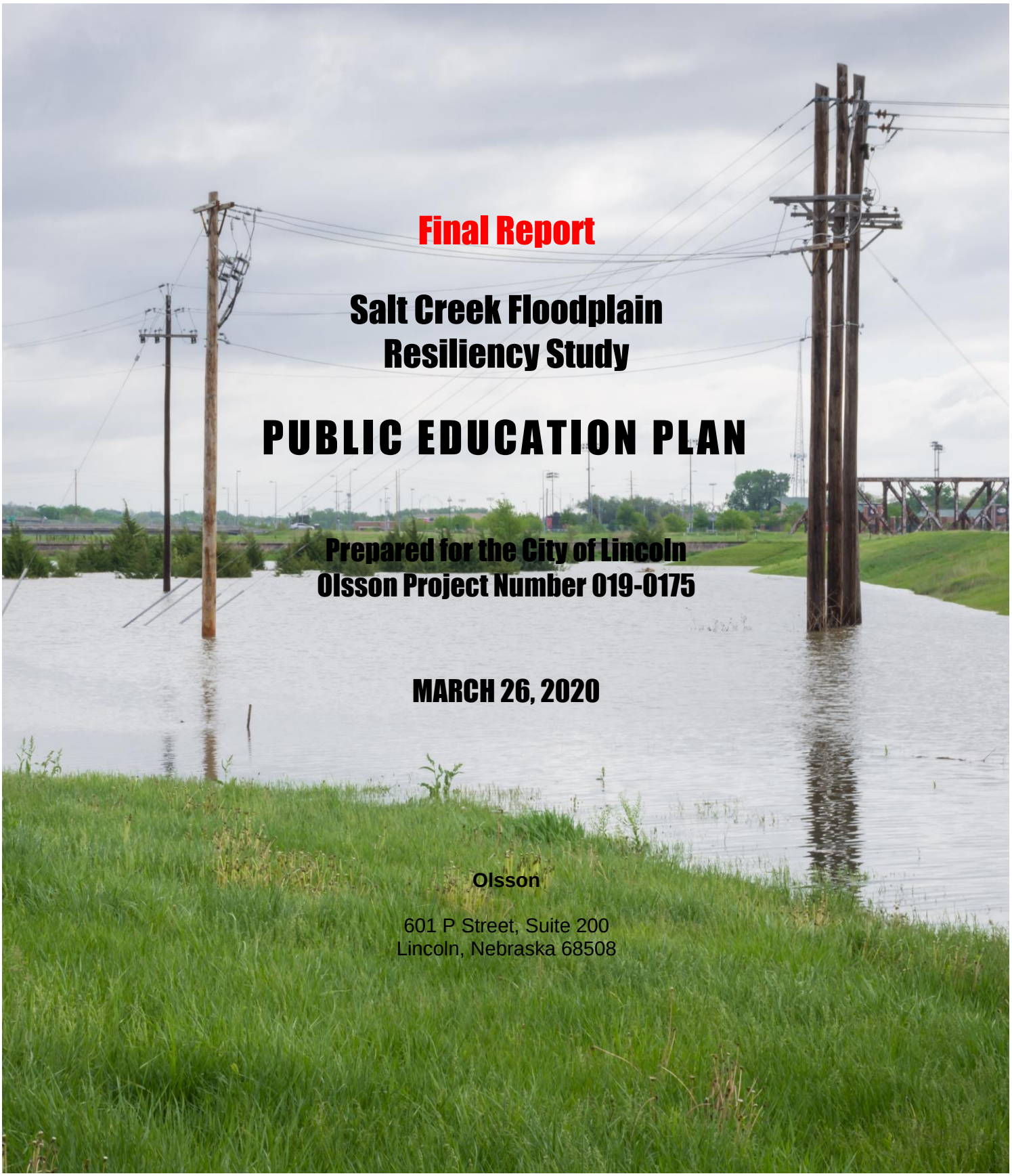

Final Report

Salt Creek Floodplain Resiliency Study

PUBLIC EDUCATION PLAN

Prepared for the City of Lincoln
Olsson Project Number 019-0175

MARCH 26, 2020

Olsson

601 P Street, Suite 200
Lincoln, Nebraska 68508

Michael Baker International Wright Water Engineers, Inc. Seacrest & Kalkowski, PC, LLO

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1. INTRODUCTION

The following report outlines the stakeholder engagement for the Salt Creek Floodplain Resiliency Study. The activities were led by the project team with support from City of Lincoln and the Lower Platte South Natural Resource District (LPSNRD). The purpose of this report is to review the content and discussion with stakeholders during meetings held during the study and look at education tools developed during the process.

2. STAKEHOLDER GROUP

The stakeholder group was composed of individuals and groups with an interest in the Salt Creek floodplain area. The City of Lincoln provided a list of individuals, groups and agencies that have previously been involved or expressed an interest in the Salt Creek floodplain. The list of stakeholders was discussed and reviewed by the city and LPSNRD to include area residents, business, agencies, and producers. Stakeholders were invited to participate in the group through written invitation from the City of Lincoln. The stakeholder invite list and letter are outlined below in Table 1. Salt Creek Stakeholder List.

Table 1. Salt Creek Resilience Study Stakeholder List.

Name	Organization Name	Email
Ann Post	Home Builders Association of Lincoln	APost@baylorevnen.com
Ben Higgins	Watershed Management	watershed@lincoln.ne.gov
Chad Blahak	Lincoln Building and Safety	bldgsafe@lincoln.ne.gov
Dan Duncan	University of Nebraska Lincoln	dduncan1@unl.edu
Dan Steinkruger	NRD Director	dsteinkruger.nrd@outlook.com
David Haring	Lincoln Airport Authority	dharing@lincolnairport.com
David Landis	NRD Director	dlandis2@unl.edu
Deb Schorr	Lancaster County Commissioner	dschorr@lancaster.ne.gov
Donna Garden	Transportation and Utilities	DGarden@lincoln.ne.gov
Gary Bentzinger	AG Producer/Rural Landowner	
Grant Daily	South Salt Creek Community Organization	grant.daily@nwlincoln.org
J.D. Linscott	Lincoln Electric System	jlinscott@les.com
James Davidsaver	Lancaster County Emergency Manager	jdavidsaver@lancaster.ne.gov
Jane Raybould	Lincoln City Council	jraybould@lincoln.ne.gov
Jared Nelson	Lower Platte South NRD	jnelson@lpsnrd.org
Joey Hausmann	Hausmann Construction	joeyh@hausmannconstruction.com
Ken Fougeron	Speedway Properties	kgfougeron@speedwayproperties.com
Kim Morrow	Verdis	kim@verdisgroup.com
Leo Schumacher	Lincoln Federal Savings Bank	lschumacher@lincolnfed.com
Marc LeBaron	Lincoln Industries	marc.lebaron@lincolnindustries.com
Nick Cusick	Bison	ncusick@bisoninc.com
Paul Barnes	Planning Department	PBarnes@lincoln.ne.gov
Paul Zillig	Lower Platte South NRD	pzillig@lpsnrd.org
Penny Costillo	Friends of Wilderness Park	friendsofwildernesspark@gmail.com
Roy Christensen	Lincoln City Council	rchristensen@lincoln.ne.gov
Shelly Simonson	Lincoln Federal Savings Bank	SSimonson@LincolnFed.com
Ted Triplett	Belmont Neighborhood Association	ted_triplett@yahoo.com
Todd Wiltgen	Lincoln Chamber of Commerce	TWiltgen@lcoc.com
Tracy Corr	Neighborhood Roundtable	tlines24@hotmail.com
Tracy Straatmeyer	Northridge Heights	tstraatmeyer@hotmail.com

