed in January 1966, December 1967, and June 1968. In general, with the exception of the Salt Creek Left Bank levee from Station 34+10L to Station 66+35L, the crown width of the levee is 10 feet, the levee side slopes are 1V:3H (Vertical:Horizontal) and the average levee height is 3 to 5 feet. From Station 34+10L to Station 66+35L, the crown width of the levee is 26 feet and the levee side slopes are 1V:2H. The levee is approximately 6,624 feet long. Project features include 2 gravity drainage structures and channel improvements on Salt Creek.

Salt Creek LB & Middle Creek LB – The Salt Creek LB & Middle Creek LB levee is located on the west side of Lincoln, Lancaster County, Nebraska, and is a total of approximately 7,920 feet long. The levee starts at the confluence of Salt Creek & Middle Creek and extends north about 7,920 feet terminating near the intersection of Charleston Street and Sun Valley Boulevard. In general, the crown width of the levee is 10 feet, the levee side slopes are 1V:3H (Vertical:Horizontal) and the average levee height is 5 to 15 feet.

Also associated with this project were channel improvements within Salt Creek from the confluence with Middle Creek to the south to the confluence with Oak Creek on the north. The improvements consisted of enlarging and straightening the channel. The enlarged channel is 120 feet wide with a berm provided between the toe of the levee and top of channel.

City of Lincoln Flood Mitigation Master Plan

The project was authorized by Public Law 500, 85th Congress, essentially in accordance with the report of the Chief of Engineers contained in House Document 396, 84th Congress, 2nd Session. Construction of the project took place in three stages. Stage I, which was performed under contract DA64-166, started on 20 July 1964 and was completed on 11 January 1966. Stage II, which was performed under contract DA67-104, started on 4 April 1967 and was completed on 23 December 1967. Stage III, which was performed under contract DA68-C-0106, started on 23 April 1968 and was completed on 20 June 1968. The District Engineer, Corps of Engineers, Omaha District, supervised the projects which were turned over to the Salt Valley Watershed District for operation and maintenance on 21 December 1965, 25 January 1968 and 24 June 1968 for stages I, II and III, respectively. Lower Platte South Natural Resources District is the current non-federal levee sponsor.

Salt Creek LB & Oak Creek LB – The Salt Creek Left Bank and Oak Creek Left Bank levee is located within north-central Lincoln, Lancaster County, Nebraska. The Oak Creek Left Bank levee starts near the intersection of N Antelope Valley Parkway and Saunders Avenue and heads northeast to the confluence with Salt Creek. At this point, the Oak Creek Left Bank levee connects with the Salt Creek Left Bank levee and continues northeast to its termination point near the confluence with Deadmans Run. The project was authorized by Public Law 500, 85th Congress, essentially in accordance with the report of the Chief of Engineers contained in House Document 396, 84th Congress, 2nd Session. Construction of the project took place in three stages; the three stages being completed in January 1966, December 1967, and June 1968. In general, the crown width of the levee is 10 feet, the levee side slopes are 1V:3H (Vertical:Horizontal) and the average levee height is 8 to 10 feet. The levee is approximately 9,100 feet long. Project features include 8 gravity drainage structures.

Salt Creek RB – The Salt Creek Right Bank levee is located on the west side of Lincoln, Lancaster County, Nebraska. The levee starts south and west of the intersection of Calvert Street and S 6th Street and heads north-northeast to its termination point near the intersection of Charleston Street and N 4th Street. The project was authorized by Public Law 500, 85th Congress, essentially in accordance with the report of the Chief of Engineers contained in House Document 396, 84th Congress, 2nd Session. Construction of the project took place in three stages; the three stages being completed in January 1966, December 1967, and June 1968. In general, the crown width of the levee is 10 feet, the levee side slopes are 1V:3H (Vertical:Horizontal) and the average levee height is 4 to 10 feet. The levee is approximately 21,305 feet long. Project features include 24 drainage structures. The bridge locations are O Street Bridge, Union Pacific Railroad Bridge, Chicago Burlington & Quincy Railroad Bridge and Missouri Pacific Railroad Bridge. Depths of the closure areas range from approximately 1.2 to 2.6 feet. Also associated with this project were channel improvements within Salt Creek from Calvert Street to the confluence with Haines Branch and from the confluence with Middle Creek to the confluence with Oak Creek. The improvements consisted of enlarging and straightening the channel. The enlarged channel is 120 feet wide with a berm provided between the toe of the levee and top of channel.

Salt Creek RB & Dead Man's Run RB – The Salt Creek Right Bank and Deadmans Run Right Bank levee is located within north-central Lincoln, Lancaster County, Nebraska. The

Deadmans Run Right Bank levee (south end) starts at the intersection of U.S. Highway 6 and Deadmans Run and heads north to the confluence with Salt Creek. At this point, the Deadmans Run Right Bank levee connects with the Salt Creek Right Bank levee and continues northeast to its termination point at the intersection with Superior Avenue. The project was authorized by Public Law 500, 85th Congress, essentially in accordance with the report of the Chief of Engineers contained in House Document 396, 84th Congress, 2nd Session. Construction of the project took place in three stages; the three stages being completed in January 1966, December 1967, and June 1968. In general, the crown width of the levee is 10 feet, the levee side slopes are 1V:3H (Vertical:Horizontal) and the average levee height is 8 to 10 feet. The levee is approximately 7,028 feet long. Project features include 5 gravity drainage structures.

Salt Creek RB to Dead Man's Run – The Salt Creek Right Bank to Deadmans Run levee is located in north-central Lincoln, Lancaster County, Nebraska. The levee starts on the north side of the confluence of Salt Creek with Antelope Creek and heads northeast terminating at the confluence of Salt Creek with Deadmans Run. The project was authorized by Public Law 500, 85th Congress, essentially in accordance with the report of the Chief of Engineers contained in House Document 396, 84th Congress, 2nd Session. Construction of the project took place in three stages; the three stages being completed in January 1966, December 1967, and June 1968. In general, with the exception of the levee at the far upstream end, the crown width of the levee is 10 feet, the levee side slopes are 1V:3H (Vertical:Horizontal) and the average levee height is 8 to 10 feet. At the upstream end, for a length of approximately 2,000 feet, the crown width of the levee is 24 feet. The levee is approximately 8,580 feet long. Project features include gravity drainage structures.

Oak Creek Levee 1 – The USACE does not have a levee system overview developed for Oak Creek Levee 1. The date the levee was constructed is also not available.

3.4.3 *Extent of Dam and Levee Failure*

Extent means the strength or magnitude of the hazard. It can be described in terms of the specific measurement of an occurrence on a scientific scale or other hazard factors, such as duration and speed of onset.

Extent of Dam Failure

The severity of a dam failure depends mostly on what class the dam is, where it is located, and what caused it to fail. The inundation zone as defined by each Emergency Action Plan (EAP) shows what areas will be the most heavily impacted during a dam failure event. During these events, hazardous materials such as agricultural chemicals and wastes, solid wastes, raw sewage, common household chemicals, and loose mud and concrete can worsen rescue and cleanup operation. Much of the damage done during a dam failure will be downstream and within the immediate area.

Another way to classify dam failure in terms of extent is through FEMA's High Hazard Potential Classification. The classification has three categories of potential impacts a dam failure would create:

City of Lincoln Flood Mitigation Master Plan

Low Hazard Potential: Dams assigned the low hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner’s property.

Significant Hazard Potential: Dams assigned the significant hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

High Hazard Potential: Dams assigned the high hazard potential classification are those where failure will probably cause loss of human life.

Table 3-22 USACE Dam Information for City of Lincoln Dams

Name	Year Completed	Owner	Type	EAP Date	Height (feet)	Top of Dam Storage (Acre Ft.)
Wedgewood Lake Dam	1961	Wedgewood Manor Lake Associaton	Earth	8/27/2019	23.26	309.5
Salt Creek Site 12 – Conestoga Dam	1964	USACE – Omaha District	Earth	2/1/2010	65	15,000
Salt Creek Site 10 – Yankee Hill Dam	1965	USACE – Omaha District	Earth	2/1/2010	60	10,300
Salt Creek Site 13 – Twin Lakes Dam	1965	USACE – Omaha District	Earth	2/1/2010	45	11,750
Salt Creek Site 17 – Antelope Creek Dam (Holmes Lake)	1962	USACE – Omaha District	Earth	2/1/2010	61	7,455
Korver Dam	2003	Appian Way Lake Association Inc	Earth	10/7/2015	40	383
Stevens Creek A2-1	2005	Lower Platte South Natural Resources District	Earth	5/5/2015	32	256
Stevens Creek A17-1	2005	Lower Platte South Natural Resources District	Earth	5/27/2015	45	1,127
Village Gardens Dam	2006	Village Gardens	Earth	1/19/2017	33	51

City of Lincoln Flood Mitigation Master Plan

		Dev. Company LLC				
Waterford Estates Dam	2008	Lower Platte South Natural Resources District	Earth	1/5/2021	47	2,081
Salt Creek Site 18 – Branched Oak	1967	USACE – Omaha District	Earth	2/1/2010	80	122,283
Salt Creek Site 14 – Pawnee Dam	1965	USACE – Omaha District	Earth	2/1/2010	71	38,300
Salt Creek Site 2 – Olive Creek	1964	USACE – Omaha District	Earth	2/1/2010	46	8,590
Salt Creek Site 4 – Bluestem	1963	USACE – Omaha District	Earth	2/1/2010	48	17,550
Salt Creek Site 8 – Wagon Train	1963	USACE – Omaha District	Earth	2/1/2010	45	15,050
Salt Creek Site 9 – Stagecoach	1964	USACE – Omaha District	Earth	2/1/2010	48	10,200

Extent of Levee of Failure

The USACE has developed a Risk Classification System for levees. The following table outlines the risk characteristic definitions for the six classifications as well as actions for levee systems and leveed areas for the correlating class.

Table 3-23 USACE Levee Risk Classification System

Risk Classification Rating	Risk Characteristics	Actions for Levee Systems and Leveed Areas
Very High	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very high risk.	Based on risk drivers, take immediate action to implement interim risk reduction measures. Increase frequency of levee monitoring, communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning systems and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as very high priority.
High	Likelihood of inundation due to breach and/or system component	Based on risk drivers, implement interim risk reduction measures. Increase frequency of

City of Lincoln Flood Mitigation Master Plan

Risk Classification Rating	Risk Characteristics	Actions for Levee Systems and Leveed Areas
	malfunction in combination with loss of life, economic, or environmental consequences results in high risk.	levee monitoring; communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as high priority.
Moderate	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in moderate risk.	Based on risk drivers, implement interim risk reduction measures as appropriate. Verify risk information is current and implement routine monitoring program; assure O&M is up to date; communicate risk characteristics to the community in a timely manner; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as a priority.
Low	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in low risk.	Verify risk information is current and implement routine monitoring program and interim risk reduction measures if appropriate; assure O&M is up to date; communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions to further reduce risk to as low as practicable.
Very Low	Likelihood of inundation due to breach and/or system component malfunction in combination with loss of life, economic, or environmental consequences results in very low risk.	Continue to implement routine levee monitoring program, including operation and maintenance, inspections, and monitoring of risk. Communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance.
No Verdict	Not enough information is available to assign Risk.	

3.4.4 Frequency of Dam and Levee Failure

Frequency of Dam and Levee Failure can be extrapolated through review of previous occurrences.

City of Lincoln Flood Mitigation Master Plan

Previous Occurrence – Dam Failure

There are no recorded dam failure events that have occurred in the City of Lincoln.

Previous Occurrence – Levee Failure

While there have not been any recorded levee failure events in the City of Lincoln, the waters from the 2015 flood event caused a near levee overtopping – however the levee never failed. According to the Lower Platte South Natural Resources District Multi-Jurisdictional Hazard Mitigation Plan, during May 6-7, 2015, severe thunderstorms brought significant heavy rain to the Salt Creek Basin. Heavy rain began on the evening of May 6th and continued into early the next morning after upwards of seven inches had fallen. The stream gauge on the Salt Creek in Lincoln rose from 4.4 feet to 16.6 feet in two hours and continued to rise. By the afternoon of May 7th, Salt Creek crested at 28.87 feet, which is now the record crest at the 27th Street Bridge. It broke the previous record from July 1993 which was 26.52 feet. The levee was nearly overtopped in a few spots and voluntary evacuations were ordered in the North and South Bottoms of Lincoln. These areas saw significant water in the streets and basements because stormwater was unable to drain due to the high water in Salt Creek. Due to the quick response of the LPSNRD and the USACE, any issues identified during the flood were addressed quickly. Boils were ringed along the Salt Creek left bank and Oak Creek left bank levee and another near Haymarket Park.

3.4.5 Summary of City of Lincoln’s Vulnerability to Dam and Levee Failure

Dam Failure Vulnerability

As dams continue to age, the likelihood for failure increases if undesirable woody vegetation on the embankment, deteriorated concrete, animals burrowing into the structure, inoperable gates, and corroded outlet pipes become problems. Since dam failures are often exacerbated by flooding, the probability of dam failures can be associated with projected flood frequencies. Overall, the probability of a dam failure throughout region should remain low with continued maintenance of dams. Additionally, warning plans in place for designated high hazard dams will continue to decrease the danger for those residents in potential risk areas.

The United States Army Corps of Engineers (USACE) maintains the National Inventory of Dams (NID) database. Within the NID database, there are modeled dam failure scenarios and the vulnerable assets located in the dam’s inundation zones. For the purpose of the Lincoln Flood Mitigation Master Plan, the Maximum High Pool Breach Scenario was closely examined as this scenario for a dam would have the largest impact. The following table shows the pool elevation at the time of a breach, daytime people at risk should the breach occur during the day, nighttime people at risk should the breach occur at night, buildings at risk, and the economic cost of the dam breach for each dam that could impact the City of Lincoln. Data is not available for dams that are not owned by USACE – Stevens Creek A17-1 Dam, Korver Dam, Village Gardens Dam, Stevens Creek A2-1 Dam, Wedgewood Lake Dam, and Waterford Estates Dam.

City of Lincoln Flood Mitigation Master Plan

Table 3-24 National Inventory of Dams Maximum High Pool Breach Scenario

Dam Name	Maximum High Pool Breach Scenario				
	Pool Elevation	Daytime People at Risk	Nighttime People at Risk	Buildings at Risk	Economic Cost
Salt Creek Site 12 – Conestoga Dam	1,260.65	8,000	7,200	N/A	\$487,500,000
Salt Creek Site 10 – Yankee Hill Dam	1,271.5	5,200	4,300	0	\$243,400,000
Salt Creek Site 13 – Twin Lakes Dam	1,364.1	4,878	4,238	0	\$215,976,095
Salt Creek Site 17 – Antelope Creek Dam (Holmes Lake)	1,268.7	9,066	10,556.869	N/A	\$373,006,336
Salt Creek Site 18 – Branched Oak	1,320.3	16,994	18,169	N/A	\$1,222,727,630
Salt Creek Site 14 – Pawnee Dam	1,272.1	15,660	13,890	4,393	\$979,521,388
Salt Creek Site 2 – Olive Creek	1,358.2	1,855	1,740	0	\$57,331,263
Salt Creek Site 4 – Bluestem	1,334.6	5,549	4,674	N/A	\$137,548,643
Salt Creek Site 8 – Wagon Train	1,314.4	7,802	7,372	N/A	\$349,881,556
Salt Creek Site 9 – Stagecoach	1,294.86	5,611	4,768	0	\$229,831,760

Levee Failure Vulnerability

The following narratives describe the vulnerability assessments USACE has conducted on the levees that are located within the City of Lincoln. The National Levee Database also provides the population at risk behind the levee, the structures at risk behind the levee, and the approximate value of structures that are at risk behind the levee. The USACE has not completed a high-level risk assessment for Salt Creek LB & Haines LB & Middle Cr RB, Salt Creek RB & Dead Man’s Run RB, or Oak Creek Levee 1.

City of Lincoln Flood Mitigation Master Plan

Table 3-25 Assets at Risk from Levee Failure, National Levee Database

Levee	Population at Risk	Structures at Risk	Value of Structures at Risk
Lincoln – Salt Creek LB & Haines LB & Middle Cr RB	387 residents	103 structures	\$127,000,000
Lincoln – Salt Creek LB & Haines RB	32 residents	7 structures	\$4,510,000
Lincoln – Salt Creek LB & Middle Creek LB	701 residents	76 structures	\$225,000,000
Lincoln – Salt Creek LB & Oak Creek LB	827 residents	123 structures	\$150,000,000
Lincoln – Salt Creek RB	1,063 residents	440 structures	\$160,000,000
Lincoln – Salt Creek RB & Dead Man’s Run RB	655 residents	203 structures	\$60,000,000
Lincoln – Salt Creek RB to Dead Mans Run	965 residents	146 structures	\$114,000,000
Oak Creek Levee 1	1,553 residents	8 structures	\$213,000,000

USACE completed a risk assessment for the Salt Creek LB & Haines RB in 1993. The levee was loaded to approximately 25% of its height in 1993 with no performance issues noted. There is moderate likelihood embankment seepage or embankment erosion could lead to poor performance under a significant loading. LPSNRD conducts annual inspections of the levees as well as culverts located throughout the levees inspected every five years. Erosion repairs were required after 1993 flood on right bank of Salt Creek on upstream and downstream levee systems. The community has a high level of awareness of the levee and its role in flood risk reduction and evacuation distances would be less than 3/4 of a mile and are not expected to be congested due to the number of evacuation routes and the population.

USACE considers the risk characterization associated with the Lincoln - Salt Creek LB & Middle Creek LB to be Moderate for Overtopping and to be Low for Prior to Overtopping. The levee has been loaded up to 80% of the levee height with no performance issues. Prior to overtopping, risk is based on uncertain performance for embankment erosion and stability related to erosion around inlet structures and dispersive clays in the embankment. The risk is also influenced by the transient nature of the population within the leveed area (approximately 700 during the day and 50 during the night) and the short egress to high ground (approximately 1 mile). However, the event would be short in duration with a marginal evacuation plan and flood warning effectiveness may catch the population by surprise. There is no overtopping resilience built into this project.

Salt Creek LB & Oak Creek LB has had minimal loading since construction; the 1993 event loaded the levee less than 12.5%. The levee is not expected to perform well under significant loading. Embankment seepage concerns are primarily due to the culverts found to be in unacceptable condition, additionally there are encroachments and animal control issues. Channel erosion has been a problem historically and has begun to reach the levee toe; embankment erosion has been an issue on other systems in the area. Areas of slope instability have been noted during past inspections. The culvert gate may pose inundation risk as there is sediment built up at the outlet of the drainage structure and the flap gate will not close properly. The population at risk is generally in shallow inundation areas up to 5 feet in depth; the community is very aware that it is

protected by a levee and understands the risk of breach or overtopping. It should be noted that the LPSNRD has performed significant repairs to the levee and culverts since the 2015 flood event.

USACE considers the risk associated with the Lincoln – Salt Creek right bank levee segment to be Moderate (LSAC 3), driven by Overtopping. The levee has been loaded to 84% the levee height (in 2015), with some performance concerns subsequent to pre-2015 repairs, including observations of seepage. There are concerns should the levee be overtopped (return period of approximately 50 years), primarily because of the possibility of quickly rising stage and consequent marginal warning effectiveness, and the proximity of the population at risk. These concerns are mitigated by the low to moderate consequences, and the likely short loading duration and shallow sheet flow should breach occur. Also, there are secondary concerns regarding seepage along and/or into deteriorated metal conduits penetrating the embankment, and possible erosion under high loading.

USACE completed a risk assessment for Salt Creek RB to Dead Man's Run in 1993. The levee was loaded to approximately 28% of its height with no performance issues noted. There is moderate likelihood embankment seepage or embankment erosion could lead to poor performance under a significant loading. Embankment seepage uncertainty is due to aged culverts in unknown condition and minor encroachments; embankment erosion uncertainty is due to past history of erosion issues on Salt Creek levee system due to dispersive clay used to construct levees. Erosion repairs were required after 1993 flood on right bank of Salt Creek on upstream and downstream levee systems. The community has a high level of awareness of the levee and its role in flood risk reduction and evacuation distances would be less than 3/4 of a mile and are not expected to be congested due to the number of evacuation routes and the population.

3.4.6 Impacts of Dam and Levee Failure

Impact means the consequence or effect of the hazard on the community and its assets. Assets are determined by the community and include, for example, people, structures, facilities, systems, capabilities, and/or activities that have value to the community.

Life Safety and Dam/Levee Failure Warning and Notification – Loss of life and injury is most likely in High Hazard dam or levee failures. Fatalities could be expected in the dozens or hundreds depending on population density. Communities can become isolated due to impassable roads. Dam and levee failure can occur rapidly and without extended warning time.

Public Health – Severe floods resulting from dam or levee failure can kill those caught in their way. Injuries may also result. Illnesses from water-borne viruses, bacteria, or parasites if contact is made with floodwaters. Similar to flooding, sewer backups can occur in north Lincoln near the Theresa Street plant. The north and south bottoms neighborhoods within the city can also experience interior drainage flooding issues.

Critical Facilities – The Nebraska Emergency Management Agency is likely to be impacted by rapid flooding should the Branched Oak Dam fail, creating a wider impact on the state's ability to respond in the event of a disaster event. Other locations that will be heavily impacted by the dam's failure include the airport and National Guard base. The LES facility located along North 27th would be impacted should the Salt Creek levee fail.

Economy and Major Employers – Significant or catastrophic dam failures can wipe out large portions of a single small town. Residents may move away permanently, and jobs may be lost.

Specifically, Branched Oak Dam would wipe out many industrial and commercial facilities, as well as the mentioned National Guard base and airport, creating massive blowbacks to the city's economy. Industrial and commercial facilities along Salt Creek could be destroyed by levee failure or overtopping.