CITY OF LINCOLN NEBRASKA

Mayor Leirion Gaylor Baird

August 20, 2019

Recipient
Address Line 1 / Address Line 2
City, State Zip Code

Dear Stakeholder:

We would like you to serve on the Salt Creek Resiliency Study Stakeholder Committee. We are requesting you to participate in the Salt Creek floodplain resiliency discussions and assist in developing a public education plan for long term floodplain improvements. Please review the following responsibilities outlined below to understand stakeholder member expectations. If you are not able to participate, please contact our team to discuss an alternate. We would like a response by **September 5, 2019.**

Expectations

As a Stakeholder you are asked to commit to the following:

- Be honest in your comments and suggestions, keeping the entire community in mind.
- Participate in two stakeholder meetings during the study phase.
    - *Tuesday, September 10, 2019 5:30-7:30pm, Lancaster County Extension Office*
    - *Tuesday, October 1, 2019 5:30-7:30pm, Lancaster County Extension Office*
- Provide feedback on materials posted to project website and engage in conversations about the study.
- Help educate the public and encourage community members to attend the public open house.
    - Tuesday, November 5, 2019, 6:00-7:30pm - TBA

Should you have any questions, please contact Emily Bausch at 402-458-5064, saltcreek@olsson.com or myself at the contact information shown below.

Sincerely,

Ben Higgins
Superintendent of Stormwater | Watershed Management
City of Lincoln Transportation and Utilities
O: 402-441-7589 | M: 402-430-9703

2.1. Stakeholder Meeting 1

Stakeholder Meeting 1 was held September 10, 2019, from 5:30pm-7:30pm at the Lancaster County Extension office 444 Cherrycreek Road. The purpose of the meeting was to introduce the study and purpose. 18 of the 29 Stakeholders attended and engaged in a discussion to understand the challenges facing the Salt Creek floodplain. During the meeting, stakeholders posed and discussed information relevant to the topics, a post meeting discussion information sheet was developed to highlight topics and ideas discussed during the meeting. Stakeholder Meeting 1 Invitation list and attendance shown below in Table 2. Stakeholder Meeting1 Invitation List.

Table 2. Stakeholder Meeting 1 Invitation List

Initial	Name	Organization Name	Email
X	Ann Post	Home Builders Association of Lincoln	APost@baylorevnen.com
X	Ben Higgins	Watershed Management	watershed@lincoln.ne.gov
X	Brian Dunnigan	Olsson	bdunnigan@olsson.com
X	Carter Hubbard	Olsson	chubbard@olsson.com
	Chad Blahak	Lincoln Building and Safety	bldgsafe@lincoln.ne.gov
	Dan Duncan	University of Nebraska Lincoln	dduncan1@unl.edu
X	Dan Steinkruger	NRD Director	dsteinkruger.nrd@outlook.com
	David Haring	Lincoln Airport Authority	dharing@lincolnairport.com
	David Landis	NRD Director	dlandis2@unl.edu
	Deb Schorr	Lancaster County Commissioner	dschorr@lancaster.ne.gov
X	Donna Garden	Transportation and Utilities	DGarden@lincoln.ne.gov
X	Emily Bausch	Olsson	ebausch@olsson.com
	Gary Bentzinger	AG Producer/Rural Landowner	
X	Grant Daily	South Salt Creek Community Organization	grant.daily@nwlincoln.org
X	J.D. Linscott	Lincoln Electric System	jlinscott@les.com
X	James Davidsaver	Lancaster County Emergency Manager	jdavidsaver@lancaster.ne.gov
	Jane Raybould	Lincoln City Council	jraybould@lincoln.ne.gov
X	Jared Nelson	Lower Platte South NRD	jnelson@lpsnrd.org
	Joey Hausmann	Hausmann Construction	joeyh@hausmannconstruction.com
X	Kara Burwell	Olsson	kburwell@olsson.com
X	Ken Fougeron	Speedway Properties	kgfougeron@speedwayproperties.com
X	Kim Morrow	Verdis	kim@verdisgroup.com
X	Leo Schumacher	Lincoln Federal Savings Bank	lschumacher@lincolnfed.com
	Marc LeBaron	Lincoln Industries	marc.lebaron@lincolnindustries.com
	Nick Cusick	Bison	ncusick@bisoninc.com
X	Paul Barnes	Planning Department	PBarnes@lincoln.ne.gov
X	Paul Zillig	Lower Platte South NRD	pzillig@lpsnrd.org
X	Penny Costillo	Friends of Wilderness Park	friendsofwildernesspark@gmail.com
	Roy Christensen	Lincoln City Council	rchristensen@lincoln.ne.gov
X	Shelly Simonson	Lincoln Federal Savings Bank	SSimonson@LincolnFed.com
	Ted Triplett	Belmont Neighborhood Association	ted_triplett@yahoo.com
X	Todd Wiltgen	Lincoln Chamber of Commerce	TWiltgen@lcoc.com
X	Tracy Corr	Neighborhood Roundtable	tlines24@hotmail.com
X	Tracy Straatmeyer	Northridge Heights	tstraatmeyer@hotmail.com

SALT CREEK FLOODPLAIN RESILIENCY STUDY

GOAL OF THE SALT CREEK FLOODPLAIN RESILIENCY STUDY:

Reduce adverse impacts from flooding to life and property from existing and future flood events

WHAT DOES RESILIENCY MEAN?

- ***Meet the floodplain challenges of today and safeguard against the uncertainties of the future.***

WHY IS SALT CREEK FLOODPLAIN SPECIFICALLY BEING STUDIED?

- ***Salt Creek is the largest stream, with the largest floodplain and impacts the most structures and property within Lincoln and Lancaster County.***
- ***Since 1900, 100 floods have been recorded along Salt Creek and its tributaries in and near the City of Lincoln. Of those, 17 were classified as major, 30 as moderate, and 49 as minor.***

WHAT IS A FLOOD EVENT AND WHAT IS THE RISK?

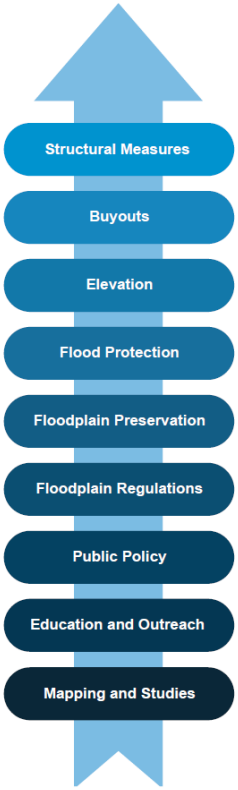
- ***"100-year" -1% chance annually of a storm producing many inches of rain in a 24-hour period (current standard is 6.68 inches).***

WHAT IS BEING DONE FOR FLOOD PROTECTION?

- Lincoln and Lower Platte South Natural Resource District (LPSNRD) have a comprehensive approach to flood reduction.

WHAT HAS BEEN STUDIED?

- Currently, the study team has reviewed national floodplain management Best Management Practices and evaluated Lincoln and LPSNRD floodplain Best Management Practices.
- The study team has evaluated and summarized Lincoln and LPSNRD existing floodplain management measures and practices in conjunction with national and local flood history.



WHAT ARE THE NEXT STEPS FOR THIS STUDY?

- Lincoln and LPSNRD are currently evaluating future climate projections to estimate the impacts of future flood events.
- This information will be presented at the next stakeholder meeting on **October 1, 2019.**
- This study will provide an evaluation of potential flood reduction measures in comparison to current and future climate models to evaluate Salt Creek floodplain's resiliency.
- A public meeting will be held at the conclusion of the study to present the information to the public.

WHAT CAN I DO?

- Share the knowledge you gain with your organization, community, friends, and neighbors.
- Help determine where information gaps exist.

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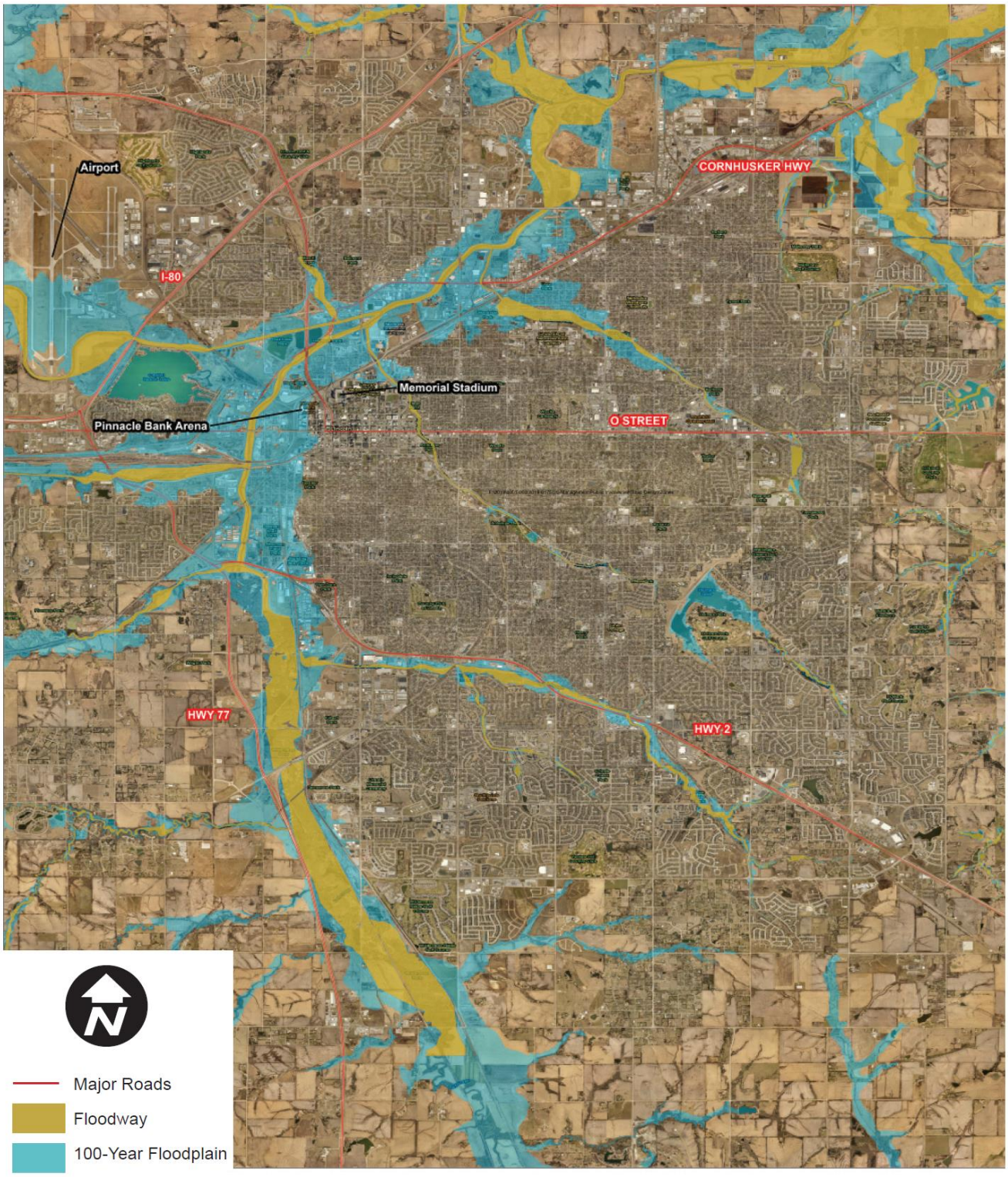
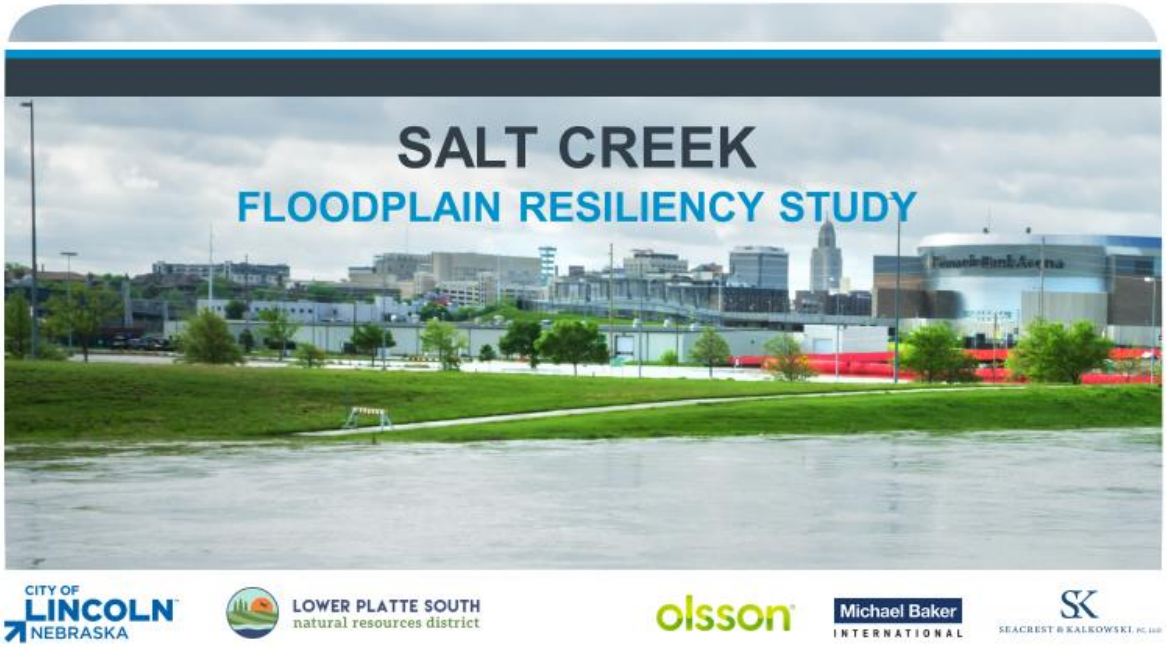
SALT CREEK FLOODPLAIN RESILIENCY STUDY