Buildings – Entire buildings can be washed away, or otherwise flooded irreparably. Power outages from disrupted underground utilities.

Transportation – Bridges, highways, and roads can be destroyed completely. Significant detours will be necessary. In the City of Lincoln, should Branched Oak Dam fail, the airport would be impacted. This impact would lead to a loss of use for airplanes to fly into the city.

Natural Systems – Flooding can destroy large tracts of land. Alteration of riverbeds can occur. Debris can become stuck in place. As dams and levees fail, entirely new channels of that water flows can be created.

3.5 Repetitive Loss Properties Profile

A Repetitive Loss (RL) property is a FEMA designation defined as an insured property that has made two or more claims of more than \$1,000 in any rolling 10-year period since 1978. The term “rolling 10-year period” means that a claim of \$1,000 can be made in 1991 and another claim for \$2,500 in 2000; or one claim in 2001 and another in 2007, as long as both qualifying claims happen within ten years of each other. Claims must be at least ten days apart but within ten years of each other. RL properties may be classified as a Severe Repetitive Loss (SRL) property under certain conditions. A SRL property has had four or more claims of at least \$5,000, or at least two claims that cumulatively exceed the building's reported value. A property that sustains repetitive flooding may or may not be on the City's RL property list for a number of reasons:

- Not everyone is required to carry flood insurance. Structures carrying federally backed mortgages that are in a SFHA are required to carry flood insurance in the cCity;
- Owners who have completed the terms of the mortgage or who purchased their property outright may not choose to carry flood insurance and instead bear the costs of recovery on their own;
- The owner of a flooded property that does carry flood insurance may choose not to file a claim;
- Even insured properties that are flooded regularly with filed claims may not meet the \$1,000 minimum threshold to be recognized as an RL property; or
- The owner adopted mitigation measures that reduce the impact of flooding on the structure, removing it from the RL threat, and the RL list (in accordance with FEMA's mitigation reporting requirements).

3.5.1 Repetitive Loss in Lincoln, Nebraska

There are 7 repetitive loss properties in the City of Lincoln, as of January 2020 from FEMA Region VII. Four of the repetitive loss properties are single family homes; three of the repetitive loss properties are businesses. Each repetitive loss property in the City of Lincoln is caused by localized flooding. There are no severe repetitive loss properties located in the City of Lincoln.

City of Lincoln Flood Mitigation Master Plan

A jurisdiction can be categorized into one of three categories based on the number of repetitive loss properties that are located within the community. Based on the data from FEMA Region VII, the **City of Lincoln is a Category B repetitive loss community**.

CRS defines the categories with the following definitions:

Category A: A community that has no repetitive loss properties, or whose repetitive loss properties all have been mitigated. A Category A community has no special requirements except to submit information to update its repetitive loss list, as needed.

Category B: A community with at least one, but fewer than 50, repetitive loss properties that have not been mitigated. At each verification visit, a Category B community must:

- Prepare a map of the repetitive loss area(s),
- Review and describe its repetitive loss problem,
- Prepare a list of the addresses of all properties with insurable buildings in those areas, and
- Undertake an annual outreach project to those addresses. A copy of the outreach is submitted with each year's recertification.

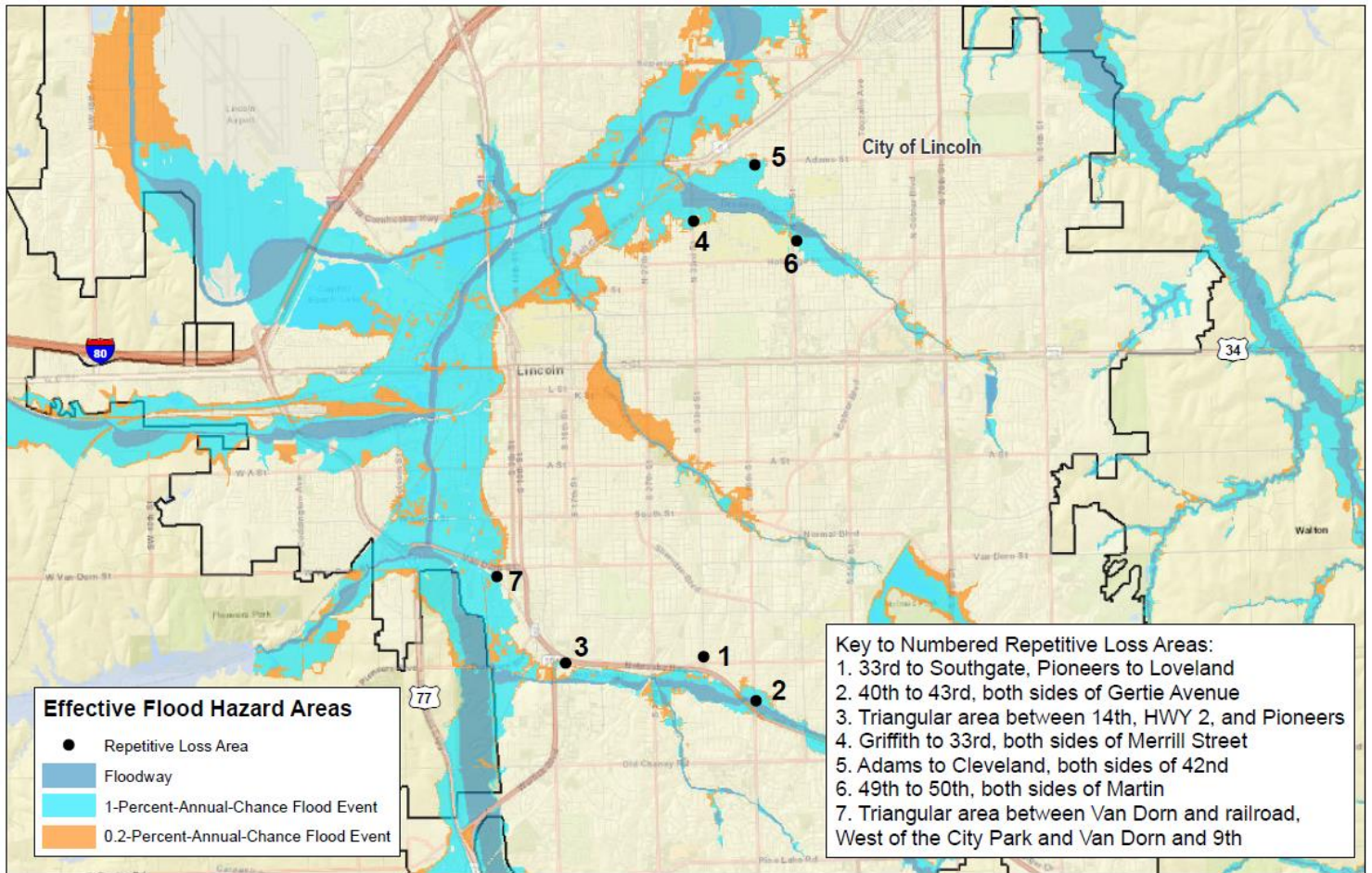
Category C: A community with 50 or more repetitive loss properties that have not been mitigated. A Category C community must:

- Do the same things as a Category B community, and
- Prepare and adopt a repetitive loss area analysis for all repetitive loss areas, or prepare and adopt a Floodplain Management Plan that includes full credit for planning Step 5(c) outlined in the CRS Coordinator's Manual for Floodplain Management Planning. Repetitive loss area analyses and floodplain management plans are described under Activity 510 (Floodplain Management Planning).

City of Lincoln Flood Mitigation Master Plan

3.5.2 Map of Repetitive Loss Areas in City of Lincoln

Figure 3-9 Repetitive Loss Areas in Lincoln

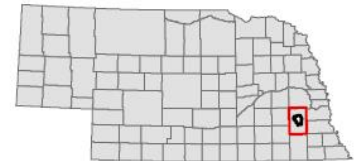


Michael Baker
INTERNATIONAL

Repetitive Loss Areas (Overview)

*User Defined Structures
(FEMA Regulatory)* v. *User Defined Structures
(Existing Conditions
Future Precipitation)*

Date: 4/11/2022



City of Lincoln Flood Mitigation Master Plan

List of Addresses of All Insurable Properties within the Repetitive Loss Area

Table 3-26 Repetitive Loss Zones in City of Lincoln

Repetitive Loss #	Buffer Area	Source of Flooding
1	33 rd to Southgate, Pioneers to Loveland	Localized Flooding
3.5.3 2	40 th to 43 rd , both sides of Gertie Avenue	Localized Flooding
3	Triangular area between 14 th , HWY 2, and Pioneers	Localized Flooding
4	Griffith to 33 rd , both sides of Merrill Street	Localized Flooding
5	Adams to Cleveland, both sides of 42 nd	Localized Flooding
6	49 th to 50 th , both sides of Martin	Localized Flooding
7	Triangular area between Van Dorn and railroad, West of the City Park and Van Dorn and 9 th	Localized Flooding

3.5.4 Annual Outreach Project

Every year, the City of Lincoln will conduct an outreach project to the addresses that are within the seven repetitive loss areas identified in Section 5.3. The outreach project will consist of a letter from the City of Lincoln Watershed Management Division or Building and Safety. The letter will provide the parcel owner with a background as to why they are receiving the letter based on the CRS program benefits for citizens of the city as well as the parcel owner’s geographical location in a repetitive loss area in the city. Contents of the letter will outline the steps the parcel owner can take to reduce flooding impacts to their property. The addresses that receive the letter will also obtain contact information for City personnel to learn more about reducing flooding impacts to their property. A sample letter that will be mailed to the addresses in each repetitive loss area in the City of Lincoln can be found below.

After completion of the Annual Repetitive Loss Outreach Project, the City of Lincoln will submit the outreach project to the CRS program each year with the city’s recertification.

Sample Letter for Annual Public Outreach Project

Month Day, Year

Owner of Structure
Street Address
Lincoln, NE Zip code

RE: Repetitive Flooding in your area of your property (Street Address)

Dear Owner:

The Federal Management Agency (FEMA) has identified that your property is within a repetitive flood risk area due to the number of FEMA claims filed in this area.

We are sending this to you as a service and to comply with the requirements that assist the citizens of Lincoln in having lower flood insurance rates than the national rate. Below are items you can do to reduce flooding impacts to your structure:

Call the City's Watershed Manager (Name, Phone Number) in the Public Works Department about past flooding in your area. They can tell you about the causes of repetitive flooding, what the city is doing about it, and what would be an appropriate flood protection level. They are also available to visit your property to discuss flood protection alternatives.

- Prepare for flooding by doing the following:
- Know the flood safety guidelines (enclosed with this letter).
- Know how to shut off the electricity and gas to your house when a flood comes.
- Make a list of emergency numbers and identify a safe place to go.
- Make a household inventory, especially of basement contents.
- Put insurance policies, valuable papers, medicine, etc. in a safe place.
- Collect and put cleaning supplies, camera, waterproof boots, etc. in a handy place.
- Visit the Red Cross website: <https://www.redcross.org/about-us/our-work/disaster-relief.html> for a copy of the brochures *Flood Safety Checklist*, *Returning Home after Flooding*, and *Repairing Your Flooded Home*.
- Consider some permanent flood protection measures:
- Mark your fuse or breaker box to show the circuits to flooded areas. Turning off the power to the basement can reduce property damage and save lives.
- Consider elevating your house above flood levels.
- Check your building for water entry points, such as basement windows, the basement stairwell, doors, and dryer vents. These can be protected with low walls or temporary shields.
- Install a floor drain plug, standpipe, overhead sewer, or sewer backup valve to prevent sewer backup flooding.

More information can be found at: https://www.fema.gov/sites/default/files/2020-08/FEMA_P-312.pdf *Homeowners Guide to Retrofitting: Six Ways to Protect Your House from Flooding*.

City of Lincoln Flood Mitigation Master Plan

Because some flood protection measures may need a building permit and others may not be safe for your type of building, be sure to contact the Department of Building & Safety for more information. Talk to the City's Watershed Manager in the Public Works Department about options for financial assistance.

Get a flood insurance policy (if you don't have one already) or consider updating.

Homeowner's insurance policies do not cover damage from floods. However, because the City of Lincoln participates in the National Flood Insurance Program, you can purchase a separate flood insurance policy. The insurance is backed by the Federal government and is available to everyone, even properties that have been flooded. Because the City of Lincoln also participates in the Community Rating System, you will receive a reduction in the insurance premium.

Talk to the City's Floodplain Manager (Phone Number) in the Department of Building & Safety to see if you qualify for a lower-cost Preferred Risk Policy.

Some people have purchased flood insurance because it was required by the bank when they got a mortgage or home improvement loan. Usually, these policies just cover the building's structure and not the contents. During the kind of flooding that happens in your area, there is usually more damage to the furniture and contents than there is to the structure. Be sure you have contents coverage.

Don't wait for the next flood to buy insurance protection. In most cases, there is a 30-day waiting period before coverage under National Flood Insurance Program takes effect.

Contact your insurance agent for more information on rates and coverage.

Should you have any questions or concerns, please contact the City's Watershed Manager at [Phone Number] for more information.

Sincerely,

Name

Title, Department

cc: Name, Additional Name, Public Works

City of Lincoln Flood Mitigation Master Plan

3.6 Critical Facilities

Critical facilities are vulnerable structures to a community as they house the essential operations and vulnerable populations of the City of Lincoln. If a critical facility located in the City of Lincoln were to be impacted by flooding, the City’s ability to respond and operate on a normal basis could be impacted as well. The following critical facility data is from the 2020 Lower Platte South Natural Resources District Multi-Jurisdictional Hazard Mitigation Plan, Lancaster County Appendix, City of Lincoln section. The City of Lincoln has identified 5 types of critical facilities: Emergency Response, Medical, Government, Infrastructure, and School.

Table 3-27 Critical Facilities in City of Lincoln

Number	Critical Facility	Address	Type	Located in Floodplain
1	Center Team Police Department Sub-Station	1501 N 27 th St	Emergency Response	N
2	Emergency Operations/Maintenance/Lancaster County Sherriff	444 N Cherrycreek Rd	Emergency Response	Y (0.2%)
3	Fire Station #1	1801 Q St.	Emergency Response	N
4	Fire Station #2	1545 N 33 rd St	Emergency Response	N
5	Fire Station #3	2 nd and N St	Emergency Response	Y (1%)
6	Fire Station #4	5600 S 27 th St	Emergency Response	N
7	Fire Station #5	3640 Touzalin Ave	Emergency Response	N
8	Fire Station #6	5041 S 48 th St	Emergency Response	N
9	Fire Station #7	1345 S Cotner St	Emergency Response	N
10	Fire Station #8	2760 S 17 th St	Emergency Response	N
11	Fire Station #9	901 N Cotner Blvd	Emergency Response	N
12	Fire Station #10	4421 N 24 th St	Emergency Response	N
13	Fire Station #11	4600 W Adams St	Emergency Response	N
14	Fire Station #12	4405 S 84 th St	Emergency Response	N
15	Fire Station #13	1700 S Coddington Ave	Emergency Response	N
16	Fire Station #14/Northwest Team Police Department Sub-station	5435 NW 1 st St	Emergency Response	N
17	Fire Station #15/Southeast Team Police Department	6601 Pine Lake Rd	Emergency Response	N
18	Fire Station #16	9765 Boathouse	Emergency Response	Y (1%)
19	Fire Training Facility	South Street	Emergency Response	Y (1%)

City of Lincoln Flood Mitigation Master Plan

Number	Critical Facility	Address	Type	Located in Floodplain
20	Lincoln/Lancaster County Emergency Management	1200 Radcliff St #200	Emergency Response	N
21	Northeast Team	4843 Huntington Ave	Emergency Response	N
22	Northwest Team Police Department Sub-station	3220 N 14 th St	Emergency Response	N
23	Northwest Team Police Department Sub-station	700 Penrose Drive	Emergency Response	N
24	Police Headquarters	575 S 10 th St	Emergency Response	N
25	Southeast Team Police Department Sub-station	3800 S 48 th St	Emergency Response	N
26	Southwest Team Police Department Sub-station	1225 F St	Emergency Response	N
27	Southwest Team Police Department Sub-station	6701 S 14 th St	Emergency Response	N
28	Southwest Team Police Department Sub-station	2300 S 16 th St	Emergency Response	N
29	Bryan Medical Center – East	1600 S 48 th St	Medical	N
30	Bryan Medical Center – West	2300 S 16 th St	Medical	N
31	Community Mental Health Center	2201 S 17 th St	Medical	N
32	Lincoln Surgical Hospital	1710 S 70 th St	Medical	N
33	Madonna Rehabilitation Hospital	5401 South St	Medical	N
34	Nebraska Heart Hospital	7500 S 91 st St	Medical	N
35	Saint Elizabeth Regional Medical Center	555 S 70 th St	Medical	N
36	City Health Dept/Parks Dept	3140 N St	Government	N
37	City of Lincoln Offices	555 S 10 th St	Government	N
38	Lincoln Municipal Services Center	901 and 949 W Bond St	Government	N
39	Pershing Center	226 Centennial Mall South	Government	N
40	StarTran	710 J St	Government	N
41	16 Lift Stations	(not mapped)	Infrastructure	-
42	Airport	2400 W Adams	Infrastructure	Y (1%)
43	Black Hills Natural Gas Transmission Lines	(not mapped – run throughout City)	Infrastructure	-
44	LES	1040 O St	Infrastructure	N
45	LES	2600 Fairfield St	Infrastructure	Y (1%)*
46	LES Generation Stations (two solar farms, one wind farm)	(not mapped)	Infrastructure	-
47	NE Treatment Plant	7000 N 70 th St	Infrastructure	Y (0.2%)
48	Police Equipment Garage	105 N 8 th St	Infrastructure	N
49	Stormwater Pump	48 th St and Cornhusker	Infrastructure	N
50	Stormwater Pump	56 th St and Cornhusker	Infrastructure	N
51	Street Maintenance Facility	3200 Baldwin Ave	Infrastructure	Y (0.2%)
52	Street Maintenance Facility	3180 South Street	Infrastructure	N
53	Wastewater Facility	2400 Theresa St	Infrastructure	Y (1%)
54	Water Production & Distribution	2021 N 27 th St	Infrastructure	Y (0.2%)

City of Lincoln Flood Mitigation Master Plan

Number	Critical Facility	Address	Type	Located in Floodplain
55	58 Additional Elementary and Middle Schools	(Not mapped)	School	-
56	Lincoln East High School	1000 S 70 th St	School	N
57	Lincoln High School & Infant Toddler	2229 J St	School	Y (0.2%)
58	Lincoln Northeast High School	2635 N 63 rd St	School	N
59	Lincoln Southeast High School	2930 S 37 th St	School	N
60	North Star High School, Infant Toddler	5801 N 33 rd St	School	N
61	Southwest High School	7001 S 14 th St	School	Y (1%) – property not building
62	Potable Water Pump Stations	(not mapped)	Infrastructure	N
63	Wellfields	(not mapped – near Ashland)	Infrastructure	Y (1%)
64	Water Storage Reservoirs	(not mapped)	Infrastructure	N

* = Has flood gates

3.7 Future Conditions

3.7.1 Changes in Floodplain Development and Demographics

The City of Lincoln enforces floodplain development requirements through the City’s zoning code. The floodplain regulations have minimum flood corridor criteria that requires the natural drainage of the waterway to remain nonimpacted by development.

Recently, there has been new growth in areas outside of the City limits, but the floodplain regulations have ensured that there have been no impacts to the depth of the waterways nearby.

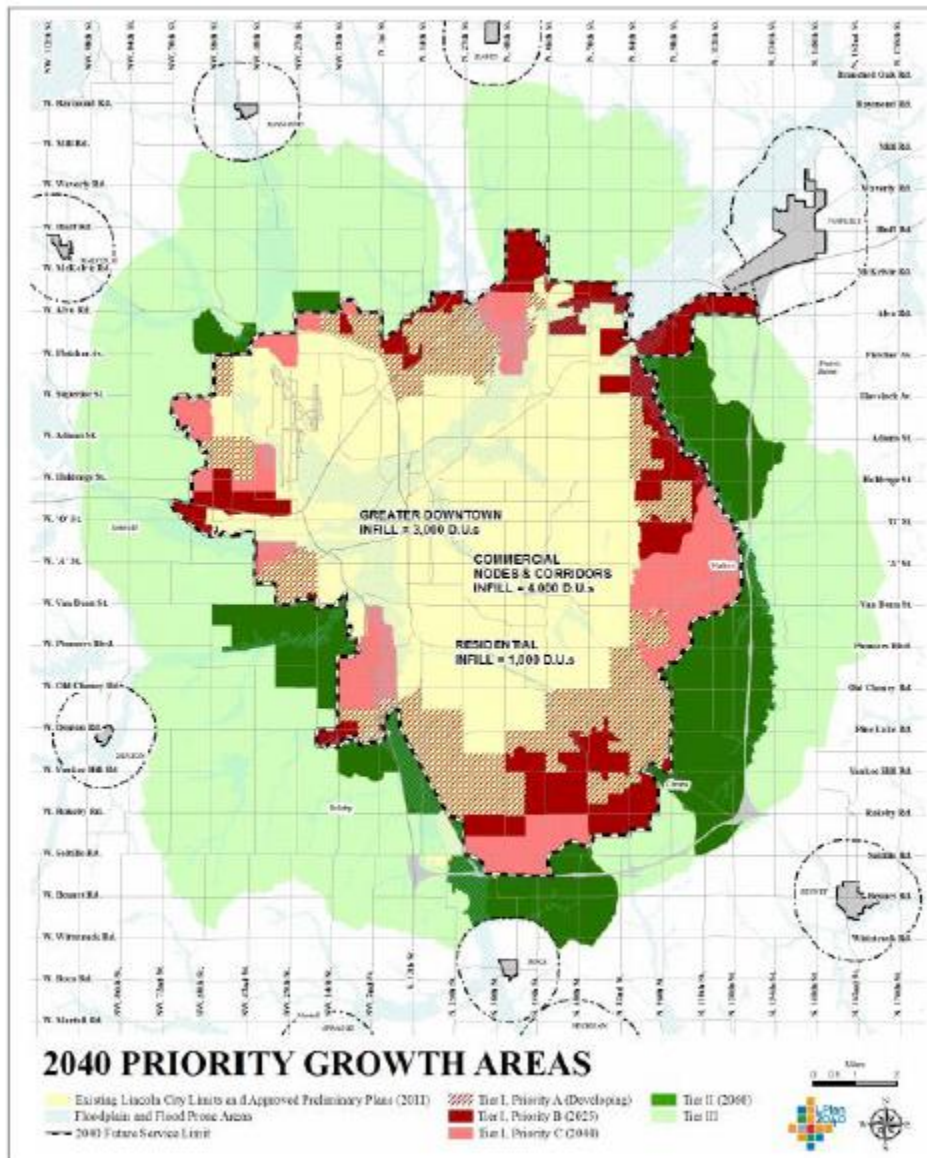
3.7.2 Development in the Watershed

The Salt Creek Floodplain Resiliency Study considers how land use changes in the Salt Creek Watershed will impact flooding in the watershed by year 2100. Land use changes typically cause increases in runoff by reducing the amount of precipitation absorbed into the soil. When native land, cropland and vegetation are replaced with buildings and impervious surfaces, a higher percentage of precipitation runs off, creating a higher potential for downstream flooding. It is because of this increased runoff, the city now has requirements for detention basins in these areas.

The City’s comprehensive plan identifies areas where future development is planned based on timeframes of when the expected development will be completed by. Tier 1A is currently under development, Tier 1B is planned to be finished by 2025, Tier 1C is planned to be finished by 2040, Tier II is planned to be finished by 2060, and Tier III is development that is expected after 2060. The comprehensive plan also expects redevelopment and expanded development to occur in already developed areas as well. The following image, from the City’s comprehensive plan, shows the various tiered development that is expected to occur in the City of Lincoln.

City of Lincoln Flood Mitigation Master Plan

Figure 3-10 Lincoln-Lancaster County 2040 Comprehensive Plan Tiered Future Growth Areas



The Salt Creek Floodplain Resiliency Study incorporated the expected tiered growth areas into its hydrologic and hydraulic models to calculate the new flood discharge rate increases in the planning area. The following table, from the study, considers the expected development to occur by 2100 and how much the flood discharge rates will increase for each subbasin.

The first column in the following table, Index Percent of Subbasin to be developed, was calculated as 0.05 times higher than the percent area that is currently developed to account for additional new development in the area, plus the percent area considered in growth tiers I and II, plus 0.33 times the percent area in tier III to account for considered but not certain development by 2100.

City of Lincoln Flood Mitigation Master Plan

Table 3-28 Projected Increase in Flood Discharges Caused by Projected Development, Salt Creek Floodplain Resiliency Study

Subbasin	Index Percent of Subbasin to be Developed	10% Annual Chance Discharge (% Change)	2% Annual Chance Discharge (% Change)	1% Annual Chance Discharge (% Change)	0.2% Annual Chance Discharge (% Change)
Antelope Creek	17%	2.3%	1.6%	1.3%	0.8%
Cardwell Branch	41%	5.2%	4.1%	3.1%	1.5%
Little Salt Creek	12%	3.0%	1.2%	0.6%	0.2%
Middle Creek	8%	0.6%	0.4%	0.3%	0.3%
Oak Creek	6%	0.1%	0.1%	0.1%	0.0%
Southeast Upper Salt Creek	88%	11.6%	8.0%	6.6%	5.0%
South Salt Creek	9%	0.4%	0.3%	0.3%	0.2%
AVERAGE	10%	3.3%	2.2%	1.8%	1.1%

The average total area of the Salt Creek watershed to be developed by 2100 is expected to be 10%, having an increase of 3.3% of flood discharge in the 10% annual chance floodplain, 2.2% increase of flood discharge in the 2% annual chance floodplain, 1.8% increase of flood discharge in the 1% annual chance floodplain, and 1.1% increase of flood discharge in the 0.2% annual chance floodplain.

3.7.3 Climate Change

As the science indicates, extreme weather events are anticipated to continue and increase in frequency, such as heavy rainfall or rain falling on frozen ground leading to flash melting of snowpack and flash flooding. Flood debris, such as large trees, hit bridge piers and clogged streams during flooding, which can reduce the overall expected lifespan of bridges and culverts. As seen during the recovery phase of the March 2019 flood, materials such as gravel, rock, and riprap are in high demand, which leads to shortages and price increases. As flood frequencies increase so too will repair costs and the frequency with which infrastructure will need to be replaced.

According to the City of Lincoln’s Climate Action Plan, there will be significant changes to the average temperature, number of days with a heat index over 100°F, average winter and spring precipitation totals, and number of heavy precipitation days statewide by 2050. By 2050, the mean average temperature will increase by 5°F compared to the 1990 average for the cCity – from 52°F to 57°F. The Climate Action Plan also indicates that the City of Lincoln will see a 340% increase in the number of days in a year that have a heat index over 100°F by 2050. There will be 44 days each year in the City of Lincoln where the air temperature and relative humidity produce a heat index over 100°F. Additionally, 26 of those days will have a heat index over 105°F. As for winter and spring precipitation totals, the City’s will see a 10-16% increase in precipitation totals compared to the current day precipitation totals, while the summer precipitation total will decrease by 4%. Lastly, statewide heavy precipitation days are projected to increase up to 30% by 2050.

The City of Lincoln’s Climate Action Plan identified twelve vulnerable areas that will be impacted with the projected climate changes: flooding, drought, single water source, public health risks,

City of Lincoln Flood Mitigation Master Plan

disproportionate impacts on vulnerable populations, financial and workforce resources not aligned with climate risks and opportunities, City policies not aligned with climate risks and opportunities, auto-reliant transportation system, reliance on fossil fuels, external control over food supplies, vulnerable natural resources, and public awareness.

The US Army Corps of Engineers conducted a Hydrologic Analysis and Climate Assessment on Deadmans Run in March 2018. Flooding on Deadmans Run would be sensitive to change in peak rainfall intensity, especially for shorter duration storms of 3 hours or less. Trends in streamflow and precipitation models were evaluated in order to determine if there are any current trends that could be used to project future without project rainfall and runoff conditions that would be different from the current conditions. Additionally, regional climate trend analysis studies were evaluated to determine if there were implications to the rainfall-runoff regime on flood flow frequency relationships in the future.

The Salt Creek Floodplain Resiliency Study considered how flooding would increase due to climate change in the Salt Creek watershed. The study calculated flood discharge rates in the current precipitation conditions, updated precipitation conditions, and future precipitation conditions by through a hydrologic model. As precipitation increases in frequency and severity, the seven subbasins of the Salt Creek watershed will see a higher influx of water, as modeled by the different precipitation models representing the 1% annual chance discharges scenarios in the following table.

Table 3-29 1% Annual Chance Existing, Updated, and Future Conditions Discharges by Subbasin

Subbasin	Existing Model Discharge (cfs)	Updated Conditions Discharge (cfs)	Future Conditions Discharge (cfs)
Antelope Creek	12,100	13,400	15,700
Cardwell Branch	2,350	2,630	2,950
Little Salt Creek	14,300	17,100	21,100
Middle Creek	11,000	12,500	13,700
Oak Creek	15,600	17,100	20,700
Southeast Upper Salt Creek	8,130	9,700	11,300
South Salt Creek	14,400	17,000	19,300

As shown in Table 5-4,3-29 the future conditions flood discharge rates have higher flood discharge rates than the existing and updated conditions scenarios. The Salt Creek Floodplain Resiliency Study then utilized hydraulic models for each annual exceedance flood on Salt Creek for future conditions and compared the results to existing conditions data. The results of the hydraulic study are presented in the following table.

Table 3-30 Future Conditions on Salt Creek Hydraulic Study

	10% Annual Chance Event	2% Annual Chance Event	1% Annual Chance Event	0.2% Annual Chance Event
Average Increase in Discharge	+1,100 cfs	+4,400 cfs	+6,500 cfs	+12,600 cfs
Increase in Discharge	+8%	+21%	+28%	+45%
Average Increase in Water Surface Elevation	+0.6 ft	+1.5 ft	+2.2 ft	+4.5

This data shows that flood hazards will increase significantly in future conditions, compared to the existing conditions data. Some of this increase is because of improved updated conditions precipitation data, some of this increase is because of changes in future land use, and some of this increase is because of changes in future conditions precipitation caused by climate change. Overall, these three factors combine to greatly increase the flood risk in the City of Lincoln by the year 2100.

Generally, flooding during the most extreme events will increase by the greatest amount. The increase in flood hazards during the 10 percent annual chance flood event in the year 2100 is not expected to be as extreme as other events – an average 8 percent increase in discharge, and an average 0.6-foot rise in water surface elevation. The more extreme events will incur larger increases in discharge and water surface elevation. The water surface elevations for the 1% annual chance flood event and 0.2% annual chance flood event are expected to increase by 2.2 feet and 4.5 feet, respectively, by the year 2100.

3.8 Hazard and Risk Assessment Conclusion

Severe flooding has the potential to cause significant damage along the flood sources that run throughout the City of Lincoln. Assessing flood damage requires residents throughout the cCity to remain alert and notify local officials of potential flood prone areas near infrastructure such as roads, bridges, and buildings. While flooding remains a highly likely occurrence for Lincoln, smaller floods caused by heavy rains and inadequate drainage capacity will be more frequent, but not as costly as the large-scale floods which may occur at much less frequent intervals.

4 Action Plan

Development of the Action Plan included a thorough review of flooding hazards and identified policies and projects intended to reduce the future impacts of flood events and help the City of Lincoln achieve compatible economic, environmental, and social goals. All projects included in the final Action Plan have been carefully selected from a comprehensive list of proposed actions following consideration of the pros and cons associated with each. The projects selected are a direct result of the planning process and aim to reduce the vulnerabilities identified in the Risk Assessment.

The Action Plan includes the goals and objectives developed by Planning Committee, specific strategies considered for the Action Plan, and the finalized, prioritized Action Plan to reduce flooding impacts to the City of Lincoln.

Step 6, Set Goals

4.1 Goals and Objectives

The goals and objectives of the City of Lincoln Flood Mitigation Master guided identification of actions considered and selected for inclusion in the Action Plan. The goals and objectives of this plan will also help steer future floodplain policy and project administration.

Goals are general guidelines that explain what the City of Lincoln wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results.

Objectives describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals.

Actions provide more detailed descriptions of specific work tasks to help the City achieve prescribed goals and objectives.

When any part of the community is damaged by flooding, the whole community is affected. Flood damage can have economic and social impacts far beyond the floodplain. By reducing the impact of flooding through mitigation, Lincoln reduces future economic and social impacts.

The vision of the Planning Team is to reduce flood risk in Lincoln through a shared vision for flood risk reduction. Steps to achieving this vision include:

GOAL 1: Protect the Health and Safety of Residents and Visitors

OBJECTIVE 1.1: Reduce or eliminate loss of life and/or health, and the social, economic, and psychological impacts of flooding.

GOAL 2: Reduce Future Losses from Flood Events

OBJECTIVE 2.1: Provide flood protection to the built environment (both existing and future) including residential, commercial, and agricultural development, infrastructure, utilities, critical facilities, and essential services; and

OBJECTIVE 2.2: Protect, preserve, and enhance the natural and beneficial functions of floodplains.



GOAL 3: Increase Public Awareness and Education Regarding Vulnerability to Flood Hazards

OBJECTIVE 3.1: Provide information to the public and individual property owners through multiple outlets and modes about their flood risk, as well as preventative measures, preparedness actions, and flood mitigation options.

GOAL 4: Ensure Coordinated Efforts to Increase Flood Resilience and Promote Sustainability

OBJECTIVE 4.1: Implement, improve, share, and synchronize procedures and resources related to planning, floodplain management, flood mitigation, flood monitoring and warning, and emergency management.

4.2 City of Lincoln Capability Assessment

The City of Lincoln Flood Mitigation Master Plan includes an assessment of the City of Lincoln’s planning and regulatory, administrative/technical, and fiscal capabilities to implement actions that will reduce flood risk.

Planning and Regulatory Capability

The following table summarizes Lincoln’s planning and regulatory capabilities. These are the plans and policies that the City currently has in place that can help to further floodplain management and flood mitigation.

In addition to the Lincoln-Lancaster County 2040 Comprehensive Plan, the City of Lincoln also has a Recommended Growth Scenario published in October 2020, Residential Land Inventory Report published in March 2019, Future Land Use Review Interactive Map 2050 published in June 2021, Growth Tier Review Interactive Map 2050 published in October 2020.

The main stormwater plan for the City of Lincoln is the Comprehensive Watershed Master Plan, adopted in 2022. The Comprehensive Watershed Master Plan is a collaboration between the Lower Platte South Natural Resources District and Lincoln to combine the previously developed watershed plans into one master plan for all watersheds located in the city as well as future growth areas. Included in the 2022 plan are a list of flood reduction, stream stability, and water quality activities to be implemented through the capital improvement project program developed for these activities. There are also studies that have been conducted regarding the City of Lincoln’s waterways: Salt Creek Floodplain Resiliency Study, published in August 2020 and the Salt Creek at Lincoln, Nebraska Section 216 Study published in December 2001.

City of Lincoln Flood Mitigation Master Plan

Table 4-1 Planning and Regulatory Capabilities

Planning or Regulatory Tool/Program	City of Lincoln
Affordable Housing Coordinated Action Plan	X
Airport Master Plan	X
Building Code	X
Capital Improvement Plan	X
Climate Action Plan	X
Comprehensive Plan	X
Continuity of Operations Plan	X
Disaster Recovery Plan	X
Economic Development Plan	X
Emergency Operations Plan	X
Evacuation Plan	X
Farmland Preservation	
Fire Code	X
Floodplain Management Plan	Under development
Floodplain Regulations	X
Hazard Mitigation Plan	X
Historic Preservation Plan	X
Natural Resource Protection Plan	X
NFIP	X
NFIP-CRS	Class 5
Open Space Management Plan	X
Stormwater Management Plan	X
Subdivision Regulations	X
Transportation Plan	X
Wastewater Facilities Master Plan	X
Zoning Regulations	X

City of Lincoln Flood Mitigation Master Plan

Administrative and Technical Capability:

The table below provides a summary of administrative and technical capabilities organized by staff type and department. It is important to understand current administrative and technical capabilities before developing a myriad of flood mitigation activities.

Table 4-2 Administrative and Technical Capabilities

Administrative/Technical Capability	City of Lincoln
Emergency Manager	X
Engineers	X
Floodplain Manager	X
GIS Personnel	X
Grant Writers	X
Land Surveyor	X
Planners (with land use / development knowledge)	X
Other	Chief Building Official

Fiscal Capability:

This section identifies the financial tools or resources that the City of Lincoln could potentially use to help fund flood mitigation activities. Fiscal capabilities include community specific as well as state and federal resources. The identified state and federal resources identified in this section are derived from the State of Nebraska Flood Hazard Mitigation Plan.

Table 4-3 Fiscal Capabilities

Fiscal Capability	City of Lincoln
Capital Improvement Planning	X
Community Development Block Grant	X
Special Purpose Taxes	X
Gas / Electric utility fees	
Water / Sewer fees	X
Stormwater utility fees	
Development impact fees	X
General obligation, revenue, or special tax bonds	X
Partnering / intergovernmental arrangements	X
Other	

City of Lincoln Flood Mitigation Master Plan

State resources that could potentially financially support the actions in the City of Lincoln FMMP Action Plan include:

- Nebraska Cooperative Development Center Cooperative Business Development Mini Grant
- Nebraska Department of Economic Development Community Development Block Grant
- Nebraska Department of Economic Development Civic and Community Center Financing Fund (CCCCFF)
- Nebraska Department of Economic Development Community Development Assistance Act (CDAA)
- Nebraska Department of Economic Development Economic Development Certified Community
- Nebraska Department of Economic Development Enterprise Zones
- Nebraska Department of Environment and Energy Clean Water State Revolving Fund
- Nebraska Department of Environment and Energy Drinking Water State Revolving Loan Fund
- Nebraska Department of Environment and Energy Nonpoint Source Water Quality Grant
- Nebraska Department of Environment and Energy Source Water Protection Grant
- Nebraska Natural Resources Commission Water Sustainability Fund
- Nebraska Environmental Trust
- Nebraska Museums Association Disaster Relief Mini Grant
- Nebraska Tourism Commission Community Impact Grant Program

Federal resources that could potentially financially support the actions in the City of Lincoln FMMP Action Plan include:

- FEMA Hazard Mitigation Grant Program (HMGP)
- FEMA Building Resilient Infrastructure and Communities (BRIC)
- FEMA Flood Mitigation Assistance (FMA) Program
- FEMA Safeguarding Tomorrow Through Ongoing Risk Mitigation (STORM) Act
- FEMA Public Assistance (PA) Program
- FEMA Emergency Management Performance Grant (EMPG)
- FEMA Homeland Security Grant Program
- FEMA Rehabilitation of High Hazard Potential Dams (HHPD) Grant Program
- U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant (CDBG)
- Natural Resources Conservation Service (NRCS) Emergency Watershed Protection Program (EWPP)
- NRCS EWPP – Recovery Assistance
- NRCS EWPP – Floodplain Easement (EWPP-FPE)
- NRCS Environmental Quality Incentive Program (EQIP)
- NRCS Regional Conservation Partnership Program (RCPP)
- NRCS Watershed and Flood Prevention Operations (WFPO)
- United States Environmental Protection Agency (EPA) Environmental Justice Small Grants Program (EJSG)
- EPA Region 7 Healthy, Resilient, and Sustainable Materials Management Grant

City of Lincoln Flood Mitigation Master Plan

- EPA Water Infrastructure Finance and Innovation Act (WIFIA)
- Farm Service Agency Emergency Conservation Program (ECP)
- Federal Highway Administration (FHWA) Emergency Relief Program
- FHWA National Highway Performance Program
- FHWA Surface Transportation Block Grant Program
- FHWA Transportation Alternatives
- National Parks Service Historic Preservation Fund
- National Parks Service Land and Water Conservation Fund (LWCF)
- National Parks Service Paul Bruhn Historic Revitalization Grants Program
- National Parks Service Underrepresented Communities Grants Opportunity
- Small Business Administration (SBA) 504 Loan Program
- SBA 7(a) Loans
- SBA Community Development Block Grant Disaster Recovery Program
- SBA Microloan Program
- USACE Aquatic Ecosystem Restoration (Section 206)
- USACE Emergency Streambank and Shoreline Protection (Section 14)
- USACE Flood Damage Reduction (Section 205)
- USACE Flood Plain Management Services (FPMS)
- USACE Flood Risk Management Program (FRMP)
- USACE Levee Rehabilitation & Inspection Program (PL 84-99)
- USACE Levee Safety Program
- USACE Product Modifications for Improvement of the Environment (Section 1135)
- USACE Snagging and Clearing for Flood Risk Reduction (Section 208)
- United States Bureau of Reclamation (USBR) Animal and Plant Health Inspection Service
- USBR Applied Science Grant
- USBR BOR-CPN Water Conservation Field Services
- USBR Cooperative Watershed Management Program
- USBR Small-Scale Water Efficiency Projects
- USBR Title XVI – Water Reclamation and Reuse
- United States Department of Agriculture (USDA) Business and Industry Loan Guarantees
- USDA Community Facilities Direct Loan and Grant Program
- USDA Emergency Community Water Assistance Grants
- USDA Emergency Watershed Protection Program
- USDA Technical Assistance and Training for Innovative Regional Wastewater Treatment Solutions Grant Pilot Program
- USDA Water and Waste Disposal Loan and Grant Program
- USDA Water and Waste Disposal Loan Guarantees
- USDA Water and Waste Disposal Predevelopment Planning Grants
- United States Geological Survey (USGS) Groundwater and Streamflow Information Program
- USGS Partners for Fish and Wildlife Program
- USGS Water Use Data and Research Program

City of Lincoln Flood Mitigation Master Plan

Self-Assessment of Capability:

The table below is Lincoln’s estimated degree of capability in the three main capability categories that were included in the FMMP.

Table 4-4 City of Lincoln’s Overall Degree of Capability

Area	Limited	Moderate	High
Planning and Regulatory Capability			✓
Administrative and Technical Capability			✓
Fiscal Capability			✓

Ability to Expand on Existing Capabilities

The capabilities captured in the can be expanded upon with the proper influx of funds or personnel. Should additional local, state, or federal funding become available to specifically augment existing capabilities, then City would be able to improve their regulatory, administrative and technical, and financial capabilities to further flood mitigation. Additionally, as personnel turn over, they may be replaced with individuals with skillsets not captured in this plan. The City of Lincoln will continue to develop their capabilities over time and expand upon them where they are able.

Step 7, Draft an Action Plan

4.3 Review of Existing Activities

Existing activities related to floodplain management and flood risk reduction were inventoried and assessed to determine their effectiveness and any modifications to the activities that might be necessary or beneficial to city stakeholders. The results of this review are summarized in Table 4-5. For those activities where the city indicated a need for modification, the modification is discussed in the table and is carried forward as a potential action for consideration in Section 4.4.