INTRODUCTIONS

LOWER PLATTE SOUTH natural resources district

CITY OF LINCOLN NEBRASKA

olsson

Michael Baker INTERNATIONAL

SEACREST & KALKOWSKI, PC, LLO

STAKEHOLDER'S ROLE

- Help the project team understand what is known about the Salt Creek Floodplain
- Help educate others about Salt Creek Floodplain resiliency

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GOAL OF THE SALT CREEK RESILIENCY STUDY:

Reduce adverse impacts from flooding to life and property from existing and future flood events.

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STUDY TASKS

- Review Floodplain Best Management Practices (BMPs)
- Review Lincoln and Lancaster County's Current Floodplain Standards and Practices
- Summarize Flood History
- Evaluate Local Climate and Resiliency Standards
- Summarize and Recommend Potential Flood Reduction Measures and Funding Sources
- Prepare a Public Education and Dissemination Plan

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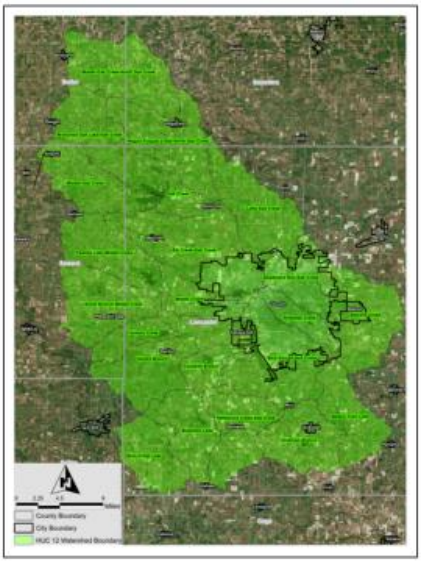
WHY STUDY SALT CREEK?

- Salt Creek is the receiving stream for all the runoff generated within the City of Lincoln and Lancaster County
- Since 1900, 100 floods have been recorded along Salt Creek and its tributaries in and near the City of Lincoln. Of those, 17 were classified as major, 30 as moderate, and 49 as minor.



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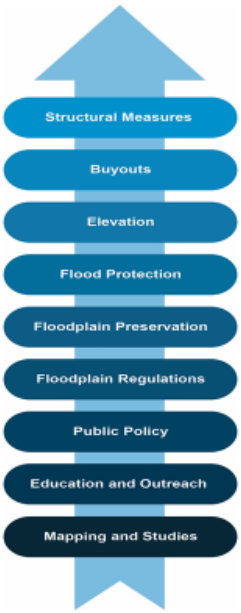
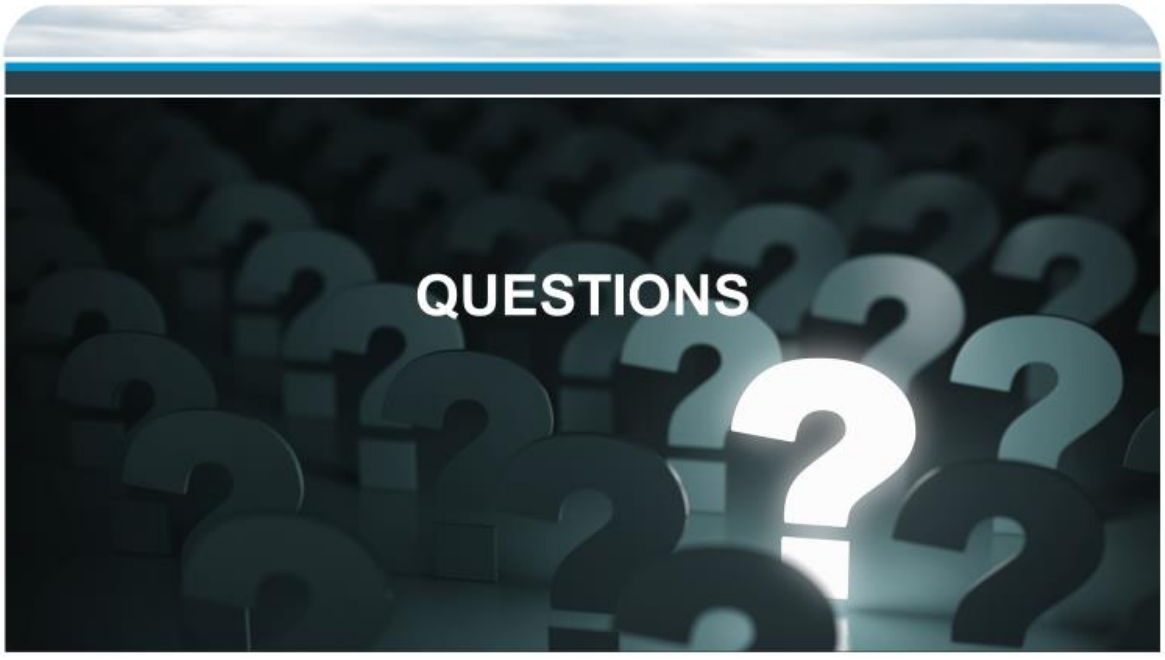
WHAT IS BEING DONE?

- Lincoln and LPSNRD have a Comprehensive Approach to Flood Reduction.