City of Lincoln Flood Mitigation Master Plan

Table 4-5 City of Lincoln, NE Current Regulations, Policies, and Programs Related to Floodplain Management and Flood Risk Reduction

Type	Current Standard/methods	Purpose	Successful?	Keep in Place?	Modification Discussion	Goal Correlation
Education & Outreach	Websites Festivals and Events Flood Warning Systems Public Meetings	To increase understanding of floods and flood risk, city expenditures on flood mitigation and stormwater management	Yes	Yes	Events such as Waterfest have become difficult for the City to plan and run. The city would like to pursue increased involvement/attendance at other events for the purposes of flood/stormwater education and outreach.	1, 3
Floodplain Development Policies	standards that govern development in future urban areas (City of Lincoln ETJ)	ensuring that the action of one property owner does not adversely impact the flood risk (flood heights, velocities, discharges, erosion/sedimentation) on other properties.	Yes	Yes		1, 2
Floodplain Development Policies	requires projects anywhere in a 1%-annual-chance flood-prone area demonstrate no net rise in water surface elevation (no more than 0.05 foot).	To preserve flood conveyance along streams and drainageways	Yes	Yes		1, 2
Floodplain Development Policies	also called 'no net fill', this policy requires that an applicant demonstrate that the 50%, 10%, and 1% annual chance flows have not been altered downstream of the project, or that flood storage has not been altered.	To conserve the volume of flood storage available within the floodplain	Yes- but needs modification	Yes	current policy does not meet CRS requirements for 1.5:1	1, 2

City of Lincoln Flood Mitigation Master Plan

Type	Current Standard/methods	Purpose	Successful?	Keep in Place?	Modification Discussion	Goal Correlation
Floodplain Development Policies	a protected area equal to the channel bottom width + 60 feet +6 x channel depth. Development within this corridor is restricted to bank stabilization, road & trail crossings, utilities, and stormwater facilities.	To preserve the stream corridor and to minimize impacts to the stream channel and vegetation	Yes- but needs modification	Yes	The minimum corridor varies by stream, and In some instances, it may be necessary to consider looking at <i>Fluvial Hazard Zones</i> to ensure that the intent of the minimum corridor is being met on streams with these conditions. Incorporating FHZs would require additional field investigations, calculations, modeling, and mapping.	1, 2
Floodplain Development Policies	Developed to limit fill and preserve storage in the floodplain on the landward side of the Salt Creek Levees.	To limit fill in the floodplain on the landward side of the Salt Creek Levee System, which ultimately preserves floodplain storage and limits floodplain creep.	Yes	Yes		1, 2
Floodplain Development Policies	Development in or <u>adjacent to</u> FEMA-mapped SFHAs: 2-foot above BFE. Will revert back to 1-foot above BFE when FEMA-mapped SFHAs based on updated rainfall.	To provide additional flood protection for buildings and reduce flood losses in flood-prone areas	Yes	Yes		1, 2
Floodplain Development Policies	In most cases, the city requires a LOMC to remove a property or portion of a property from the floodplain	To provide increased review and protections for residential development	Yes	Yes		1, 2

City of Lincoln Flood Mitigation Master Plan

Type	Current Standard/methods	Purpose	Successful?	Keep in Place?	Modification Discussion	Goal Correlation
	prior to issuing a Building Permit.					
Floodplain Development Policies	Requires that any future development on the site removed from the floodplain by a LOMR must still comply with floodplain regulations.	To ensure future development is adequately protected from flooding	Yes	Yes		1, 2
Floodplain Development Policies	Required on preliminary and final plats	To ensure proper design and construction of proposed development	No	Yes	Additional internal education/coordination for review of final plat is necessary; external coordination to developers/applicants necessary to ensure finished floor elevations are included on final plat. Preliminary plat adjustments- must ensure that lowest floor and/or minimum opening tables are updated. Currently for LFE, require EC. For lowest opening, require affidavit. Both are required following as-built survey.	1, 2
Stormwater Policies	Proposed developments are required to detain peak runoff rates from the site for the 50%, 10% and 1%-annual-chance flood events such that the pre-	To reduce runoff and increase stormwater attenuation and storage, which affects water quality and flood hazards and improves ecosystems	Yes- but needs modification	Yes	Consider adding 25-year event	1, 2

City of Lincoln Flood Mitigation Master Plan

Type	Current Standard/methods	Purpose	Successful?	Keep in Place?	Modification Discussion	Goal Correlation
	development rates are maintained.					
Stormwater Policies	All new development/redevelopment provide on-site SWMBMPs to treat runoff.	Manages stormwater runoff from development sites to address water quality concerns by disconnecting impervious areas, providing vegetated features for retention, infiltration, and evapotranspiration, and slowing runoff to diminish downstream flooding potential.	Yes- but needs modification	Yes	Maintenance for BMP installations proves to be a challenge. May need to consider additional or different BMPs.	1, 2
Programs	Urban open space program with enhanced spaces using constructed wetlands and other measures. current parcels are deed restricted, conservation easements, etc.	Keeps infrastructure away from high-risk areas, relies on natural flood mitigating properties of floodplains	Yes- but needs modification	Yes	Add corridor enhancements as alternative BMPs. opportunities to enhance storage, system detention, etc.	1, 2, 4
Programs	Buyouts have historically been project-specific (for example, the Antelope Valley Project results in 46 residential/commercial buyouts).	One of the best ways to reduce or eliminate risk in flood-prone areas	Yes- but needs modification	Yes	Program can be enhanced/expanded to a voluntary program with dedicated funding source	1, 2, 3, 4

City of Lincoln Flood Mitigation Master Plan

Type	Current Standard/methods	Purpose	Successful?	Keep in Place?	Modification Discussion	Goal Correlation
Programs	Large-scale projects such as reservoirs, levees, and urban flood management projects aimed at reducing flood risk	To reduce flood risk at a large scale	Yes	Yes		1, 2, 3, 4
Programs	Master planning effort for all sub-basins affecting the City with project alternatives identified and publically-vetted	To right-size and prioritize flood mitigation projects for the city's sub-basins	Yes	Yes		1, 2, 3, 4

4.4 Review of Possible Strategies for Inclusion in the Action Plan

To ensure that a broad range of flood reduction projects were considered, the Planning Committee analyzed a comprehensive range of mitigation actions for each flood hazard after completion of the risk assessment. Actions that would prevent flooding from getting worse, maintain or restore natural floodplain function and reduce risk to new construction were selected for inclusion of the plan.

There are six categories of mitigation actions that the Planning Committee considered in developing the proposed project list. Those categories, as defined by the CRS Coordinator's Manual, include:

1. **Preventive:** Preventive activities keep flood problems from getting worse. The use and development of flood-prone areas is limited through planning, land acquisition, or regulation. They are usually administered by building, zoning, planning, and/or code enforcement officers. Examples of preventive activities can include: flood mapping and data, open space preservation, floodplain regulations, erosion setbacks, planning and zoning, stormwater management, drainage system maintenance, and building codes.
2. **Property Protection:** Property protection activities are usually undertaken by property owners on a building-by-building or parcel basis. Examples of property protection activities can include: relocation, acquisition, building elevation, retrofitting, sewer backup protection, and insurance.
3. **Natural Resource Protection:** Natural resource protection activities preserve or restore natural areas or the natural functions of floodplain and watershed areas. They are implemented by a variety of agencies, such as parks, recreation, or conservation agencies or organizations. Examples of natural resource protection activities can include: wetlands protection, erosion and sediment control, natural area preservation, natural area restoration, water quality improvement, coastal barrier protection, environmental corridors, and natural functions protection.
4. **Emergency Services:** Emergency services measures are taken during an emergency to minimize its impact. These measures are usually the responsibility of City or county emergency management staff and the owners or operators of major or critical facilities. Emergency services activities can include: hazard threat recognition, hazard warning, hazard response operations, critical facilities protection, health and safety maintenance, and post-disaster mitigation actions.
5. **Structural Projects:** Structural projects keep flood waters away from an area with a levee, reservoir, or other flood control measure. They are usually designed by engineers and managed or maintained by public works staff. Examples of structural project activities can include: reservoirs, levees/floodwalls, diversions, channel modifications, and storm drain improvements.
6. **Public Information:** Public information activities advise property owners, potential property owners, and visitors about the hazards, ways to protect people and property from the hazards, and the natural and beneficial functions of local floodplains. They are usually implemented by a public information office. Examples of public information activities can include: map information, outreach projects, real estate disclosure, library, technical assistance, and environmental education.

. Flood risk management and reduction activities being considered by the Planning Committee for advancement within this plan were reviewed and analyzed for applicability to the goals of the

plan, capability for the city to implement the strategy, and ability for the strategy to be funded. Actions were then selected for advancement to the Action Plan presented in Section 4.5 and further assessed for cost, cost-benefit, and prioritization. A table of all possible strategies being considered for advancement can be found in Appendix E.

Step 8, Draft an Action Plan

4.5 Action Plan

To begin the process of finalizing activities for the Action Plan, the Planning Committee reviewed the identified flood hazards that can occur in the City of Lincoln, the mitigation goals and objectives for the Flood Mitigation Master Plan, and the proposed activities identified in the meeting held in June. Based on the City of Lincoln's resources, flood hazards, and identified vulnerabilities, mitigation activities were selected from the list of possible strategies in Step 7 and advanced to the Action Plan.

4.5.1 Cost-Benefit and Action Prioritization

It's important to characterize each potential action by the ratio of project cost to the amount of risk reduction afforded by the project. FEMA typically refers to this ratio as a Benefit-Cost Ratio, or BCR. For the purposes of this flood mitigation plan, however, the benefit side of the ratio has been simplified according to the breakdown below in order to do planning-level estimates of projects to advance in the action plan. For projects that will be implemented using outside funding, additional and more-detailed Benefit-Cost Analyses (BCAs) will be performed. Cost-benefit values (high/medium/low) are further defined below.

High Cost-Benefit. Those projects which impact a large number of properties/stakeholders, especially community-wide projects. .

Medium Cost-Benefit. Those projects which impact groups of properties/stakeholders, such as neighborhoods and/or special districts.

Low Cost-Benefit. Those projects which impact a small number of properties/stakeholders, especially those projects targeted at individual properties.

Actions were prioritized for this plan using a combination of cost, cost-benefit, alignment with plan goals, alignment with CRS action categories, pros and cons for each action, resources and funding available for each action, community input/judgement. An emphasis was placed on those actions that had high cost-benefit and met more of the flood mitigation plan goals. The action plan activities are presented in Table 4-6.

City of Lincoln Flood Mitigation Master Plan

Table 4-6 City of Lincoln Flood Mitigation Master Plan Action Plan Activities

Action	Flood Reduction within Deadmans Run Watershed
Priority	HIGH
Activity Type	Structural Projects
Description	Implement projects to address flooding and drainage deficiencies, including channel improvements, within the Deadmans Run watershed. Areas include those identified in the Deadman's Run Watershed Master Plan, including University Place Park and 52 nd Street to 56 th Street
Hazard Addressed	Riverine/Urban Flooding
Estimated Cost	\$24,000,000*
Estimated Cost-Benefit	MEDIUM
Timeline	5-10 years
Funding Sources	USACE Section 205, FEMA HMGP, FEMA BRIC, City of Lincoln, LPSNRD
Lead Agency	LTU Watershed Management Division
Status	Alternatives Evaluation
Plan Goals Addressed	1,2,4

Action	Stormwater Drainage System Improvements
Priority	MEDIUM
Activity Type	Structural Projects
Description	Lincoln utilizes a stormwater system comprised of pipes and inlets as well as ditches and culverts. Stormwater system improvements may include pipe upsizing and additional inlets. Retention and detention facilities may also be implemented to decrease runoff rates while also decreasing the need for other stormwater system improvements. Other improvements may include ditch upsizing, ditch cleanout and culvert improvements. These improvements can serve to more effectively convey runoff within city, preventing interior localized flooding.
Hazard Addressed	Urban Flooding
Estimated Cost	\$100,000+
Estimated Cost-Benefit	MEDIUM
Timeline	Annually- project timelines differ
Funding Sources	Stormwater bonds, FEMA HMGP, FEMA BRIC, CDBG, City of Lincoln
Lead Agency	LTU Watershed Management Division
Status	Ongoing
Plan Goals Addressed	2

Action	Public Education on Flood Risk Reduction
Priority	HIGH

City of Lincoln Flood Mitigation Master Plan

Activity Type	Public Information
Description	Increase public awareness of vulnerability and risk reduction measures through hazard education
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	Minimal
Estimated Cost-Benefit	HIGH
Timeline	Annually
Funding Sources	General Obligation funds, LPSNRD, FEMAHMGP, FEMA BRIC
Lead Agency	LTU Watershed Management Division, LPSNRD
Status	Ongoing
Plan Goals Addressed	1, 3

Action	PIO Training
Priority	HIGH
Activity Type	Public Information
Description	Develop an offering for interagency Public Information Officer (PIO) training or similar
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	Minimal
Estimated Cost-Benefit	HIGH
Timeline	Annually
Funding Sources	City of Lincoln, LPSNRD
Lead Agency	LTU Communications, LTU Watershed Management Division, LPSNRD
Status	Not started
Plan Goals Addressed	3,4

Action	Enhanced Stakeholder Engagement
Priority	HIGH
Activity Type	Public Information
Description	To improve stakeholder engagement, create a contact list of communication staff members, identify existing outreach efforts of each agency, and coordinate those efforts
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	Minimal
Estimated Cost-Benefit	HIGH
Timeline	1 Year
Funding Sources	General Obligation funds, LPSNRD
Lead Agency	LTU Communications
Status	Ongoing
Plan Goals Addressed	3,4

City of Lincoln Flood Mitigation Master Plan

Action	Dam-related Flood Warning (911) Improvements
Priority	HIGH
Activity Type	Public Information
Description	Flood warning system
Hazard Addressed	Dam/Levee Failure
Estimated Cost	\$100,000
Estimated Cost-Benefit	HIGH
Timeline	TBD
Funding Sources	FEMA HMGP, FEMA BRIC, FEMA FMA, LPSNRD, City of Lincoln, Lancaster County
Lead Agency	City of Lincoln Emergency Management
Status	Not started
Plan Goals Addressed	1,2,3,4

Action	Repetitive Loss Structure/High Risk Property Plan and Implementation
Priority	LOW
Activity Type	Property Protection
Description	Develop a plan that recommends a best-fit approach for each repetitive loss area/structure as well as other identified high-risk properties in the City and then implement a project such as property acquisition, relocation, demolition, or elevation of the one existing repetitive loss structure located in the City
Hazard Addressed	Riverine/Urban Flooding
Estimated Cost	\$700,000 (fluctuates based on market)
Estimated Cost-Benefit	LOW
Timeline	TBD
Funding Sources	FEMA HMGP, FEMA BRIC, FEMA FMA, LPSNRD, City of Lincoln, Lancaster County
Lead Agency	LTU Watershed Management Division LPSNRD
Status	Not started
Plan Goals Addressed	2

Action	Develop and implement a Property Acquisition Program
Priority	HIGH
Activity Type	Property Protection
Description	More robust than targeted buyouts, an acquisition program would provide resources to homeowners that may want to sell (relocation assistance, etc), lay out a sustained source of funding through fees or taxes, and codify the buyout process for the city
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$200,000 program development; implementation is market-driven
Estimated Cost-Benefit	HIGH

City of Lincoln Flood Mitigation Master Plan

Timeline	TBD
Funding Sources	FEMA HMGP, FEMA BRIC, FEMA FMA, General Obligation Bonds
Lead Agency	LTU Watershed Management Division
Status	Planning stage
Plan Goals Addressed	1,2,3,4

Action	Develop and implement a Home Elevation Program
Priority	HIGH
Activity Type	Property Protection
Description	Another option for pursuing flood risk reduction is through the development and implementation of an elevation program to retrofit existing buildings such that they are elevated with their first floors above the anticipated flood height.
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$200,000 program development; \$100,000-\$300,000 per structure
Estimated Cost-Benefit	HIGH
Timeline	TBD
Funding Sources	FEMA HMGP, FEMA BRIC, FEMA FMA, General Obligation Bonds
Lead Agency	LTU Watershed Management Division
Status	Planning stage
Plan Goals Addressed	1,2,3,4

Action	Make updates to LID/Green Infrastructure/Local Detention Requirements
Priority	LOW
Activity Type	Property Protection
Description	Update existing policy to include local detention for the 25-year event; add green infrastructure options such as bioswales, rain gardens, pervious pavements, etc.
Hazard Addressed	Riverine/Urban Flooding
Estimated Cost	\$125,000
Estimated Cost-Benefit	MEDIUM
Timeline	TBD
Funding Sources	TBD
Lead Agency	LTU Watershed Management Division, LPSNRD
Status	Not started
Plan Goals Addressed	2

Action	Adopt community-wide No Adverse Impact Language
Priority	HIGH
Activity Type	Property Protection/Public Information

City of Lincoln Flood Mitigation Master Plan

Description	Current practice promotes NAI in New Growth Areas. Evaluate expanding the concept to be community-wide for all development types.
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$25,000
Estimated Cost-Benefit	HIGH
Timeline	Ongoing
Funding Sources	TBD
Lead Agency	LTU Watershed Management Division
Status	Not started
Plan Goals Addressed	1,2,3

Action	Investigate and Obtain Dam Failure Modeling/Mapping/Risk Assessment
Priority	HIGH
Activity Type	Preventative Activities/Emergency Services
Description	This information would include dam failure scenarios and risk assessment for non-federal dams to determine risk profile and vulnerability of existing development in these areas. The data should already exist from NEDNR so the effort is mostly coordination.
Hazard Addressed	Dam/Levee Failure
Estimated Cost	Minimal
Estimated Cost-Benefit	HIGH
Timeline	TBD
Funding Sources	TBD
Lead Agency	City of Lincoln Emergency Management
Status	Not started
Plan Goals Addressed	1,2,3,4

Action	Develop and Implement Stormwater/Wastewater Inflow and Infiltration Reduction Program
Priority	LOW
Activity Type	Preventative Activities
Description	Develop and implement a program to reduce inflow and infiltration of stormwater into the wastewater collection system.
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$500,000 program development; \$500,000 annual implementation
Estimated Cost-Benefit	HIGH
Timeline	Ongoing
Funding Sources	City of Lincoln Wastewater rate revenue
Lead Agency	LTU Wastewater Division
Status	Scope of work being developed

City of Lincoln Flood Mitigation Master Plan

Plan Goals Addressed	1
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Action	Future Conditions Flood Hazard Modeling and Mapping
Priority	HIGH
Activity Type	Preventative Activities
Description	Model and map future flood risk for inclusion in plans and projects and to manage floodplain development considering future conditions.
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$800,000
Estimated Cost-Benefit	HIGH
Timeline	5-8 years
Funding Sources	FEMA CTP
Lead Agency	LTU Watershed Management Division
Status	Work has started through floodplain remapping project
Plan Goals Addressed	1,2,3,4

Action	Update Compensatory Storage Code/Policy
Priority	LOW
Activity Type	Preventative Activities
Description	Update compensatory storage requirements/policy to meet CRS requirements in response to the Atlas 14 map updates
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$50,000
Estimated Cost-Benefit	HIGH
Timeline	TBD
Funding Sources	TBD
Lead Agency	LTU Watershed Management Division
Status	Not started
Plan Goals Addressed	2

Action	Update Final Plat Requirements Code/Policy
Priority	LOW
Activity Type	Preventative Activities
Description	Update Final Plat requirements for finished floor elevations to meet the future flood risk maps
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$50,000
Estimated Cost-Benefit	HIGH
Timeline	TBD
Funding Sources	TBD

City of Lincoln Flood Mitigation Master Plan

Lead Agency	LTU Watershed Management Division
Status	Not started
Plan Goals Addressed	1,2

Action	Fluvial Hazard Zone Mapping
Priority	HIGH
Activity Type	Preventative Activities
Description	Develop a map of fluvial hazards (erosion, deposition, channel evulsion and migration, debris), where they exist, to provide opportunity for additional land use and design standards to be implemented.
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$400,000
Estimated Cost-Benefit	HIGH
Timeline	TBD
Funding Sources	General Obligation funds, LPSNRD, FEMA CTP
Lead Agency	LTU Watershed Management Division
Status	Not started
Plan Goals Addressed	1,2,3,4

Action	Adopt Cluster Development Regulations
Priority	MEDIUM
Activity Type	Preventative Activities/Natural Resource Protection
Description	This project is a coordinated effort between Lincoln and Lancaster County planning departments to craft cluster subdivision regulations for new development. See Salt Creek Resiliency Study for more information.
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$100,000
Estimated Cost-Benefit	HIGH
Timeline	TBD
Funding Sources	TBD
Lead Agency	LTU Watershed Management Division
Status	Investigated as a part of the Salt Creek Resilience Study
Plan Goals Addressed	1,2

Action	Deed Restrictions for Current/Future Open Space Parcels
Priority	LOW
Activity Type	Natural Resource Protection
Description	Add legal restrictions to the property deeds such that current open parcels remain that way In perpetuity.
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure

City of Lincoln Flood Mitigation Master Plan

Estimated Cost	\$200,000
Estimated Cost-Benefit	MEDIUM
Timeline	TBD
Funding Sources	TBD
Lead Agency	LTU Watershed Management Division
Status	Not started
Plan Goals Addressed	2

Action	Adopt Native/Natural Vegetation Policy/Requirements
Priority	LOW
Activity Type	Natural Resource Protection
Description	Preservation of open space for flood attenuation purposes is enhanced with the use of native vegetation to store water and stabilize stream banks and floodplains
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$50,000
Estimated Cost-Benefit	LOW
Timeline	TBD
Funding Sources	TBD
Lead Agency	LTU Watershed Management Division
Status	Not started
Plan Goals Addressed	2

Action	Create Weather Radio Inventory/Replacement Program
Priority	MEDIUM
Activity Type	Emergency Services/Public Information
Description	Conduct an inventory of weather radios at schools and other critical facilities and provide new radios as needed.
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$25,000
Estimated Cost-Benefit	HIGH
Timeline	TBD
Funding Sources	HMGP, PDM, City of Lincoln, Lancaster County, LPSNRD
Lead Agency	City of Lincoln, Lancaster County Emergency Management
Status	On-going
Plan Goals Addressed	1,3,4

Action	Civil Service Improvements: Vehicles and Training
Priority	MEDIUM
Activity Type	Emergency Services

City of Lincoln Flood Mitigation Master Plan

Description	Improve Fire Department and Rescue squad equipment and facilities. Providing additional, or updating existing emergency response equipment; this could include fire trucks, ATV's, motor boats, etc. This would also include developing backup systems for emergency vehicles, and identifying and training additional personnel for emergency response.
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$200,000 annually
Estimated Cost-Benefit	HIGH
Timeline	TBD
Funding Sources	HGMP, City of Lincoln, Lancaster County, LPSNRD
Lead Agency	City of Lincoln, Lancaster County Emergency Management
Status	On-going
Plan Goals Addressed	1,4

Action	Update Emergency Action Plans for Transportation & Utilities Divisions
Priority	MEDIUM
Activity Type	Emergency Services
Description	Update emergency action plans for service divisions of Lincoln Transportation & Utilities. These plans would outline the response protocol employed during emergency events.
Hazard Addressed	Riverine/Urban Flooding and Dam/Levee Failure
Estimated Cost	\$80,000
Estimated Cost-Benefit	HIGH
Timeline	Ongoing
Funding Sources	City of Lincoln, Lancaster County
Lead Agency	City of Lincoln Department of Public Works
Status	In progress
Plan Goals Addressed	1,2,4

5 Plan Adoption and Maintenance

Adopting, implementing, evaluating and revising the plan is critical to its value and preserving the City's standing in the CRS program. This section details the following:

- Formal adoption of the plan by City Council.
- Method and schedule for monitoring, evaluating, and updating the floodplain management plan over a 5-year cycle.
- Process for the community to continue to participate in the plan maintenance process.
- Process for the City to incorporate floodplain management requirements into other planning mechanisms, such as general or capital improvement plans, when appropriate.