SALT CREEK FLOODPLAIN STAKEHOLDER MEETING 1

SEPTEMBER 10, 2019 | 5:30 -7:30 P.M.
LANCASTER COUNTY EXTENSION OFFICE
MEETING DISSCUSSION

STUDY

WHAT IS THE SCHEDULE OF THE STUDY?

The study will be completed by the end of January 2020.

DOES THIS STUDY INCLUDE UPDATED FLOODPLAIN MAPS?

No. A floodplain map update was not included in the scope. The Salt Creek floodplains were remapped in 2005.

DOES THIS STUDY HAVE A ROLE WITH THE LINCOLN-LANCASTER COUNTY COMPREHENSIVE PLAN LIKE SUGGESTING DIFFERENT STANDARDS WITH BUILDING MATERIALS?

The study will make recommendations on regulations, policy, and flood reduction measures. These recommendations may be incorporated in a general manner into future Lincoln-Lancaster Comprehensive Plan. One example would be a more robust minimum stream corridor standard and green corridor plans.

IS THE FOUNDATION FOR THE STUDY BASED ON CLIMATE CHANGE?

The purpose of study is to develop recommendations to reduce adverse impacts from flooding to life and property, based on current and future flood events. The study includes review of national floodplain best management practices and the potential impacts of a warming climate. Recommended flood control measures will be evaluated using current and future flood events.

FLOODPLAIN

WHAT EVENT IS USED FOR FLOODPLAIN MANAGEMENT REGULATIONS?

The 1% annual chance flood event is the federal, state and local regulatory flood for floodplain mapping and administration purposes. Salt Creek floodplain maps were last updated in 2005.

WHAT ARE OTHER FOLKS "SKIN IN THE GAME," THOSE NOT IN THE FLOODPLAIN?

Large flood events can have devastating, community-wide impacts that go far beyond the impacts to those who were flooded. Economic damages can be a massive burden for a community, particularly one trying to recover from a flood event. Businesses can be disrupted throughout the community because of loss of rail, vehicle, or air services. Loss of power, water supply, or sanitary sewer services can impact the entire community. Loss of tax revenues can lead to budget shortfalls and disruption of future services and infrastructure investment.

DOES THE PACE OF DEVELOPMENT IMPACT THE FLOODPLAIN?

The City of Lincoln adopted detention standards city-wide in the late 1990s, a No Adverse Impact (NAI) policy in 2004 for new growth areas and added storm water quality standards in 2015. These policies have been very effective at reducing the adverse impacts of developments. The NAI policy requires no increase in flood discharges downstream from the property, no backup of floodwaters on upstream properties, no loss of floodplain volume on the developed property, and treatment of runoff for more frequent events to reduce pollutant discharges to streams and lakes. A minimum stream corridor policy was also adapted in 2004, which has significantly increased the amount of natural streams in recent development projects, as well as an associated buffer area for the environment and also helps to protect neighboring properties from flooding and issues with streambank erosion.

SALT CREEK FLOODPLAIN STAKEHOLDER MEETING

FLOODPLAIN

WHAT ARE SOME FLOOD CONTROL PROJECTS LINCOLN HAS COMPLETED?

The City of Lincoln and Lower Platte South NRD have completed many flood control projects, including the Antelope Valley Flood Control Project, the Upper Antelope Creek Flood Reduction Project, the Beal Slough Flood Reduction Project, and the ongoing Deadman's Run Flood Control Project.

WHAT IS THE FLOODWAY AND WHY IS IT LARGER IN SOME AREAS?

The floodplain is the extent of the area that is inundated during a flood event. The floodplain includes shallower areas at the edges, where the flow is not as active. The floodway is the actively flowing portion of the floodplain that must be kept free from obstructions to avoid excess increases to the flood elevations due to "squeezing" the floodplain. In some locations, the active flowing portion of the floodplain is wider and, in some locations, narrower. The floodway is confined to the Salt Creek levees through the levee extents of the levees and through the use of flood storage areas landward of the levees.

PRECIPITATION

WHERE DOES THE RUNOFF GO?

Surface runoff from precipitation events in Lincoln drain to Salt Creek.

IS THE CURRENT CLIMATE REFLECTIVE OF EXISTING DATA?

Is the historical discharge-frequency record indicative of what we can expect for future discharge-frequency events? Not, necessarily. The past climate/rainfall doesn't predict the future. For example, the Technical Paper 40 (TP 40, National Weather Service) precipitation-frequency relationships were developed based on rain gage data from the 1960's or earlier. The updated data from the National Oceanic and Atmospheric Administration (NOAA) NOAA ATLAS 14 precipitation-frequency relationships were developed within the last 5 years. The additional 50 years of data shows an increase in the magnitude of the one percent annual chance (100-year) precipitation event of approximately 10 percent. The trend is an increase in the 100-year precipitation over time. If the precipitation value for a given event stayed relatively constant over time, we would call this "stationarity", this is not what the data suggests.

HOW OFTEN IS THE ANALYSIS OF PRECIPITATION DATA UPDATED?

As noted previously, the TP40 data was used as the standard for floodplain management for more than 50 years. It was replaced with the NOAA Atlas 14 data, which was developed approximately five years ago.

WHY DID FLOODING HAPPEN IN MARCH 2019, EVEN THOUGH THE RAINFALL WAS NOT AS SIGNIFICANT?

Rainfall amount and frequency do not always directly translate into flood frequency. For example, 4.7 inches of rainfall may be a 10 percent annual chance (10-year) event in the spring or summer. However, if the ground is frozen or saturated with water, less of the rain will soak into the ground and more runoff will be generated. The 4.7-inch rainfall event may create a 25-year or 50-year runoff event, if water can't infiltrate into the ground. In March 2019, we had a combination of snow, frozen or saturated ground, and rainfall that resulted in a runoff event that was between a 100-year and 500-year event in magnitude. The rain and snow alone were not sufficient to create such a large event.

SALT CREEK FLOODPLAIN STAKEHOLDER MEETING

PRECIPITATION

HOW DOES PRECIPITATION IMPACT DESIGN STANDARDS FOR DETENTION CELLS, BRIDGES, AND STORM DRAIN SYSTEMS?

- Detention cells are typically designed to offset (mitigate) increased runoff rates due to development for the 2-year, 10-year, and 100-year events.
- Bridges and roadway culverts are typically designed based on the level of service (how much traffic) and location. For example, a residential road in the City of Lincoln may be designed so that water doesn't overtop the structure during the 50-year event. A county road with little traffic may be designed to not overtop during a 5-year event.
- Storm drain systems are designed to convey the 5-year, or 10-year event in the infrastructure pipes. Excess flows travel along the curb and gutter of the street. Typically, the bypassed flows from larger events that don't make it in the storm drain system, are required to be contained within the roadway right-of-way.
- If the rainfall amounts associated with the design event for a detention cell, bridge or culvert for a roadway crossing, or storm drain system change, that can have an impact on the cost to replace that infrastructure. Increased precipitation amounts typically lead to increased costs for the construction and maintenance of drainage features.

IF RAIN EVENTS INCREASE IN FREQUENCY AND VOLUME SHOULD THE CITY LOOK AT CHANGING STANDARDS, OR FLOOD CONTROL SOLUTIONS?

This is a foundational study to examine potential future measures for floodplain management and flood control. New regulations and flood control measures may be part of the recommendations that come forward from this report; but, are not specifically being brought forward for formal approval at this time.

STREAMFLOW

WHAT IS THE DIFFERENCE BETWEEN PRECIPITATION DATA AND DISCHARGE DATA?

Precipitation data is recorded by rain gages and is the measure of how much rainfall occurred. Precipitation data is usually measured and reported on an hourly or daily basis. Streamflow data is the measure of how much water is flowing in the stream. Streamflow can be measured on a continuous basis and we typically use the peak annual streamflow (peak streamflow for each year of the stream gage record) to analyze extreme flood events and develop an estimate of the flows for the one percent annual chance, or 100-year, regulatory event.

WHAT DO UNITED STATES GEOLOGICAL SURVEY (USGS) STREAM GAUGES MEASURE?

Stream gages measure how much water is flowing in a stream. The measurement is reported in cubic feet per second (cfs). Stream gage data is available from USGS, USGS Current Water Data for Nebraska.

WHAT IMPACTS STREAMFLOW?

Generally, the amount of flow in a stream is a result of the precipitation received and the ground surface conditions in the watershed. The more impervious (paved areas, roof tops, etc.) areas there are within a watershed, the greater and quicker the amount of runoff will be generated for a given rainfall event. If soils are saturated (can't soak up any more water), or if the ground is frozen, that can also lead to more runoff.

WHAT ROLE DOES TEMPERATURE PLAY IN STREAM DISCHARGE?

Increases in atmospheric temperature have a direct influence on precipitation. Increased precipitation leads to increased stream discharges.

WHAT ARE STORM WATER QUALITY CHALLENGES?

Water quality is different than floodplain management but some design items offer a benefit to both. Healthy floodplain corridors and minimum buffer stream corridors that include green spaces, can help improve water quality along our streams.

SALT CREEK FLOODPLAIN STAKEHOLDER MEETING

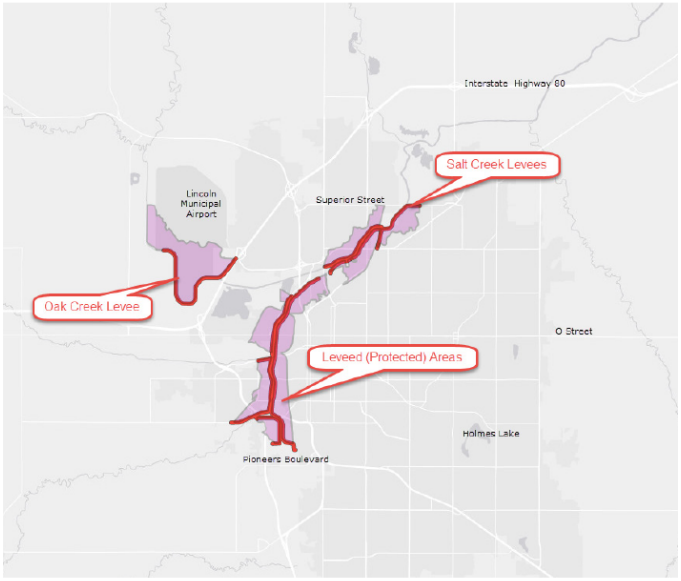
LEVEES

WHAT IS A LEVEE?

A man-made structure, usually an earthen embankment, designed and constructed to contain, control or divert the flow of water to reduce the risk from temporary flooding. Levees are typically built parallel to a water way, to reduce risk on the "landward" side.

WHERE ARE THE LEVEES LOCATED AND WHAT AREAS DO THEY PROTECT?

The Salt Creek levees are along either bank of Salt Creek from Calvert Street in the south to Superior Street in the north (area red below). The levees protect numerous neighborhoods, commercial, and industrial areas (area in pink). The levees also help to provide protection for critical infrastructure like the Theresa Street Wastewater Treatment Facility and the Lincoln Electric System facility along North 27th Street.



BASED ON NOAA ATLAS 14, IS THERE AN INCREASE RISK IN DOWNTOWN?

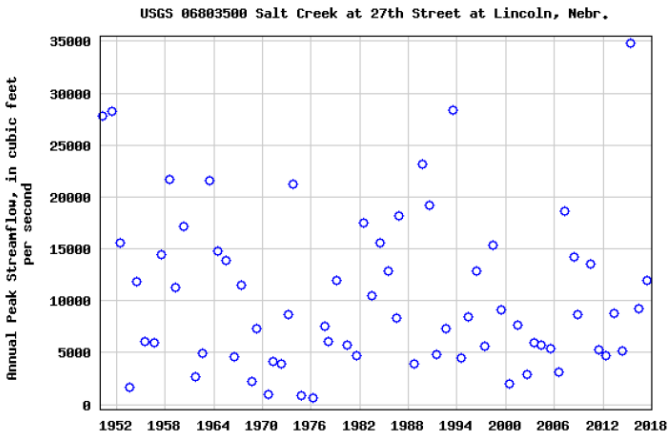
All the areas protected by the Salt Creek levees are at increased risk of flooding and flood damages. This includes the areas on the west and north side of downtown Lincoln.

WHAT ARE THE CONDITIONS THAT WOULD CAUSE LEVEE OVERTOPPING?

The levee generally provides protection and does not overtop for the approximate two percent annual chance (50-year) flood event. Minimal overtopping of the levees occurred during the May 2015 flood event.

SINCE THE LEVEE SYSTEM WAS INSTALLED IN THE 1960'S, IN THE LAST 50 YEARS , HOW MANY FLOODING EVENTS HAS LINCOLN EXPERIENCED?

According to the USGS Gage 06803500, the flows in Salt Creek at North 27th Street have exceeded the 10-year flow rate seven times since 1970. The 50-year flow rate has been equaled or exceeded three times, and the 100-year flow event was exceeded once in 2015. The flood stage flow for the gage is approximately 16,000 cfs. The peak flow rates are 18,500, 24,000, and 30,100 cfs for the 10-year, 50-year, and 100-year events, respectively.