Step 9, Adopt the plan

5.1 Plan Adoption

This section documents formal adoption of the plan by the City of Lincoln City Council. A copy of the adoption resolution is provided in Appendix A [To be added upon adoption].

Step 10, Implement, Evaluate, and Revise

5.2 Plan Implementation, Evaluation, and Revision

The Action Plan is a framework for guiding implementation of flood risk reduction activities over a 5-year period. The effectiveness of the plan and preservation of CRS standing is dependent upon implementation.

The City of Lincoln Planning Committee will lead plan implementation, monitoring, evaluation and updating efforts. It will coordinate maintenance efforts and solicit input from County-wide representatives and other important stakeholders. The Committee will oversee the progress made on the implementation of action items and modify actions, as needed, to reflect changing conditions. The committee will meet bi-annually to evaluate the plan and discuss specific coordination efforts that may be needed.

Each year, the Planning Committee will evaluate both progress on floodplain management actions and the effectiveness of those actions in reducing losses in an Annual Evaluation Report. A review of the qualitative and quantitative benefits and/or avoided losses of activities will support this assessment. The evaluation will then be compared to the goals and objectives established in the plan. The committee will then decide if any actions should be discontinued or modified.

Progress will be documented by the Planning Committee for use in the Floodplain Management Master Plan update. Finally, the committee will monitor and incorporate elements of this Plan into other planning mechanisms.

5.3 Plan Update

This Plan will be updated on a 5-year cycle from the date of its adoption. The plan is due by October 1, five years after the plan was adopted. Plan updates will account for any new flood vulnerabilities, special circumstances, or new information that becomes available. The hazard and problem assessments will be reviewed and updated. The assessments will account for:

City of Lincoln Flood Mitigation Master Plan

- New data, including new floodplain or hazard maps
- Annexation of flood-prone properties
- Additional repetitive loss properties
- Completed and planned mitigation and flood control projects
- Changes in development and land use in the floodplain and watershed
- Maintenance issues regarding flood control projects
- Major floods or other disasters that have occurred in the previous five years
- Any other relevant changes in flooding conditions and/or development

City of Lincoln Flood Mitigation Master
Plan

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6 References

[To be completed following finalization of FMMP]



City of Lincoln Flood Mitigation Master
Plan

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Appendix A – Adoption Resolution

City of Lincoln Flood Mitigation Master
Plan

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City of Lincoln Flood Mitigation Master
Plan

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Appendix B – Planning Process Documentation

City of Lincoln Flood Mitigation Master Plan



LINCOLN FLOOD MITIGATION
MASTER PLAN



Welcome!

Lincoln Flood Mitigation Master Plan
Planning Committee Meeting

August 5, 2021

Lower Platte South
Natural Resource District

PLANNING COMMITTEE MEETING OVERVIEW

- Community Rating System Overview (CRS)
- The purpose of the Planning Committee
- Hazard mitigation activities
- Hazard problems and possible solutions
- Planning process
- Future Schedule

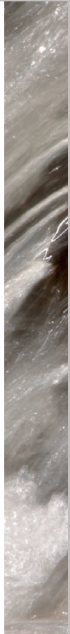
COMMUNITY RATING SYSTEM

- The City of Lincoln participates in the Community Rating System, a program that rewards efforts to reduce flood risk by lowering flood insurance rates for residents and businesses.
- The City can earn points toward lower rates from the planning process. Carrying out the projects that will be identified in the plan can assist with lowering rates even further in the future.
- Lower rates make it easier for Lincoln residents to get and keep flood insurance on their properties.

PHASE I – PLANNING PROCESS		
1	Organize	15
2	Involve the public	120
3	Coordinate	35
PHASE II – RISK ASSESSMENT		
4	Assess the hazard	35
5	Assess the problem	52
PHASE III – MITIGATION STRATEGY		
6	Set goals	2
7	Review possible activities	35
8	Draft an action plan	60
9	Adopt the plan	2
10	Implement, evaluate, revise	26

PURPOSE

- To provide an overall hazard mitigation plan related to flooding for the City of Lincoln
- This plan will be an extension of the 2020 Lower Platte South National Resources District Multi-Jurisdictional Hazard Mitigation Plan
- Enable Lincoln to potentially move up one or more CRS classifications for the benefit of those who carry flood insurance in the city
- The committee will provide an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities to be involved in the planning process



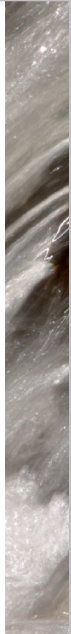
HAZARD MITIGATION ACTIVITIES

- Preventative Activities
- Property Protection
- Natural Resources Protection
- Emergency Services
- Structural Projects
- Public Information

PROBLEMS & POSSIBLE SOLUTIONS

Lincoln has always been at the national forefront of floodplain management. The goal of this project and plan is to identify and assess areas with critical structures at risk. As a result, this will reduce the long-term risk to human life, property and the environment.

POTENTIAL SOLUTIONS						
Higher Floodplain Regulatory Standards	Riparian Preservation	Floodplain Remapping	Voluntary Buyout Pilot Program	Cluster Subdivisions	Overlay Zoning	Low Impact Development Regulations



PLANNING PROCESS/SCHEDULE

Task	Purpose	Tentative Completion Date
Planning Committee Meeting	Project Kickoff	August 2021
Public Meeting #1	Obtain public input on hazards, problems and possible solutions	August 2021
Planning Committee Meeting #2	Assess Hazards	October 2021
Planning Committee Meeting #3	Assess Problems	October 2021
Planning Committee Meeting #4	Set Goals	November 2021
Planning Committee Meeting #5	Review Possible Activities	January 2022
Planning Committee Meeting #6	Draft Action Plan	March 2022
Public Meeting #2	Provide Input on Draft Action Plan	April 2022
Submit Plan for Adoption		June 2022
Project Closeout		July 2022

*VIRTUAL PUBLIC OUTREACH ACTIVITIES: brochures, mailers, public webcast, questionnaire

City of Lincoln Flood Mitigation Master Plan



Lincoln Flood Mitigation Master Plan Advisory Committee Meeting

Name	Organization	Meeting #1	Meeting #2	Meeting #3	Meeting #4	Meeting #5	Meeting #6
Ben Higgins	Watershed Management	BH					
Mike Middendorf	Watershed Management	MM					
Rachel Christopher	Planning	RC					
Terry Kathe	Building and Safety	TK					
Tracy Zayac	Lower Platte South NRD	TZ					
Mark Hosking	Emergency Management						
Erika Hill	Public Information Officer	zoom					
Grant Daily	South Salt Creek Community Organization	zoom					
Tim Zach	Watershed Mgmt.	zoom					



MINUTES

DATE:	August 5, 2021, 2:30 pm
LOCATION:	Lower Platte South Natural Resource District; Zoom

Planning Committee Kickoff Meeting

- **Welcome / Sign-in**
- **Group Introductions (see sign in sheet)**
- **Presentation (see attached)**
 - Community Rating System (CRS)
 - Project Purpose
 - Hazard Mitigation Activities
 - Problems and Possible Solutions
 - Planning Process and Upcoming Schedule
 - Two additional current Watershed Management projects – the Comprehensive Watershed Plan and Salt Creek Floodplain Resiliency Task Force – were noted.
 - Closing Comments
- **Final Questions / Debrief**
 - The group discussed the upcoming public meeting and the need for meaningful information to continue to educate and engage the public. Topics should include history of flooding / flood reduction projects (like Antelope Valley), flood risk



solutions and flood insurance, along with the CRS program structure and schedule.

- Public outreach materials as part of the CRS program to be released at the time of the public meeting include a program brochure, public webcast (if time allows), and a questionnaire / online survey.
- A meeting invite will be developed and distributed to a list of contacts developed by the Planning Committee. This email would also include information about the project and a link to the project website. Distribution list will include:
 - Developer / engineers
 - Realtors Association
 - Chamber of Commerce
 - Community and Cultural Centers
 - Neighborhood and Homeowners Associations
- A social media campaign modeled after Papio NRD's "Would You Rather" campaign. Erika Hill would help promote the project page and public meeting through Lincoln Transportation and Utilities' social media channels.
- It is important to provide translated information to non-English speaking communities about the importance of this project and process.
- Target meeting date of Thursday, September 2, time and location TBD. Jayne Snyder Trails Center was suggested as a possible venue.
- The next Planning Committee meeting is anticipated to be held in September 2021.



MINUTES

DATE:	October 21, 2021, 10:00am
LOCATION:	Zoom

Planning Committee Meeting – October

- **Welcome**
- **Group Introductions (see sign in sheet)**
- **Agenda**
 - Introductions and goals of the meeting
 - Review of the CRS process and the hazard mitigation plan
 - Hazard discussion
 - Previous planning processes
 - Required plan components
 - Problem discussion
 - Problem versus hazard
 - Next steps, schedule, closing comments
- **Purpose**
 - The goal of today's meeting is to discuss the hazards and problems (impacts) and include them in the hazard mitigation plan for the CRS submittal.
- **Review**
 - Michael Baker has reviewed some of the documents that have been submitted to Olsson and included in the completed Hazard Mitigation plan.



- The Hazard Mitigation Plan has since been accepted and applied in Lincoln.
 - Are there individuals who were apart of that process that are not included in the Planning Committee?
 - Yes. Folks from emergency services, Parks, schools, villages, municipalities, and other representatives from agencies impacted by an all-hazards mitigation plan.
 - The Hazard Mitigation plan was more project-focused and didn't go into detail in terms of localized flooding. More high-level.
 - As we go through the process, there should be a greater focus on how we can help people in the event of a flood. Is there a better way to do things?
 - Being able to coordinate with LTU and other agencies will be a big advantage should another flood, like 2015, occur.
 - A lot of the decision-making process for the 2015 flood happened behind closed doors. Having a go-to process to better serve the community in the event of a flood and achieving more Community Rating points will be extremely beneficial for Lincoln.
 - Lincoln has done a lot of planning and the goal with this plan is put together an all-encompassing document to help alleviate flooding and plan.
- **Hazards**
 - Since a Hazard Mitigation Plan has recently been completed, we will be able to refer to the document in the submittal to CRS.



- Hazard Considerations:
 - *Map of known flood hazards*
 - *Description of known flood hazards (pluvial and fluvial)*
 - *Discussion of past floods*
 - *Assessment of less frequent flood hazards*
 - *Assessment of areas likely to flood*
- Is the list of the known flood areas up to date in the Hazard Mitigation Plan?
 - Tracey did follow-up and ask if there were additional areas of flooding and didn't have any new areas for that list.
- The Climate Change Plan will also be a good resource for future needs and future hazards
- Are there other less frequent flood hazards such as ice jam flooding or anything of the sort?
 - That tends to happen on the Platte River and dams tend to alleviate the ice jam flooding. In Nebraska, dams are used as flood control structures. The City has been running into old dams while building out into more agricultural areas. Developers have refurbished them as needed per request of the City.
- High hazard flooding maps are not shared with the public.
- The areas that are likely to flood are listed in the Hazard Mitigation Plan. However, there are sub-area maps of urban flooding that look at very localized flooding.



- Ronda shared a spreadsheet of the data and information that has been collected after reviewing information from previously compiled documents/reports.
- The Emergency Management Plan includes: warning sirens throughout the city/county, public warning system, etc.
- What is shared (and how much is shared) in the plan is entirely up to the City/community. The plan can be solution-focused and how much work has already been done before compiling this plan.
- Critical facilities and infrastructure have already been documented in pre-existing reports.
- **Problems (Impacts)**
 - Most possible impacts have been documented in throughout other pre-existing plans.
 - We will need to provide the number of impacted buildings within the floodplain. This will come from the Residential Land Inventory Report.
 - Tam at LTU is running the footprint in the GIS system for the floodplain and it is consistently updated.
 - The City has an interactive flood map on the website that can be referenced in the plan.



o Problem Considerations:

- *Warning and evacuation*
- *Life safety and health considerations (during and after flooding)*
- *Critical facilities and infrastructure*
- *Flood impacts on economy and tax base*
- *Number and type of affected buildings*
- *Future impact considerations*
- *Past damage and flood insurance claims*
- *Areas that provide natural floodplain functions*
- *Development/redevelopment trends*
- *Future flood conditions*

• Deliverables/Follow-Up

- o The following individuals will have been requested to provide documents/resources/materials to Michael Baker for the CRS submittal:
 - Ben and Mark will follow-up with one another to discuss what
 - Ronda will follow-up with examples of other city's plans
 - Katie will send Ben the correct FEMA form for claim data
 - Tracy will send Brian the Salt Creek Flood Warning Program
 - Ben will send Ronda the interactive flood map from the website



- **Next Steps**

- Meeting invites have been sent out for the Planning Committee meeting for November. The primary topic of discussion for the upcoming meeting will be setting and organizing "goals" for the hazard mitigation plan.
- Meeting adjourned.



LINCOLN FLOOD MITIGATION MASTER PLAN



Welcome

- Where we are in the process
- Goals for the meeting
 - Review new data
 - Identify interagency priorities



New Data

- Hazus Report
- Hazard Assessment Report
- Survey Results



Current Conditions - All
100y Flood



Direct Economic Losses for User Defined Facilities



Monday, December 6, 2021

Specific Occupancy	Capital Stock Exposure		Capital Stock Losses				Loss Ratio	
	Building Exposure	Contents Exposure	Building Loss	Contents Loss	Inventory Loss	TOTAL Loss	Buildings %	Contents %
REL1-Churches and Other Non-profit Org.	12,238,700	12,238,700	1,168,439	7,980,772	0	9,149,210	9.5	65.2
RES3A-Duplex	18,242,200	9,121,100	5,202,412	3,231,361	0	8,433,773	28.5	35.4
EDU1-Grade Schools	11,951,750	11,951,750	1,172,823	7,991,831	0	9,164,654	9.8	66.9
IND1-Heavy	280,076,800	420,115,200	51,923,841	153,559,822	43,927,057	249,410,720	18.5	36.6
RES2-Manuf. Housing	692,575,700	346,287,850	440,047,888	186,030,485	0	626,078,373	63.5	53.7
COM1-Retail Trade	2,496,165,387	2,496,165,387	417,469,245	1,429,219,286	52,119,354	1,898,807,885	16.7	57.3
RES1-Single Family Dwelling	320,208,152	160,104,076	123,940,881	68,872,572	0	192,813,453	38.7	43.0
RES4-Temporary Lodging	12,207,100	6,103,550	607,700	1,121,902	0	1,729,602	5.0	18.4
Scenario Total	3,843,665,789	3,462,087,613	1,041,533,228	1,858,008,032	96,046,411	2,995,587,670.77	23.796	47.054
Salt Creek 100y (85%)	3.38	2.98						

City of Lincoln Flood Mitigation Master Plan



Future Conditions - Salt Creek 100y Flood



Direct Economic Losses for User Defined Facilities



Monday, December 6, 2021

Specific Occupancy	Capital Stock Exposure		Capital Stock Losses				Loss Ratio	
	Building Exposure	Contents Exposure	Building Loss	Contents Loss	Inventory Loss	TOTAL Loss	Buildings %	Contents %
REL1-Churches and Other Non-profit Org.	14,706,700	14,706,700	652,897	4,694,397	0	5,347,294	4.4	31.9
RES3A-Duplex	14,843,400	7,421,700	3,496,788	2,221,224	0	5,718,012	23.6	29.9
EDU1-Grade Schools	11,951,750	11,951,750	899,471	5,088,853	0	5,988,324	7.5	42.6
IND1-Heavy	205,213,200	307,819,800	24,683,169	75,776,201	21,497,220	121,956,590	12.0	24.6
RES2-Manuf. Housing	385,044,900	192,522,450	235,948,981	96,213,800	0	332,162,781	61.3	50.0
COM1-Retail Trade	2,265,323,008	2,265,323,008	191,411,177	611,873,779	23,366,355	826,651,311	8.4	27.0
RES1-Single Family Dwelling	381,777,939	190,888,970	104,357,650	59,176,337	0	163,533,987	27.3	31.0
RES4-Temporary Lodging	5,734,100	2,867,050	89,914	177,987	0	267,901	1.6	6.2
Scenario Total	3,284,594,997	2,993,501,427	561,540,047	855,222,577	44,863,576	1,461,626,199.67	18.273	30.405
Salt Creek 100y (85%)	3.3B	2.9B	885M	1.5B	81M	2.5B		

Hazard Assessment Report

- Brings together data from multiple sources
- Analyzes future trends
- Limitations: Dams and Levees

Hazard Mitigation Plan

1. Dam
2. Drought
3. Flood
4. Levee
5. Thunderstorms
6. Winter storms
7. Tornadoes

Survey Responses

- Recognized the complexity of the flood problem
- Favored long-term mitigation over short-term fixes
- Positive view of greenspace and green infrastructure
- Prioritized improving quality of life for residents

Step 6: Set Goals

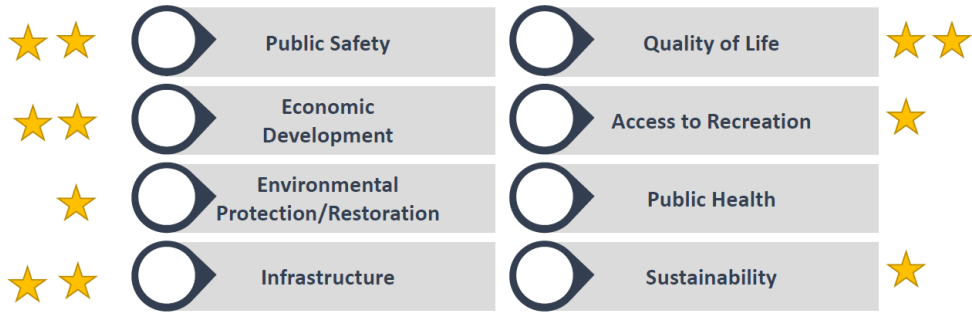
Agency Goals

- What is your organization's primary role related to flooding?

EM	<input type="radio"/>	Life Safety	<input type="radio"/>	Social Impacts	City, Planning
NRD, Planning, FPM	<input type="radio"/>	Property Protection	<input type="radio"/>	Risk Reduction	City, EM, FPM
FPM	<input type="radio"/>	Environmental Protection	<input type="radio"/>	Public Education	
NRD	<input type="radio"/>	Infrastructure Management	<input type="radio"/>	Other?	

Community Goals

- What are the priorities in Lincoln?



Interagency Goals

- Where do your risk reduction projects come from?
- Who are you working with?
- Where can priorities be aligned?

Interagency Goals

- How can risk reduction goals align with other community priorities?

Next Steps

- Set goals
- Review and prioritize activities (creating crossovers in project streams)



City of Lincoln Flood Mitigation Master Plan





MINUTES

DATE:	February 22, 2022, 10:00am – 11 am
LOCATION:	Zoom
ATTENDEES:	Haley Engstrom, Ronda Nowak, Erika Hill, Mike Middendorf, Adele Phillips, Andrew Friend, Mark Hosking, Rachel Christopher, Terry Kathe, Tim Zach, Tracy Zayac

Planning Committee Meeting – February

Welcome/Housekeeping

Identifying Community and Agency Priorities

- While the City of Lincoln has a wide range of priorities across its departments, the Mayor's office stresses the importance of public safety, economic development and sustainability.
- The agencies on the Planning Team have responsibilities for life safety, property protection, environmental protection, infrastructure management, management of the social impacts of risk, and risk reduction.
- The stakeholder survey identified access to recreation and quality of life as important priorities. Green space around rivers was the most commonly mentioned solution by participants. They expressed appreciation for both the recreation and risk reduction benefits of this approach.
- Representatives from each agency took turns stating their own agency and the overarching themes that are implemented from the Mayor's office.