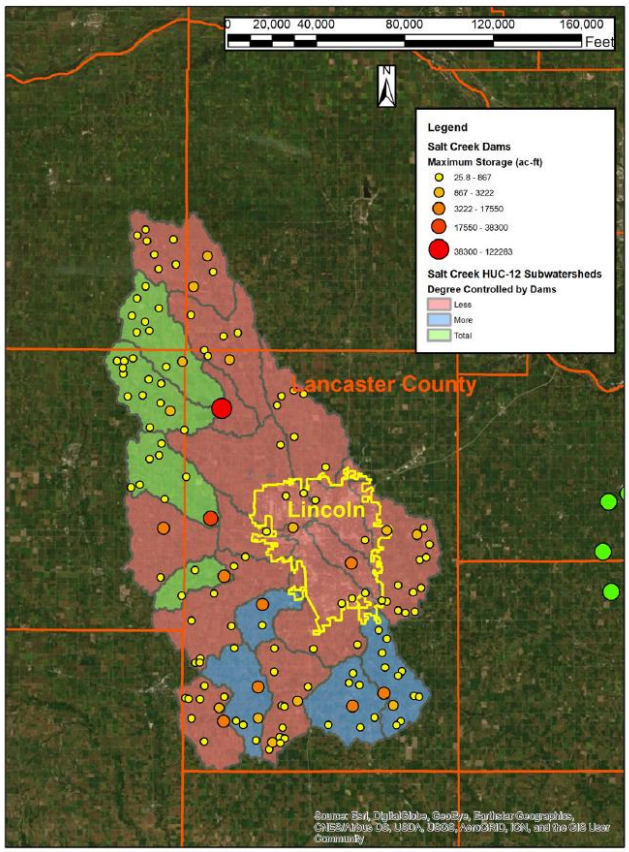


SALT CREEK FLOODPLAIN STAKEHOLDER MEETING

RESERVOIRS

ARE THERE FLOOD CONTROL RESERVOIRS (DAMS) IN THE SALT CREEK WATERSHED?

The Salt Creek and Tributaries Flood Control Project in Nebraska was authorized by the Federal Flood Control Act of 1958 to provide flood damage reduction, water quality, recreation, and fish and wildlife enhancement. The basin drains a 1,645 square mile area of southeastern Nebraska, encompassing the City of Lincoln. Salt Creek enters the Platte River from the right bank 25 miles southwest of Omaha and drains the southern and western part of the basin, while Wahoo Creek drains the northeastern portion. The ten Salt Creek Lakes, in addition to providing flood control, also furnish much needed recreation for local residents as well as providing vital habitat for wildlife (red and orange dots on the map below). These projects control flooding 11,239 acres. The Army Corps of Engineers leases all but one of its Salt Creek Reservoirs to the Nebraska Game and Park Commission (NGPC). These projects are referred to as the Salt Valley Lakes. Holmes Lake is leased to the City of Lincoln.



Salt Creek flood control reservoirs include:

Holmes Lake
Bluestem Lake
Branched Oak Lake
Conestoga Lake
Olive Creek Lake
Pawnee Lake
Stagecoach Lake
Twin Lakes WMA
Wagon Train Lake
Yankee Hill Lake WMA

LPSNRD flood control reservoirs include:

Cottontail Lake
Meadowlark Lake
Merganser Lake
Red Cedar Lake
Tanglewood Lake
Timber Point Lake
Wild Plum Lake
Wildwood Lake

SALT CREEK FLOODPLAIN STAKEHOLDER MEETING

DETENTION

WHAT DOES NO ADVERSE IMPACT MEAN?

No Adverse Impact (NAI) means the action of one property owner does not negatively impact the flooding risk for other properties.

WHAT IS A DETENTION AREA AND WHAT DOES IT DO?

Development creates more runoff due to more impervious surfaces, which causes an increase in runoff, quicker stormwater runoff to the stream and an easier path for pollutants to get to local streams and lakes. Developments are required to maintain the runoff rates from preexisting development conditions and to account for stormwater quality discharges. Detention areas and stormwater quality areas are the areas reserved for holding stormwater, slowing it down to reduce runoff rates, and improve the downstream water quality.

Based on the new precipitation data (NOAA Atlas 14) future detention cells may need to be larger to accommodate the increased runoff that comes with larger rainfall events. The one percent annual chance flood event from Atlas 14 is approximately 10 percent larger than the precipitation used for the 100-year design storm today.

WHAT OTHER SPACES CAN BE USED FOR DETENTION?

The green space in city parks often provide flood storage as well as outlots in residential and commercial developments. One example of flood storage in a park is Wilderness Park along Salt Creek.

CONTACT INFORMATION

Website: www.saltcreekstudy.com
Email: saltcreek@olsson.com

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2.2. Stakeholder Meeting 2

Stakeholder Meeting 2 was held October 25, 2019, from 11:30AM-1:00PM at the Lancaster County Extension office 444 Cherrycreek Road. The purpose of the meeting was to review best management practices for floodplain management, review the climate evaluation, review study recommendations for non-structural and structural measures, and review funding opportunities for project implantation. 14 of the 29 stakeholders attended the meeting and discussed information presented at the meeting as show in Table 3. Stakeholder Meeting 2 Invitation List.

Table 3. Stakeholder Meeting 2 Invitation List

Initial	Name	Organization Name	Email
X	Taylor Wyatt	Home Builders Association of Lincoln	taylor@HBAL.org
X	Ben Higgins	Watershed Management	watershed@lincoln.ne.gov
X	Brian Dunnigan	Olsson	bdunnigan@olsson.com
X	Carter Hubbard	Olsson	chubbard@olsson.com
	Chad Blahak	Lincoln Building and Safety	bldgsafe@lincoln.ne.gov
	Dan Duncan	University of Nebraska Lincoln	dduncan1@unl.edu
	Dan Steinkruger	NRD Director	dsteinkruger.nrd@outlook.com
	David Haring	Lincoln Airport Authority	dharing@lincolnairport.com
X	David Landis	NRD Director	dlandis2@unl.edu
	Deb Schorr	Lancaster County Commissioner	dschorr@lancaster.ne.gov
X	Donna Garden	Transportation and Utilities	DGarden@lincoln.ne.gov
X	Emily Bausch	Olsson	ebausch@olsson.com
	Gary Bentzinger	AG Producer/Rural Land Owner	
X	Grant Daily	South Salt Creek Community Organization	grant.daily@nwlincoln.org
X	J.D. Linscott	Lincoln Electric System	jlinscott@les.com
X	James Davidsaver	Lancaster County Emergency Manager	jdavidsaver@lancaster.ne.gov
	Jane Raybould	Lincoln City Council	jraybould@lincoln.ne.gov
X	Jared Nelson	Lower Platte South NRD	jnelson@lpsnrd.org
	Joey Hausmann	Hausmann Construction	joeyh@hausmannconstruction.com
X	Kara Burwell	Olsson	kburwell@olsson.com
	Ken Fougeron	Speedway Properties	kgfougeron@speedwayproperties.com
	Kim Morrow	Verdis	kim@verdisgroup.com
	Leo Schumacher	Lincoln Federal Savings Bank	lschumacher@lincolnfed.com
X	Marc LeBaron	Lincoln Industries	marc.lebaron@lincolnindustries.com
	Nick Cusick	Bison	ncusick@bisoninc.com
X	Paul Barnes	Planning Department	PBarnes@lincoln.ne.gov
X	Paul Zillig	Lower Platte South NRD	pzillig@lpsnrd.org
X	Penny Costillo	Friends of Wilderness Park	friendsofwildernesspark@gmail.com
	Roy Christensen	Lincoln City Council	rchristensen@lincoln.ne.gov
X	Shelly Simonson	Lincoln Federal Savings Bank	SSimonson@LincolnFed.com
	Ted Triplett	Belmont Neighborhood Association	ted_triplett@yahoo.com
X	Todd Wiltgen	Lincoln Chamber of Commerce	TWiltgen@lcoc.com
	Tracy Corr	Neighborhood Roundtable	tlines24@hotmail.com
	Tracy Straatmeyer	Northridge Heights	tstraatmeyer@hotmail.com