Aligning Priorities

- Risk reduction projects that impact Lincoln may develop through different processes. Projects are identified through planning processes, such as:
 - Hazard Mitigation Plan
 - Climate Action Plan
 - Watershed Master Plan
 - Transportation plans



- Urban drainage studies
- Other projects may be developed in reaction to a specific problem, such as flooding on the Salt Creek. Reactionary projects may be developed or may be part of a longer planning process.
- These planning processes typically involve different mixes of agencies, and have different funding streams. However, more holistic planning does occur across sectors. For example, transportation planning is informed by flood control project planning. [Question for the group: What is the mechanism for this?]
- The mayor's priorities of public safety, economic development and sustainability have also acted as unifiers across processes. For example, sustainability is widely considered in projects, regardless of which planning stream generates the project.

Examples of Holistic Planning

- Holistic planning can create co-benefits. This is demonstrated in the greenspace program recognized by survey participants. Greenspace along rivers reduces risk by removing structures that might be damaged, but also by increasing floodwater storage. Increased floodwater storage has the potential to reduce damage to structures that remain in the floodplain. Risk reduction benefits increase when large, contiguous areas of greenspace are created. These large, contiguous areas of greenspace can reduce stormwater flooding by improving absorption of precipitation. Naturalized greenspace can improve habitat and water quality and can provide recreational opportunities that are linked to health benefits. The choices that communities make when planning projects determine the level of co-benefits that will be created.
- *This holistic approach to planning can also increase access to funding streams and may increase public support for risk reduction projects.*
- [Question for the group: Are there any opportunities for this style of planning in Lincoln?]



Next Steps

- Haley will send out a meeting poll/invites have been sent out to the Planning Committee meeting for April. The primary topic of discussion for the upcoming meeting will be how to incorporate and apply agency priorities to activities.
 - Meeting adjourned.



LINCOLN FLOOD MITIGATION MASTER PLAN



Welcome

- Where we are in the process
- Goals for the meeting
 - Review new data
 - Identify interagency goals



New Data

- Hazus Report
- Hazard Assessment Report



Hazard Assessment Report

- Brings together data from multiple sources
- Analyzes future trends
- Limitations: Dams and Levees



Step 6: Set Goals















Project Streams

- Hazard mitigation plan
- Climate action plan
- Watershed master plan
- Transportation plans
- Urban drainage studies
- Departmental/organizational response to problems

Agency Goals

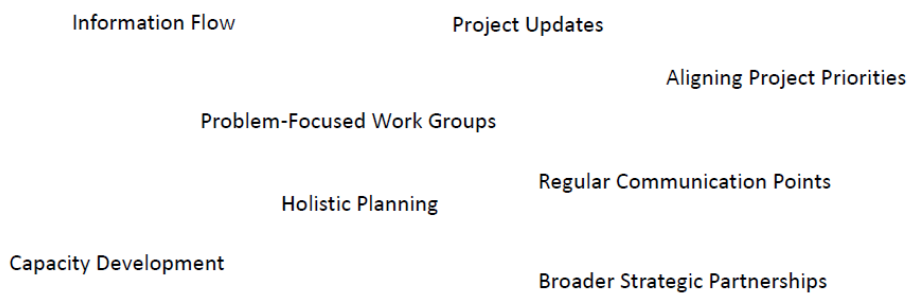
	EM	NRD	Planning	FPM	City
 Life Safety	X				
 Property Protection		X	X	X	
 Environmental Protection				X	
 Infrastructure Management		X			
 Social Impacts			X		X
 Risk Reduction	X			X	X

Community Goals

  Public Safety	 Environmental Protection/Restoration 
  Economic Development	 Access to Recreation 
  Quality of Life	 Sustainability 
  Infrastructure	

Goal Setting

- How can this group work together to reduce flood risk in Lincoln?



Step 7: Activities

Types of Projects

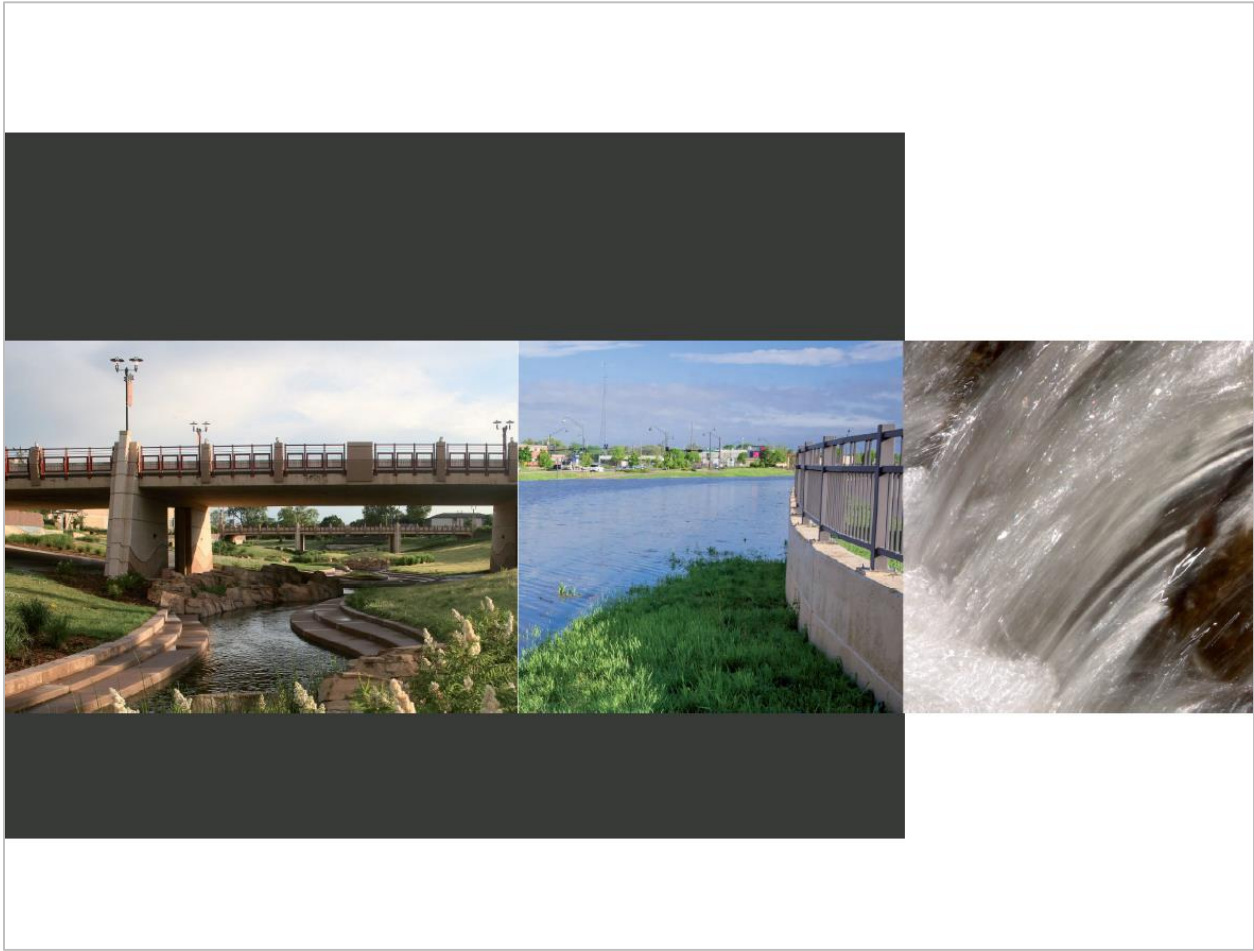
- Hazard assessment
- Mapping and flood data
- Managing new development
- Reducing losses to existing development
- Natural floodplain functions
- Threatened or endangered species
- Emergency preparedness and response
- Public information

Next Steps

- Finalize possible activities list
- Review draft plan
- Hold final public meeting
- Adopt plan



City of Lincoln Flood Mitigation Master Plan





Planning Committee Meeting

April 19, 2022

Attendees: Tim Zach, Mike Middendorf, Mark Hosking, Carter Hubbard, Tracy Zayac, Erika Hill, Adele Phillips, Stacey Roach, Ronda Nowak, Andrew Friend

Planning Team Goals and Objectives

The goal of the Planning Team is to reduce flood risk in Lincoln by strengthening relationships between organizations with a role in flood risk reduction, and by providing opportunities for organizations to work together toward their shared goals.

Recommended objectives:

1. **Align organizational priorities through existing planning efforts (hazard mitigation plan, watershed master plan, etc.**
 - a. Identify current planning efforts and timelines for each.
 - b. Include additional stakeholders in each planning process.
 - c. Include a discussion of other planning efforts, their priorities, and areas of common interest in each planning process.
 - d. Agencies communicate on a more regular basis and focus on enhancing the flow of information and project updates.
 - e. Potentially include agencies/individuals of other disciplines (roadway, environmental, etc.) when discussing upcoming projects. This could help create better opportunities and relationships and could increase chances of success.

2. **Integrate public outreach efforts**
 - a. Provide opportunities for social media leads for each organization to connect.
 - b. Increase capacity for risk communication by offering interagency Public Information Officer training.
 - c. Invite communication staff members for each agency to participate in CRS outreach planning team.
 - d. Highlight or publicize successful projects happening in Lincoln and bring awareness to the benefits of past improvement projects in the event of flooding.



3. Explore funding partnerships

- a. Jointly lobby for a wider range of projects to be funded by the state STAR WARS program.
- b. Discuss opportunities to cross fund projects with co-benefits for multiple organizations.



**Planning Committee Meeting #6:
Project Identification and Prioritization**

Agenda
June 30, 2022

1. Master Plan document status update
2. Review of comprehensive goals
 - Action items
3. Project discussion
 - Existing, identified and future projects
 - Project pros and cons
 - Responsibility, timeline, and funding
4. Next steps
5. Problem discussion
 - a. Problem versus hazard
6. Next steps



MINUTES

DATE:	June 30, 2022, 10:30 am
LOCATION:	Olsson; Zoom
ATTENDEES	Tim Zach, Mark Hosking, Carter Hubbard, Tracy Zayac, Erika Hill, Mark Lindermann, Ronda Nowak, Terry Kathe, Rachel Christopher, David Potter, Deanna Ringenberg, Haley Engstrom, Stacey Roach, Ryan (Michael Baker)

Planning Committee Meeting

- Welcome
- Introductions
- Master Plan document status update
 - Ronda gave the group an update regarding the Master Plan and where the project team was at in the process.
 - The City has reviewed the draft document and has provided feedback to Michael Baker.
 - Michael Baker and the City will meet next week to discuss the document, pending questions and schedule.
 - Once comment from the City are incorporated, the draft plan will be shared with the committee.
- Review of comprehensive goals
 - The group reviewed and gave feedback on the [list of goals and action items](#) that the committee compiled during the planning committee meeting in April.
 - Erika Hill suggested that the overall goal in the document should explain why the City has formed this committee to help inform the public of the possible benefits/efficiency that could stem from the group/Master Plan.



- Other members of the committee suggested adding/editing the list of goals and objectives.
- Mark Hosking informed the group of the crisis training process through FEMA.
- Ronda to send out revised document with goals and action items for review and further input by the committee.
- **Project discussion**
 - Potentially looking at projects that could involve the community when it comes to reducing flood risk.
 - Some of these activities and projects are in the Salt Creek Resiliency study.
 - Ronda to send the project list to identify pros and cons for committee review and input.
- **Final Questions / Debrief**
 - The group discussed the upcoming schedule, including the next committee meeting, public meeting, adoption of the plan and action items.

Coronavirus (COVID-19) Updates

[Get information about City of Lincoln Services and Operations \(https://app.lincoln.ne.gov/city/covid19/\).](https://app.lincoln.ne.gov/city/covid19/)

COVID-19 Vaccine Registration and Scheduling

[Sign up and schedule your appointment \(https://app.lincoln.ne.gov/asp/city/covidvac/default.aspx?passcode=4044e935631945448f7110a939f65fc8\).](https://app.lincoln.ne.gov/asp/city/covidvac/default.aspx?passcode=4044e935631945448f7110a939f65fc8)



Home (<https://www.lincoln.ne.gov/Home>) / City Information (<https://www.lincoln.ne.gov/City>) / Departments (<https://www.lincoln.ne.gov/City/Departments>) / Transportation and Utilities (<https://www.lincoln.ne.gov/City/Departments/LTU>) / LTU Projects (<https://www.lincoln.ne.gov/City/Departments/LTU/LTU-Projects>) / Watershed Management Projects (<https://www.lincoln.ne.gov/City/Departments/LTU/LTU-Projects/WSM>) / **Flood Mitigation Master Plan**

Flood Mitigation Master Plan

The City of Lincoln is always looking for ways to reduce flood risk. The Flood Mitigation Master Plan is just one of several initiatives that focuses on flood risk reduction measures that will reduce damage to homes, businesses, and infrastructure in future flood events. Each initiative has a different area of focus, but all have the same goal: **A safer Lincoln.**

The plan will help identify ways that the city can reduce flood risk for residents and businesses. This plan builds on the [2020 Lower Platte South Natural Resources District Multi-Jurisdictional Hazard Mitigation Plan \(https://jeo.com/psnrdhmp\)](https://jeo.com/psnrdhmp), and it will be created following guidelines

outlined in FEMA's Community Rating System (CRS). The City is already enrolled in the CRS as a Class 5 community. Participating in the program has reduced flood insurance rates for businesses and residents by 25%.

The Flood Mitigation Master Plan will assess risk and identify actions that can reduce long term flood risk to human life, local properties, and the environment. Through the planning process, the City of Lincoln will promote public awareness of flood hazards and the community's response to flooding. To assist with the identification of flood hazards and mitigation opportunities, the City and project partners are seeking technical assistance from the community, and state and federal agencies.



PUBLIC INVOLVEMENT

We are committed to involving the public in this process in meaningful ways, and to developing materials and engagement strategies that will best meet the needs of the community and the individuals that are impacted by flooding.



The Planning Team will be led by the City of Lincoln with support from the Lower Platte South Natural Resources District. The team will meet six times over the course of a year.



There will be at least two public meetings held at locations within the floodplain, as well as other outreach efforts, such as webcasts, mailings, and surveys.

SCHEDULE

All dates are subject to change.

August 2021



Planning Committee Meeting #1

Project Kickoff


August 5, 2021, 2 p.m.

September 2021

Public Meeting #1

Provide Input on Hazards, Problems and Possible Solutions

September 7, 2021, 6 p.m.

Watch Recorded Meeting (<https://youtube.com/watch?v=O2Wllk2WdYM>) 

Meeting materials:

[Invitation \(/files/sharedassets/public/ltu/projects/wsm/flood-mitigation/20210907- invita](#)

[Fact Sheet \(/files/sharedassets/public/ltu/projects/wsm/flood-mitigation/20210907-fact-](#)

October 2021

Planning Committee Meeting #2

Assess Hazards

Planning Committee Meeting #3

Assess Problems

November 2021

Planning Committee Meeting #4

Set Goals

January 2022

Planning Committee Meeting #5

Review Possible Activities

March 2022

Planning Committee Meeting #6

Draft Action Plan

April 2022

Public Meeting #2

Provide Input on Draft Action Plan

June 2022

Submit Plan for Adoption

Project Contacts

**Mike Middendorf,
Project Manager**

City of Lincoln

mmiddendorf@lincoln.ne.gov (<mailto:mmiddendorf@lincoln.ne.gov>).

**Andrew Friend,
Project Manager**

Michael Baker International

afriend@mbakerintl.com (<mailto:afriend@mbakerintl.com>).

City of Lincoln Flood Mitigation Master Plan

Q1 redacted to protect personally identifiable information.

Q2 Tell us about the impacts flooding has on your business/organization/home/community:

Answered: 13 Skipped: 1

#	RESPONSES	DATE
1	I have had no impacts up to this point. However, I have met many people who have had their homes destroyed or needed to evacuate from their homes. I do live next to an area where flood water can go if needed, which makes me a little nervous that more intense rain storms will be in our long-term future.	9/7/2021 6:43 PM
2	We are working with the City on a responsible sustainable floodplain development. Our plan removes development out of the floodplain, thereby providing a safe harbor against flooding.	9/7/2021 1:16 PM
3	Beal slough is out of its banks with only one inch of rain at my property due to too small of retention ponds south of me	9/4/2021 3:31 PM
4	Occasional water in basement	9/2/2021 1:24 PM
5	flooding and the threat of flooding is a significant concern for me due to potential impacts to the community, businesses, and community members.	9/2/2021 1:06 PM
6	Whenever we get more than an inch of rain, our backyard turns into a pond! The North side of the Mopaq trail from 30th to 27th floods on a very regular basis!	8/30/2021 8:19 PM
7	My community: Flood impacts access to safe drinking water. I have not personally experienced other impacts.	8/30/2021 6:15 PM
8	Our business was flooded with massive damage during the last flood.	8/30/2021 3:55 PM
9	Severe impacts several years ago	8/30/2021 3:27 PM
10	I saw how flooding completely shut down (never to return) communities in 1993 in Missouri. I recall the structural damage left to homes that made them simply unlivable.	8/30/2021 2:05 PM
11	Personally - As a new homeowner, flood risk was a major factor in buying a house. I intentionally avoided locations where flooding could be a factor, even though that ruled out some areas I may have wanted to live with lower cost and closer to downtown. Professionally - I am concerned about the flood impacts that are disproportionately felt by low-income residents	8/30/2021 1:41 PM

City of Lincoln Flood Mitigation Master Plan

Lincoln Flood Mitigation Master Plan

SurveyMonkey

and people of color, and how we can best mitigate those without financially burdening those same individuals.

12	flooding doesn't currently impact my work, but it could. I manage some land on the east side of East Campus, which falls within one of our floodplains.	8/30/2021 12:36 PM
13	I am part of a team in the process of developing a site located within the 100-yr floodplain and are curious about solutions to prevent further flooding without restricting development, specifically in urban infill locations. Practically every major city in the country, and across the globe, was settled along a waterway. Cities both larger and smaller than Lincoln are successfully addressing development in these floodplain areas adjacent to waterways, it would be great if Lincoln were open to other solutions for addressing rising floodwaters other than blanket statements or rules restricting development.	8/30/2021 11:53 AM

Q3 Would you say that flooding is a minor inconvenience or a major problem? Why?

Answered: 13 Skipped: 1

#	RESPONSES	DATE
1	Major problem due to the severe affect it has on people's properties and daily lives.	9/7/2021 6:43 PM
2	A balanced big picture approach to solving potential flooding is key. If one looks t flooding as a singular problem then solutions may be short-sighted.	9/7/2021 1:16 PM
3	Minor	9/4/2021 3:31 PM
4	Minor to me, major to others in higher risk areas	9/2/2021 1:24 PM
5	Day to day flooding threat may seem like a minor inconvenience, but when it happens it has the potential to be a major problem.	9/2/2021 1:06 PM
6	A major problem because our back yard turns into a frakkin pond! It comes up to the house & floods our basement on heavier rains!	8/30/2021 8:19 PM
7	Major problem: Flooding could limit Lincoln's access to safe drinking water for a prolonged period of time. People will move out of Lincoln, if that is a frequent problem. Friends across the city have experienced flooding in their basements, causing financial harms. Flooding can put some small businesses out of business...bad for economy.	8/30/2021 6:15 PM
8	Major problem. Storms are getting more violent and damaging. Flooding of the bottoms area will get worse and surrounding areas will become more flood prone.	8/30/2021 3:55 PM
9	Yes	8/30/2021 3:27 PM
10	I see it is a major problem because it can have long lasting impacts to the structural and air quality of a building. I also fear for those who may have limited mobility or limited access to transportation to evacuate flooding areas. I think about how Lincoln almost lost its potable water source due to flooding recently and really concerns me!	8/30/2021 2:05 PM
11	It is a major problem - flooding is one of the biggest environmental risks to a home and to our community, especially as extreme weather impacts increase over time.	8/30/2021 1:41 PM
12	Flooding can be both a minor inconvenience and a major problem. For me, flooding would create some clean up of trees, and could have the potential to creep into some teaching or research areas. Having research ground impacted by flooding would be a major problem for a researcher, but not on the same scale as a resident having their home flooded. Concentrating on protecting older neighborhoods, and making sure people aren't building new neighborhoods are two top priorities.	8/30/2021 12:36 PM
13	it is currently a minor inconvenience, but has the almost inevitable potential to become a major problem. Flood waters are rising and we need major solutions for major problems. Putting tighter rules on development is a band-aid over a bullet wound.	8/30/2021 11:53 AM

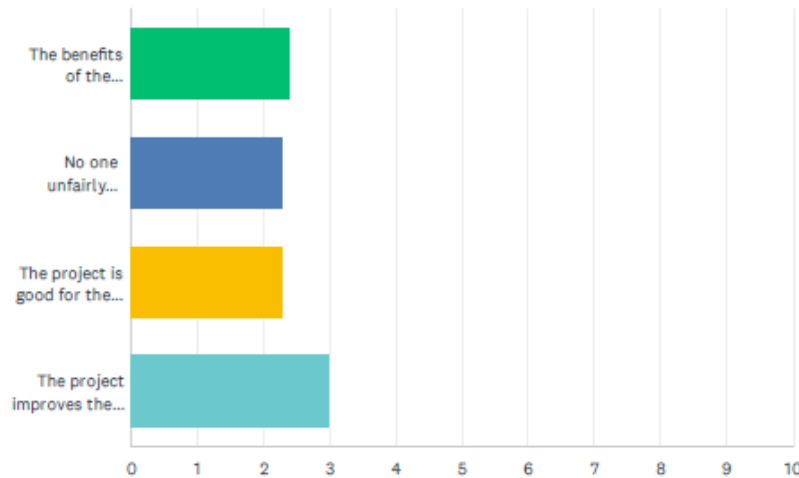
City of Lincoln Flood Mitigation Master Plan

Lincoln Flood Mitigation Master Plan

SurveyMonkey

Q4 Rank the following in order of importance to you (1 = most important, 4 = least important). *drag the items below to place them in your preferred order

Answered: 13 Skipped: 1



	1	2	3	4	TOTAL	SCORE
The benefits of the mitigation project must outweigh the costs	23.08% 3	30.77% 4	7.69% 1	38.46% 5	13	2.38
No one unfairly benefits or loses from the project	23.08% 3	7.69% 1	46.15% 6	23.08% 3	13	2.31
The project is good for the environment	23.08% 3	23.08% 3	15.38% 2	38.46% 5	13	2.31
The project improves the quality of life in the community	30.77% 4	38.46% 5	30.77% 4	0.00% 0	13	3.00

Q5 Have you experienced flooding from a nearby creek or stream? If so, how many times?

Answered: 13 Skipped: 1

#	RESPONSES	DATE
1	No I haven't... yet.	9/7/2021 6:43 PM
2	no	9/7/2021 1:16 PM
3	2 or 3 times each year	9/4/2021 3:31 PM

City of Lincoln Flood Mitigation Master Plan

Lincoln Flood Mitigation Master Plan		SurveyMonkey
4	No	9/2/2021 1:24 PM
5	Yes, indirectly. Approximately annually.	9/2/2021 1:06 PM
6	Not yet!	8/30/2021 8:19 PM
7	No.	8/30/2021 6:15 PM
8	Once	8/30/2021 3:55 PM
9	Elkhorn River - 1 time	8/30/2021 3:27 PM
10	We live off of Beal Slough and have not had any experienced flooding in our 20+ time frame of residency.	8/30/2021 2:05 PM
11	No	8/30/2021 1:41 PM
12	no	8/30/2021 12:36 PM
13	Nope	8/30/2021 11:53 AM

Q6 Do you have any other comments or suggestions related to flood hazards or solutions in Lincoln?

Answered: 13 Skipped: 1

#	RESPONSES	DATE
1	I think if I see more pictures of flooding impacting my area of town or other parts of Lincoln other than the Salt Creek area, I may feel this effort will impact me and my family more.	9/7/2021 6:43 PM
2	Flooding impacts the entire community, not just those living and working directly in the floodplain. I think the City needs to recognize that flooding has an impact on the entire community and the costs for solutions should be shared by the entire community, not just those in the floodplain. Responsive and pro-active developments just like bad developments have always occurred in floodplains since the beginning of time. Good planning is key, not reactive fear based denial of floodplain development.	9/7/2021 1:16 PM
3	No	9/4/2021 3:31 PM
4	1) maintain or remove growth from creeks already altered by previous projects. How often are the creeks inspected? 2) review planning commission's approvals for overbuilt car washes within the designated storm water path, ie. 70th & P St., 61st & O. st., 40th & South St. How many car washes are running water downstream every day? How many car washes does this city need? How is their continued water flow negatively affecting our community?	9/3/2021 8:46 AM
5	Green infrastructure should be explored and used more when found effective. Solutions include increasing "wild" areas that absorb more water, increasing tree cover to slow runoff, improving soil conditions (more organic matter, less topsoil removal, etc.) to improve holding capacity, reduction of over-watered turf, etc. utilizing both public and private land. Also making an effort to reduce parking lot size requirements since lots sit mostly empty most of the time.	9/2/2021 1:24 PM
6	This seems like a very brief survey, I would have expected a more comprehensive set of questions for such a comprehensive master plan. Hopefully this will be an open process that considers the big picture of the City of Lincoln flood mitigation process, and isn't narrowly focused on outcomes that are already in mind. Beyond flood threat and importance of the 4 criteria above, I think important questions to consider as part of the master planning process are overall benefits to the community, how mitigation measures can be mutually supportive of the community, overall quality of life, and create other benefits beyond flood control. These may include recreation, park features, economic development, and others. Looking at our current set of master plans, it seems the focus is primarily on channel stabilization and repair projects. Is this just "putting bandaids" on the watershed? It seems we should look bigger picture at the overall health of the watershed, measures that could be put into place to prevent channel degradation, etc. instead of just running around repairing degraded channels. These activities appear to consume the vast majority of the Lincoln Watershed Department budget	9/2/2021 1:06 PM

City of Lincoln Flood Mitigation Master Plan

Lincoln Flood Mitigation Master Plan

SurveyMonkey

and seems never ending if were not seeking big picture solutions. It seems channel stabilization and restoration is a reactive response; what are we doing proactively to prevent channel degradation and flooding. Cost/benefit can be estimated in many different ways. I wouldn't only consider federal evaluation of cost/benefit as a major criteria or screening of projects.

7	Fix our flooding problem by designing & building a path for the water to go instead of our backyards!	8/30/2021 8:19 PM
8	Require greater impact fees in areas of new development to cover the increased flood mitigation costs. As Lincoln develops more neighborhoods, more pavement is installed, creating stress on our flood mitigation efforts. Developers and new area homeowners need to pay those increased costs for flood mitigation since they are a primary cause. Established neighborhoods are not the problem and should not be burdened by new flood mitigation costs caused by newly developed suburban areas.	8/30/2021 6:15 PM
9	Upstream work on salt creek will prevent future issues.	8/30/2021 3:55 PM
10	With Climate Change a comin' should we be building an ark or two?	8/30/2021 3:27 PM
11	I really like how parks and recreation areas have been used to fill in spaces that regularly flood, so that flooding does feel like more of an inconvenience (shoot my favorite workout park is flooded) and less of a major problem (I need to relocate my family because I've lost my home and financial stability). Anything we can do to make that happen is ideal! For people living in flood plains, I think it is really important to supply them with the things they need to clean up afterward so they don't have mold problems.	8/30/2021 2:05 PM
12	We don't have to build houses everywhere in Lincoln. Leaving large buffer zones around creeks and floodplains and using them as parks or just wildland areas is one way to easily avoid major flooding problems.	8/30/2021 12:36 PM
13	What other solutions has the city considered for addressing rising floodwaters other than a series of dams along Salt Creek? It is my understanding that a recreational lake similar to Branched Oak located in the SW area of town could address rising floodwaters. What a great solution! SW Lincoln, as we all know is rapidly expanding, and with the casino and racetrack going in, Lincoln has an incredible opportunity to capitalize on tax revenues, impact fees, and most importantly providing opportunities for the citizens of Lincoln, be it housing, jobs, or recreation. A new lake has the ability to be ecologically and economically responsible, what more could a solution provide?	8/30/2021 11:53 AM

Coronavirus (COVID-19) Updates

Get information about City of Lincoln Services and Operations (<https://app.lincoln.ne.gov/city/covid19/>).

COVID-19 Vaccine Registration and Scheduling

Sign up and schedule your appointment (<https://app.lincoln.ne.gov/asp/city/covidvac/default.aspx?passcode=4044e935631945448f7110a939f65fc8>).



Home (<https://www.lincoln.ne.gov/Home>) / **Flood Mitigation Master Plan Virtual Public Meeting Is September 7**

Flood Mitigation Master Plan Virtual Public Meeting Is September 7

Published on September 01, 2021

Lincoln Transportation and Utilities (LTU) invites the public to a virtual public meeting for the Flood Mitigation Master Plan, 6 to 7 p.m. Tuesday, September 7. An online presentation about the plan will begin at 6 p.m. The public is invited to provide comments at the meeting and complete a survey. Visit lincoln.ne.gov/FloodMitigation (<https://lincoln.ne.gov/FloodMitigation>) for the meeting link, survey and more information.

The LTU Watershed Management division and Lower Platte South Natural Resources District are developing the plan to reduce flood risk for human life, local properties, businesses, and the environment. The plan must also meet federal requirements that will help reduce federal flood insurance rates by 25% for those who own property in the floodplain. The proposed plan will include input from the community and state and federal agencies.

City of Lincoln Flood Mitigation Master Plan

A Zoom link will be available up to an hour before and during the meeting. If you are unable to attend the meeting, a recording of the presentation will be available on the website Wednesday, September 8.

For more information, contact Mike Middendorf at MMiddendorf@lincoln.ne.gov (<mailto:MMiddendorf@lincoln.ne.gov>), 402-441-4955 or visit lincoln.ne.gov/FloodMitigation (<https://lincoln.ne.gov/FloodMitigation>).

Tagged as:

LTU **Watershed Management**



MASTER PLAN

The City of Lincoln will hold a Public Meeting regarding the Flood Mitigation Master Plan. This meeting will include a brief presentation and an opportunity for the public to learn more about the master plan and provide feedback on the hazards, problems and potential solutions related to flooding.

Whether you live, work, or play within the Lincoln city limits, you are impacted by flooding. In addition to physical damage caused by flooding, economic damages and loss of tax revenue can be massive burdens on future services and infrastructure investment within the community. The purpose of the plan is to understand Lincoln's flood risk and to identify mitigation actions and projects that can lower risk.

Lincoln participates in the Community Rating System, a program that rewards efforts to reduce flood risk by lowering flood insurance rates for residences and businesses. The master plan will help identify projects that can lower risk in the community and positively impact those in the floodplain.



VIRTUAL PUBLIC MEETING

**Tuesday, September 7, 2021
6:00-7:00 pm**

**TO ATTEND, VISIT:
www.lincoln.ne.gov
SEARCH: FLOOD MITIGATION**



**Para obtener más información, visite lincoln.ne.gov (busque: Flood Mitigation)
For more information, visit lincoln.ne.gov (search: Flood Mitigation)**

City of Lincoln Flood Mitigation Master Plan



LINCOLN FLOOD MITIGATION
MASTER PLAN



Welcome!

Lincoln Flood Mitigation Master Plan
Public Meeting

September 7, 2021

PUBLIC MEETING OVERVIEW

- Community Rating System Overview (CRS)
- The purpose of the Master Plan
- The influence of past projects
- Hazard mitigation activities
- Hazard problems and possible solutions
- Planning process
- Future Schedule

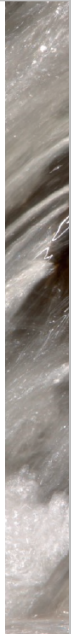
COMMUNITY RATING SYSTEM

- The City of Lincoln participates in the Community Rating System, a program that rewards efforts to reduce flood risk by lowering flood insurance rates for residents and businesses.
- The City can earn points toward lower rates from the planning process. Carrying out the projects that will be identified in the plan can assist with lowering rates even further in the future.
- Lower rates make it easier for Lincoln residents to get and keep flood insurance on their properties.

PHASE I – PLANNING PROCESS		
1	Organize	15
2	Involve the public	120
3	Coordinate	35
PHASE II – RISK ASSESSMENT		
4	Assess the hazard	35
5	Assess the problem	52
PHASE III – MITIGATION STRATEGY		
6	Set goals	2
7	Review possible activities	35
8	Draft an action plan	60
9	Adopt the plan	2
10	Implement, evaluate, revise	26

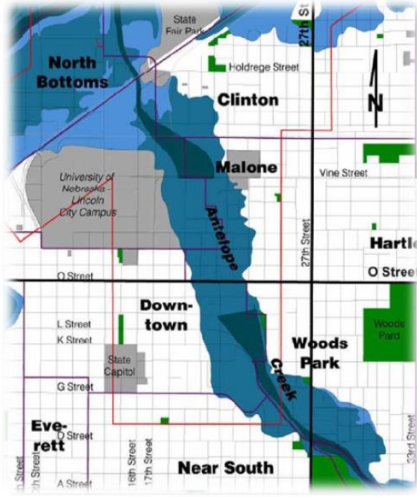
PURPOSE

- To provide an overall hazard mitigation plan related to flooding for the City of Lincoln
- This plan will be an extension of the 2020 Lower Platte South National Resources District Multi-Jurisdictional Hazard Mitigation Plan
- Enable Lincoln to potentially move up one or more CRS classifications for the benefit of those who carry flood insurance in the city
- The Planning Team will provide an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities to be involved in the planning process

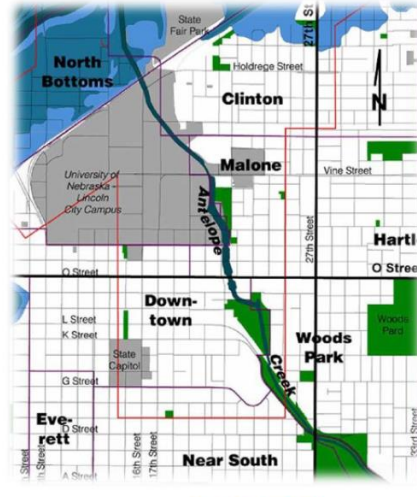


PAST PROJECTS:
ANTELOPE CREEK

ANTELOPE CREEK



BEFORE



AFTER



HAZARD MITIGATION ACTIVITIES

- Preventative Activities
- Property Protection
- Natural Resources Protection
- Emergency Services
- Structural Projects
- Public Information

PROBLEMS & POSSIBLE SOLUTIONS

Lincoln has always been at the national forefront of floodplain management. The goal of this project and plan is to identify and assess areas with critical structures at risk. As a result, this will reduce the long-term risk to human life, property and the environment.

POTENTIAL SOLUTIONS			
Higher Floodplain Regulatory Standards	Riparian Preservation	Floodplain Remapping	Voluntary Buyout Pilot Program

PLANNING PROCESS

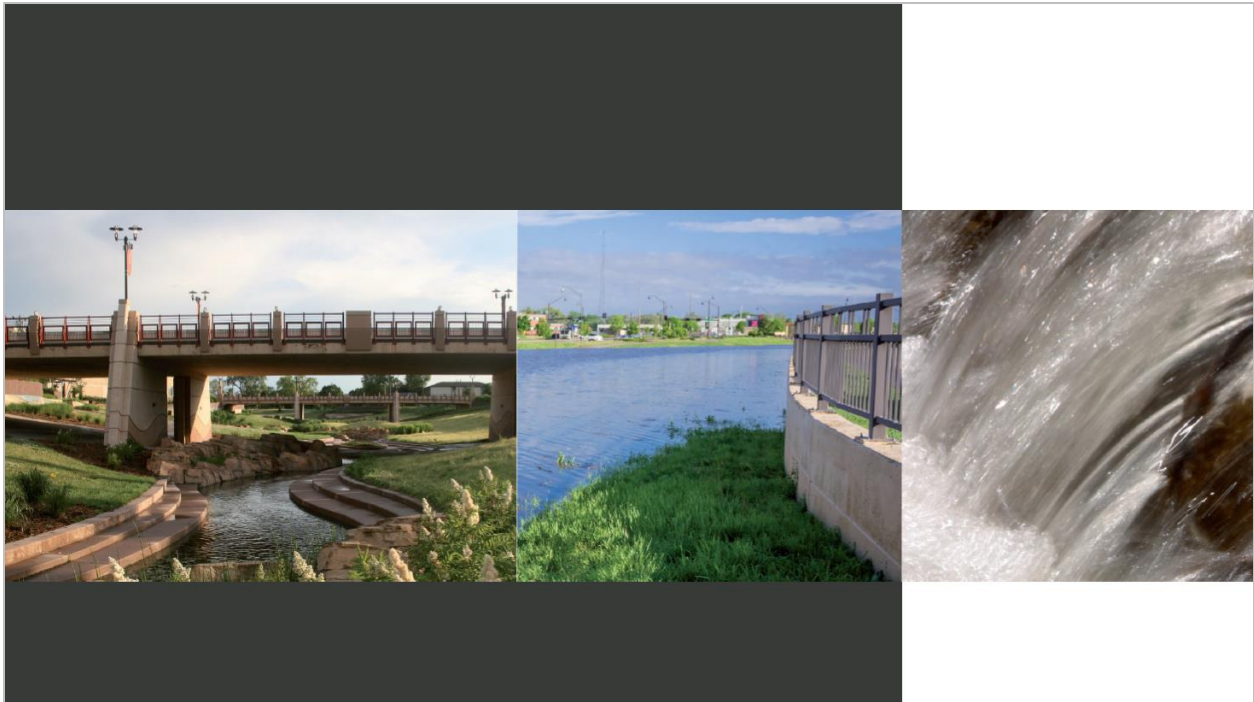


The Planning Team will be led by the City of Lincoln with support from the Lower Platte South Natural Resources District. The team will meet six times over the course of a year. There will be at least two public meetings held at locations within the floodplain, as well as other outreach efforts, such as webcasts, mailings, and surveys.

PLANNING PROCESS/SCHEDULE

Task	Purpose	Tentative Completion Date
Planning Committee Meeting	Project Kickoff	August 2021
Public Meeting #1	Obtain public input on hazards, problems and possible solutions	September 2021
Planning Committee Meeting #2	Assess Hazards	October 2021
Planning Committee Meeting #3	Assess Problems	October 2021
Planning Committee Meeting #4	Set Goals	November 2021
Planning Committee Meeting #5	Review Possible Activities	January 2022
Planning Committee Meeting #6	Draft Action Plan	March 2022
Public Meeting #2	Provide Input on Draft Action Plan	April 2022
Submit Plan for Adoption		June 2022
Project Closeout		July 2022

***VIRTUAL PUBLIC OUTREACH ACTIVITIES: brochures, mailers, public webcast, questionnaire**





Name: _____

Email or Phone: _____

1. Tell us about the impacts flooding has on your business / organization / home / community:

2. Would you say that flooding is a minor inconvenience or a major problem? Why?

3. Rank the following in order of importance to you (1 = most important, 4 = least important).

 The benefits of the mitigation project must outweigh the costs
 No one unfairly benefits or loses from the project
 The project is good for the environment
 The project improves the quality of life in the community

4. Have you experienced flooding from a nearby creek or stream? If so, how many times?

5. Do have any other comments or suggestions for mitigation projects?

City of Lincoln Flood Mitigation Master Plan

Agencies and Organizations Contacted

Name	Bus / Org
Joey Hausmann	Hausmann Construction Lincoln Federal
Leo Schumacher	Lincoln Federal
Nick Cusick	Bison
Marc Lebaron	Lincoln Industries
Kim	Verdis Group
Ken Fougeron	Speedway Properties LES Lincoln Airport
Ann Post	Baylor Evnen
Alea Landrum	North Bottoms Neighborhood Association
Cheryl Irwin	Clinton Neighborhood Association
Reshell Ray	Belmont Neighborhood Association
Kile Johnson	Capitol Beach Community Association
Karen Houseman	Near Oak Lake Neighborhood Association
Ed Patterson	Malone Neighborhood Association
Myrna Coleman	Highlands Neighborhood Association
Bill Vocasek	West A Neighborhood Association Far South Neighborhood Association
Taylor Wyatt	Home Builders Association of Lincoln Malone Community Center
Todd Wiltgen	Lincoln Chamber of Commerce Indian Center
Sheila Vinton	Asian Community and Cultural Center
Maria	El Centro de las Americas Lincoln Commission on Human Rights
Morgan Hermanek	NeighborWorks
Shaun Ryba	South of Downtown Community Organization
Todd Ogden	University Place Business Association Downtown Lincoln Association
David Haring	Lincoln Airport Authority Friends of Wilderness Park

Nebraska Dept of Environment and Energy

City of Lincoln Flood Mitigation Master Plan

Nebraska Dept of Natural Resources

American Red Cross

U.S. Army Corps of Engineers

Lincoln Housing Authority

Allan Zafft

Lincoln Lancaster Metropolitan Planning Agency

Sara Hartzell

Lincoln Parks & Recreation

Jim Davidsaver

Jared Nelson

LPSNRD

Dan Duncan

University of Nebraska - Lincoln

Lincoln Public Schools

Nebraska Wesleyan University

Jane Raybould

Lincoln City Council

Deb Schorr

Lancaster County Board

City of Lincoln Flood Mitigation Master Plan

From:
Sent on:
To:



CC:
Subject: EXTERNAL: Lincoln Flood Mitigation Master Plan input

Follow up: Follow up
Start date: Wednesday, September 14, 2022 12:00:00 AM
Due date: Wednesday, September 14, 2022 12:00:00 AM

Greetings

The City of Lincoln is continually looking for ways to reduce flood risk. The Flood Mitigation Master Plan is just one of several initiatives that focuses on flood risk reduction measures that will reduce damage to homes, businesses, and infrastructure in future flood events. Each initiative has a different area of focus, but all have the same goal: **A safer Lincoln.** The [Flood Mitigation Master Plan](#) assesses risk and identifies actions that can reduce long term flood risk to human life, local properties, and the environment. Through the planning process, the City of Lincoln is promoting public awareness of flood hazards and the community's response to flooding. To assist with the identification of flood hazards and mitigation opportunities, the City invites your input.

1. Do you have information, studies, plans, or data that shows areas where flooding occurs and the impacts of that flooding?
2. Has your organization taken any actions that might increase or reduce flooding or affect properties in flood-prone areas? Examples may include:
 - new construction in or near flood prone areas
 - removal of structures in flood prone areas
 - elevating structures in flood prone areas
 - creation of detention or retention ponds
 - designing to higher standards than local regulations
 - adoption of higher standards in zoning codes

Your input will help identify ways that the City can reduce flood risk for residents and businesses. A draft plan will be shared with you for your input in Fall 2022. You will also receive an invitation to participate in a public meeting to share any feedback. This plan builds on the [2020 Lower Platte South Natural Resources District Multi-Jurisdictional Hazard Mitigation Plan](#), and it will adhere to the National Flood Insurance Program (NFIP) Community Rating System (CRS) guidelines. Participating in CRS has reduced flood insurance rates for businesses and residents by 25%.

Sincerely,

Michael Middendorf, PE, CFM



C i t y o f L i n c o l n F l o o d M i t i g a t i o n M a s t e r
P l a n

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Appendix C – Regulatory Peak Discharge Data

City of Lincoln Flood Mitigation Master Plan

The following table shows the regulatory peak discharge data for flood sources in the City of Lincoln, as identified by the effective Flood Insurance Study.

Flood Source and Location	Drainage Area (Square Miles)	Peak Discharges (CFS)			
		10 Percent Annual chance	2 Percent Annual Chance	1 Percent Annual Chance	0.2 Percent Annual Chance
Salt Creek					
About 5,000 feet downstream of North 148th Street	616	24,000	45,500	57,600	76,200
About 2,500 feet downstream of 98th Street	611.0	24,000	37,000	45,800	53,700
Just downstream of Stevens Creek confluence	588.0	25,000	38,500	47,900	55,800
Just upstream of Stevens Creek confluence	537.0	22,000	31,500	39,200	43,800
Just downstream of Little Salt Creek confluence	529.4	22,800	32,500	40,200	44,600
Just upstream of Little Salt Creek confluence	484.0	18,800	25,500	32,000	42,400
Just downstream of Deadmans Run confluence	477.8	20,700	25,300	31,600	43,800
Just upstream of Deadmans Run confluence	469.4	18,500	24,000	30,100	43,500
Just downstream of Oak Creek Confluence	465.8	18,300	29,000	36,000	44,000
Just upstream of Oak Creek Confluence	296.8	12,300	29,000	36,000	44,000
Just downstream of Antelope Creek confluence	296.8	12,300	29,000	36,000	44,000
Just upstream of Antelope Creek confluence	289.4	12,200	28,900	35,900	44,000
Just downstream of 10th Street	289.4	12,200	29,200	36,200	44,800
Just upstream of 10th Street	289.4	12,200	29,100	36,100	44,800
Just downstream of Union Pacific Railroad	289.2	12,200	30,000	37,500	47,500
Just upstream of Union Pacific Railroad	288.8	12,200	22,200	27,700	36,100
Just downstream of Middle Creek confluence	285.6	12,100	21,300	26,500	35,800
Just upstream of Middle Creek confluence	230.6	7,300	13,600	16,900	22,200
Just downstream of Haines Branch confluence	227.6	7,300	13,300	16,600	22,900
Just upstream of Haines Branch confluence	174.6	5,400	10,000	12,400	15,200
Just downstream of Beal Slough confluence	173.6	5,200	9,800	12,200	15,000

City of Lincoln Flood Mitigation Master Plan

Flood Source and Location	Drainage Area (Square Miles)	Peak Discharges (CFS)			
		10 Percent Annual chance	2 Percent Annual Chance	1 Percent Annual Chance	0.2 Percent Annual Chance
Just upstream of Beal Slough confluence	160.7	3,800	7,100	8,800	14,000
At Old Cheney Road	157.0	4,100	7,600	9,500	14,800
Just downstream of Cardwell Branch	155.7	4,300	8,000	10,000	15,200
At State Highway 34	36.1	10,442	15,456	18,532	25,536
At confluence with Tributary 45	29.9	9,139	13,533	16,078	21,876
At A Street	23.0	7,632	11,079	13,111	17,587
At confluence with Tributary 55	22.4	7,725	11,579	13,691	18,264
At Van Dorn Street	16.7	5,800	8,707	10,253	13,709
At Pioneers Boulevard	11.4	3,477	4,815	5,641	7,840
At Old Cheney Road	8.7	3,119	4,354	5,106	6,863
At Pine Lake Road	7.3	3,104	4,320	5,044	6,759
At 120th Street	1.2	439	628	727	948
At U.S. Highway 2	0.4	650	922	1,064	1,380
Stevens Creek					
At mouth	51.3	7,147	8,058	9,030	10,915
At U.S. Highway 6	50.7	7,114	8,019	8,989	10,856
At divergence of Stevens Creek Overflow	48.0	7,243	8,906	10,367	13,056
At Havelock Street	47.5	8,531	13,184	16,036	21,928
At Adams Street	44.3	9,844	14,671	17,407	23,773
Oak Creek					
At mouth	169.0	7,800	14,300	17,900	23,000
At Interstate 80	160.0	7,550	13,900	17,500	23,000
Just upstream of Elk Creek confluence	120.0	4,300	8,100	10,000	16,100
About 200 feet downstream of West Waverly Road	115	4,750	8,900	11,100	17,700
At West Waverly Road	113	5,000	9,500	11,500	18,200
At West Bluffs Road	110	5,000	9,500	11,600	18,300
Middle Creek					
At mouth	55.0	5,200	9,900	11,900	16,300
At U.S. Highway 6	41.0	4,800	9,000	11,000	15,100
At Interstate 80	39.0	4,600	8,800	10,800	15,700
Just upstream of South Branch confluence	4.0	830	1,550	1,900	2,800
Antelope Creek					
At mouth	7.4	7.4	3,600	6,600	8,200
At N Street	6.0	6.0	3,400	6,250	7,800
At A Street	4.2	4.2	3,200	6,000	7,300
Just upstream of 40 th Street	2.1	2.1	2,100	3,800	4,700
Just upstream of 48 th Street	1.2	1.2	1,300	2,400	3,000
Just upstream of 56 th Street	0.1	0.1	110	200	250
At dam	0.0	0.0	0	0	0
At 70 th Street	2.9	2.9	1,200	2,250	2,800
At Pioneers Boulevard	2.0	2.0	850	1,580	1,930
At 84 th Street	1.1	1.1	540	1,000	1,230
Beal Slough					
At mouth	12.9	2,650	4,950	6,200	8,700
At U.S. Highway 77	12.3	2,850	5,350	6,600	9,200

City of Lincoln Flood Mitigation Master Plan

Flood Source and Location	Drainage Area (Square Miles)	Peak Discharges (CFS)			
		10 Percent Annual chance	2 Percent Annual Chance	1 Percent Annual Chance	0.2 Percent Annual Chance
Just upstream of 27th Street	10.7	2,580	4,750	6,000	8,500
At 40th Street	6.6	1,960	3,600	4,500	6,300
At State Highway 2	5.1	1,750	3,250	4,000	5,600
At South 70th Street	1.8	790	1,480	1,800	2,600
Haines Branch					
At mouth	53	4,350	8,100	10,100	15,400
Above 800 feet upstream of BNRR	45	4,450	8,400	10,400	15,400
At Lincoln extraterritorial limits	1	4,800	5,100	11,000	16,400
Cardwell Branch					
At mouth	16.3	1,530	2,060	2,410	3,210
Just downstream of unnamed tributary	13.4	1,960	2,700	3,150	4,050
Just upstream of unnamed tributary	10.5	934	1,190	1,370	1,730
Lynn Creek					
At mouth	4.1	1,960	3,600	4,500	6,200
At U.S. Highway 34	3.2	1,960	3,600	4,500	6,140
Deadmans Run					
At mouth	9.6	5,853	7,933	9,078	11,823
At 38th Street (Station 8500)	6.9	4,686	6,954	8,193	10,738
Below 48th Street	6.6	4,917	7,280	8,628	11,325
Above 48th Street	5.7	4,405	6,349	7,426	9,663
At Costner Boulevard	4.3	3,993	5,541	6,350	8,308
Below 66th Street	3.6	3,684	5,053	5,764	7,748
Above 66th Street	3.4	3,503	4,825	5,534	7,487
Below O Street	1.9	1,940	2,671	3,066	3,943
Above O Street	1.2	1,202	1,619	1,876	2,400
At A Street	0.4	637	880	1,007	1,261

Peak discharge data is not available for Little Salt Creek or Stevens Creek in the April 16, 2013, FIS for Lancaster County. The Salt Creek Floodplain Resiliency Study includes peak discharge data, represented in the following table.

Subbasin	Drainage Area (Square Miles)	Peak Discharges (cfs)			
		10 Percent Annual Chance	2 Percent Annual Chance	1 Percent Annual Chance	0.2 Percent Annual Chance
Little Salt Creek	45.8	7,570	12,000	14,300	19,900

The Stevens Creek Watershed Master Plan includes peak flow modeling results for existing conditions as well as future conditions, represented in the following table.

City of Lincoln Flood Mitigation Master Plan

Location	Peak Discharges (cfs)											
	50 Percent Annual Chance		20 Percent Annual Chance		10 Percent Annual Chance		2 Percent Annual Chance		1 Percent Annual Chance		0.2 Percent Annual Chance	
	Existing	Future	Existing	Future	Existing	Future	Existing	Future	Existing	Future	Existing	Future
Attmouthe	4,507	5,456	6,695	6,975	7,388	7,548	8,679	9,033	9,730	9,982	11,511	11,567
Upstream of Hwy 6	4,493	5,450	6,668	6,948	7,354	7,512	8,641	8,997	9,687	9,942	11,452	11,509
D/S of Stevens Creek Overflow	4,464	5,454	6,829	7,061	7,539	7,852	9,896	10,426	11,482	11,950	14,252	14,512
Havelock Avenue	4,529	5,570	7,645	8,099	9,337	10,250	15,408	16,480	18,331	19,301	24,678	25,187
Adams Street	4,602	5,846	8,086	9,109	10,927	12,197	16,311	17,653	19,372	20,669	26,381	27,288
D/S of Trib 45	5,046	6,626	8,331	10,111	11,314	12,974	17,048	19,127	20,407	22,540	28,064	30,009
Ashtree	3,460	4,541	5,698	7,209	7,760	9,385	11,247	13,563	13,298	15,892	17,819	20,565

City of Lincoln Flood Mitigation Master Plan

Location	Peak Discharges (cfs)												
	50 Percent Annual Chance		20 Percent Annual Chance		10 Percent Annual Chance		2 Percent Annual Chance		1 Percent Annual Chance		0.2 Percent Annual Chance		
	Existing	Future	Existing	Future	Existing	Future	Existing	Future	Existing	Future	Existing	Future	
et													
Pioneers Boulevard	2,233	2,106	3,192	3,134	4,032	4,298	5,783	5,961	6,769	6,833	8,633	8,777	
At Old Cheney	2,030	1,860	2,934	2,665	3,718	3,671	5,348	5,071	6,259	5,855	8,066	7,531	
Pine Lake Road	2,105	2,283	3,002	3,138	3,704	3,857	5,352	5,093	6,266	5,765	8,245	7,529	
At Yankee Hill	727	822	1,111	1,192	1,438	1,445	2,101	1,941	2,443	2,206	3,196	2,801	
Trib 45 - at Mouth	1,063	1,636	1,767	2,397	2,350	3,027	3,441	4,406	4,134	5,170	5,726	7,046	
Trib 45 - Upstream of 120th S	1,096	1,730	1,842	2,716	2,573	3,606	4,046	5,474	4,918	6,477	6,916	8,745	

City of Lincoln Flood Mitigation Master Plan

Location	Peak Discharges (cfs)												
	50 Percent Annual Chance		20 Percent Annual Chance		10 Percent Annual Chance		2 Percent Annual Chance		1 Percent Annual Chance		0.2 Percent Annual Chance		
	Existing	Future	Existing	Future	Existing	Future	Existing	Future	Existing	Future	Existing	Future	
t r e e t													

Appendix D – HAZUS Reports

City of Lincoln Flood Mitigation Master
Plan

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City of Lincoln Flood Mitigation Master
Plan

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Appendix E – Possible Strategies

City of Lincoln Flood Mitigation Master Plan

CRS Category	Proposed Project	Description	Pros	Cons	Solves For	Status
Structural Projects	Improve Drainage	Improve the drainage at 11th Street and Harrison Ave.	Localized flooding affects traffic and infrastructure	Funding contingent on passage of future Stormwater Bond(s)	Hazard(s) Addressed: Flooding	Status: Not Yet Started
Property Protection	NFIP Repetitive Loss Structure Removal/Acquisition	Implement projects such as property acquisition, relocation, demolition, or elevation of the one existing repetitive loss structure located in the City/Village	Prevention of repetitive losses and loss of life	Overall cost is high; need willing landowners	Hazard(s) Addressed: Flooding	Status: No structures have been acquired in the last five years.
Remove	Storm Shelter / Safe Rooms	Design and construct storm shelters and safe rooms in highly vulnerable areas such as mobile home parks, campgrounds, school, and other areas.			Hazard(s) Addressed: Tornados and high winds, severe thunderstorms	Status: Local officials and stakeholders have met to discuss the feasibility of safe room installation in critical facilities and near vulnerable populations
Structural Projects	Oak Creek Flood Control	Oak Creek flood control protection. This project is to increase the protection level of a non-certified levee for the airport and nearby National Guard base. This is associated with the Oak Creek Flood Control Project.	High impact projects that will have immediate effect on mitigation of losses due to flooding; Will remove some area from floodplain	Due to the limited current budget and the need to bond these types of projects, the overall ability of WSM to implement is limited; Airport/National Guard buy-in needed	Hazard(s) Addressed: Flooding	Status: Not yet started
Preventative Activities	National Flood Insurance Program (NFIP)	Maintain good standing with National Flood Insurance Program (NFIP)	Needed to obtain assistance from FEMA when flooding occurs	none	Hazard(s) Addressed: Flooding	Status: Lincoln is still participating in the NFIP
Emergency Services/ Public Information	Weather Radios	Conduct an inventory of weather radios at schools and other critical facilities and provide new radios as needed.	Advanced notice of flash flooding	May not be the best form of communication for flood risks	Hazard(s) Addressed: All hazards	Status: Weather radios have been placed in all Lincoln Public Schools School. Lincoln/Lancaster County EMA continues to work with stakeholders and local agencies to identify areas of need and make recommendations to install weather radios. Lincoln/Lancaster County EMA has assisted in the purchase of weather radios as needed. In 2014 Lincoln/Lancaster County EMA assisted in the installation of 10 weather radios for local government and local nonprofit agencies

City of Lincoln Flood Mitigation Master Plan

CRS Category	Proposed Project	Description	Pros	Cons	Solves For	Status
Structural Projects	Improve Drainage	Improve the drainage on 24 th Street from E St. to Antelope Creek	Localized flooding affects traffic and infrastructure	Funding contingent on passage of future Stormwater Bond(s)	Hazard(s) Addressed: Flooding	Status: Not Yet Started
Structural Projects	Improve Drainage	Improve the drainage on 33 rd Street from Holdrege St. to Baldwin Ave.	Localized flooding affects traffic and infrastructure	Funding contingent on passage of future Stormwater Bond(s)	Hazard(s) Addressed: Flooding	Status: Not Yet Started
Structural Projects	Improve Drainage	Improve the drainage at 63 rd and Aylesworth Ave.	Localized flooding affects traffic and infrastructure	Funding contingent on passage of future Stormwater Bond(s)	Hazard(s) Addressed: Flooding	Status: Not Yet Started
Structural Projects	Improve Drainage	Improve the drainage from 40 th and J Streets to 37 th and M Streets	Localized flooding affects traffic and infrastructure	Funding contingent on passage of future Stormwater Bond(s)	Hazard(s) Addressed: Flooding	Status: Not Yet Started
Structural Projects	Improve Drainage	Improve the drainage at Cotner Blvd and Baldwin Ave.	Localized flooding affects traffic and infrastructure	Funding contingent on passage of future Stormwater Bond(s)	Hazard(s) Addressed: Flooding	Status: Not Yet Started
Structural Projects	Improve Drainage	Improve the drainage at N 68 th St. between Fremont St and Seward St	Localized flooding affects traffic and infrastructure	Funding contingent on passage of future Stormwater Bond(s)	Hazard(s) Addressed: Flooding	Status: Not Yet Started
Structural Projects	Improve Drainage	Improve the drainage south of Lowell Ave. between 46 th and 47 th Streets	Localized flooding affects traffic and infrastructure	Funding contingent on passage of future Stormwater Bond(s)	Hazard(s) Addressed: Flooding	Status: Not Yet Started
Structural Projects	Improve Drainage	Improve the drainage at North of Madison Ave, east of 33 rd St	Localized flooding affects traffic and infrastructure	Funding contingent on passage of future Stormwater Bond(s)	Hazard(s) Addressed: Flooding	Status: Not Yet Started
Remove	Improve Drainage	Improve the drainage at Forest Lake Blvd	Localized flooding affects traffic and infrastructure	Funding contingent on passage of future Stormwater Bond(s)	Hazard(s) Addressed: Flooding	Status: Not Yet Started
Natural Resource Protection	Bank Stabilization	Implement riverbank stabilization measures for city owned property along the Platte River. Current erosion pattern will impact the ability to develop that area for wells to meet future production demands.			Hazard(s) Addressed: Flooding	Status: Completed

City of Lincoln Flood Mitigation Master Plan

CRS Category	Proposed Project	Description	Pros	Cons	Solves For	Status
Emergency Services	Emergency Generator Service Provider Agreement	Development and implementation of a service agreement to provide emergency back-up generators. These generators would be necessary to provide power for operations to provide fire suppression and minimum water demands for the City of Lincoln.	Can provide power during a flood		Hazard(s) Addressed: All Hazards	Status: In Progress
Emergency Services	Capability to Connect to Portable Generators to Operate City Vehicle Fuel Sites	Conduct a comprehensive study of remote city vehicle fueling sites to identify electrical components required for utilization of portable back-up generators. Project would also include installation of those components, generators to be provided by local emergency management or contractual services.	Can provide power during a flood		Hazard(s) Addressed: All Hazards	Status: In Progress
Preventative Activities	Inflow and Infiltration Reduction Program	Develop and implement a program to reduce inflow and infiltration of stormwater into the wastewater collection system.	Mitigates the impact flooding has on the increases in flow into the wastewater treatment plant	Limited effect on the overall need	Hazard(s) Addressed: Flooding	Status: Scope of work being developed
Emergency Services	Wastewater Collection System Monitoring	Improve/expand monitoring capabilities of the wastewater collection system for the city.			Hazard(s) Addressed: Flooding	Status: Scope of work being developed
Natural Resource Protection	Channel Improvement	Channel improvements project to correct the effects of channel constrictions near Cornhusker Highway. This project would involve 3 separate locations where the constriction of flow will be alleviated by increasing the width or the stream channel, creating a two-stage channel which allows the smaller stream forming flow to meander within the larger flood channel. Other improvements would be to replace crossing structures with larger capacity structures. (DMR Master Plan, Section 8.4.1.1)	High impact projects that will have immediate effect on mitigation of losses due to flooding	Due to the limited current budget and the need to bond these types of projects, the overall ability of WSM to implement is limited	Hazard(s) Addressed: Flooding	Status: Not yet started
Structural Projects	56 th Street and Morton Channel Improvements	The area of 56 th Street/HWY 77, between Cornhusker and HWY 80 has a history of flooding, with numerous properties subject to damage. The City is pursuing channel and crossing improvements in the northern reaches of the area to increase channel capacity and reduce flood depths.	High impact projects that will have immediate effect on mitigation of losses due to flooding	Due to the limited current budget and the need to bond these types of projects, the overall ability of WSM to implement is limited	Hazard(s) Addressed: Flooding	Status: Completed
Emergency Services	Emergency Electrical Generator for Wastewater Treatment Plant	Installation of emergency electrical generators at the Theresa Street Wastewater Treatment Plant to provide emergency backup power for wastewater treatment.			Hazard(s) Addressed: Flooding	Status: Scope of Services for an Emergency Preparedness Study for the City of Lincoln Department of Public Works & Utilities was prepared in 2014 and is under review

City of Lincoln Flood Mitigation Master Plan

CRS Category	Proposed Project	Description	Pros	Cons	Solves For	Status
Structural Projects	Levee at Theresa Street	Installation of a levee around the Theresa Street Wastewater Treatment Plant to protect it from flooding from Salt Creek.	Protects an asset of the city that is necessary the health and welfare of the public	cost to construct; challenges with mitigating fill in Salt Creek Storage Area	Hazard(s) Addressed: Flooding	Status: Not yet started
***	Complete a City-Wide Master Plan to Prioritize All Flooding Related Projects	Stormwater master plans can be conducted to perform a community-wide stormwater evaluation, identifying multiple problem areas, and potentially multiple drainage improvements for each.	This is an incontrovertible necessity for the FMMP	None	Hazard(s) Addressed: Flooding	Status: Completed. The City has completed plans examining different Watershed Basins within the city in recent years. Studies include (but are not limited to): Antelope Creek Basin Master Plan, Beal Slough Master Plan, Cardwell Master Plan, Deadman's Run Watershed Study, Haines Branch Master Plan, Little Salt Creek Master Plan, Middle Creek Master Plan, South Salt Creek Master Plan, Southeast Upper Salt Creek Master Plan, and Stevens Creek Master Plan)
Natural Resource Protection/ Preventative Activities	Preserve Natural and Beneficial Functions	Preserve natural and beneficial functions of floodplain land through measures such as: retaining natural vegetation, restoring streambeds, and preserving open space in the floodplain.	Environmental protection	Pushback from developers, public buy-in, and maintenance	Hazard(s) Addressed: Flooding	Status: Have assisted in the purchase of several properties within the floodplain of Haines Branch
***	Adopt a No Adverse Impact approach to floodplain management	Adopt a No Adverse Impact approach to floodplain management	Prevents worsening the hazards		Hazard(s) Addressed: Flooding	Status: Program On-Going
***	Utilize low impact development practices and green infrastructure to reduce flood risk	Low impact development practices and green infrastructure can reduce runoff and result in a reduction in stormwater related flooding	Increases awareness the aesthetic and environmental benefits of hazard mitigation		Hazard(s) Addressed: Flooding	Status: Program On-going; City adopted Water Quality Standards which go into effect 2/2016
	Salt Creek Resiliency Study	Structural and non-structural floodplain resiliency enhancement measures	Floodplain preservation and improved floodplain boundary mapping. Increased public awareness of floodplain environmental concerns.	Bonding and grant dependent	Hazard(s) Addressed: Flooding and floodplain preservation	Status: Completed.

City of Lincoln Flood Mitigation Master Plan