SALT CREEK FLOODPLAIN RESILIENCY STUDY

STAKEHOLDER MEETING 2

October 25, 2019 11:30am -1:00pm
Lancaster County Extension Office – 444 Cherrycreek Road, STE A

AGENDA

Stakeholder Meeting 1 Review (5 minutes)

Distribution of information sheet from Stakeholder Meeting 1
Questions/discussion

Salt Creek Floodplain Resiliency Study

1. Floodplain Best Management Practices (BMPs) (10 minutes)
Best Management Practices summary sheet
Best Management Practices Online Resources
Questions/discussion

2. Climate data and evaluation (30 minutes)
Climate Evaluation summary sheet
Questions/discussion

3. Recommended Non- Structural Floodplain Measures (15 Minutes)
Non-Structural Measures summary sheet
Questions/discussion

4. Recommended Structural Floodplain Measures (15 Minutes)
Questions/discussion

5. Funding Information (10 Minutes)
Funding Evaluation summary
Questions/discussion

Summary and next steps (5 minutes)

1. Public meeting date - TBD

2. Study timeline
Presentation to council - TBD
Full published study - TBD

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PUBLIC OUTREACH AND EDUCATION

Source: Federal Emergency Management Agency and Army Corps of Engineers

Topic: **Levee**

Resources:

- What is a Levee
- So, You Live Behind A Levee
- Living with Levees: Ideas Effective Outreach
- National Levee Database

Reason: According to the National Levee Database, Salt Creek levee systems are associated with 1,229 structures at risk, 5,912 people at risk, and $847 million in property value. Effective outreach to residents affected by these levee systems could significantly improve flood preparedness and resiliency.

Opportunity: Lincoln could develop its own fact sheet that is specifically tailored to the Salt Creek levee systems.

Source: National Oceanic and Atmospheric Administration (NOAA)

Topic: **Disaster Preparedness**

Resources:

- Weather Ready Nation Website
- National Weather Service Flood Related Products
- Weather Ready Nation Ambassadors: In Their Own Words
- NOAA National Weather Service Flood Safety Tips and Resources
- Preparation Before a Flood
- Informed Response During a Flood
- Proper Action After a Flood

Reason: Preparation and awareness are critical before, during, and after a disaster.

Opportunity: Institutionalizing NOAA's Weather Ready Nation principles can help the City of Lincoln increase its resilience to extreme weather and flooding.

PUBLIC OUTREACH AND EDUCATION

Source: Pew Trust

Topic: **Hazard Mitigation**

Resources:

- Pew Charitable Trusts Flood Prepared Communities Project
- It's Time to Make U.S. Infrastructure Flood-Ready Video
- National Institute of Building Sciences Multihazard Mitigation Council Resources

Reason: The Flood-Prepared Communities project resources are specifically tailored to help drive policy at the national level and to provide states and local communities with tools that can better communicate the value of flood mitigation to elected officials.

Opportunity: Establishing clear lines of communication with elected officials to drive flood risk mitigation planning and implementation will be a priority if subsequent policy changes are necessary.

Source: National Academy of Sciences Committee on Urban Flooding

Topic: **Flood Risk**

Resources:

- Framing the Challenges of Urban Flooding in the United States

Reason: There are important aspects of urban flooding, such as the effectiveness of stormwater systems, the importance local drainage patterns, and site-specific drainage designs, are often overlooked as critical factors in flood risk across a community. Innovative solutions are needed to better identify and communicate this risk.

Opportunity: Analyzing and communicating that nonriverine urban flooding risk will lead to greater preparedness for a full spectrum of different types of flooding that may occur.

COLLABORATION

Source: Resilient Nation Partnership Network (RNPN)

Topic: **Resiliency and Risk Reduction**

Resources:

- Resilient Neighbors Framework

Reason: Partnerships are critical to successful resilience initiatives. These partnerships may range from something as simple as a coordination call or as in depth as funding pursuits or pursuing the advancement of flood resilient policy.

Opportunity: Participation in the RNPN's annual forum that is held each year in Washington D.C. to learn about the latest trends and issues impacting resilience and how we can collectively prepare for tomorrow's risks.

PUBLIC POLICY

Source: Pew Trust

Topic: **Risk Reduction**

Resources:

• Prioritizing Flood-Ready Infrastructure: Statement of Principles

Reason: The Flood-Prepared Communities project and the Statement of Principles strategically links mitigation efforts with the need to build political support and momentum. Joining forces to build a political platform focusing on reducing flood risk vulnerability and proactive efforts to protect life and property can result in the necessary momentum to move public policy forward. Involvement in larger, organized mitigation communities can garner public support and city council approval, and it can validate the need for funding resources.

Opportunity: Improve resiliency requirements for buildings and infrastructure systems built before and after flood-related catastrophes. Enhance the use of natural defenses in planning and preparedness and reduce unsustainable development in high-risk areas.

Source: National Academy of Sciences Committee on Urban flooding

Topic: **Environmental Justice**

Resources:

• Framing the Challenges of Urban Flooding in the United States

Reason: Research suggests that the impacts of flooding tend to fall disproportionately on socially vulnerable populations, including children, the elderly, nonwhite, immigrants, non-native English speakers, disabled, homeless, poor, renters, and those with low educational attainments. These groups are more vulnerable to flooding because they are more likely to reside in flood zones, have less mobility, lower awareness of flood hazards, higher rates of mortality, and lower resilience to recover after a flood event.

Opportunity: Public outreach and mitigation projects should be targeted specifically at socially vulnerable populations. Targeting outreach to these populations is critical to facilitating increased flood awareness. Planning mitigation projects to specifically benefit areas with high social vulnerability is more likely to mitigate the social impacts of future flooding. When crafting policy, it is also critical to include those who serve socially vulnerable populations to avoid creating unintended exclusivity of policy and that the policies will best meet the intention for all populations.

LAND USE

Source: National Oceanic and Atmospheric Administration (NOAA)

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Topic: **Preservation**

Resources:

- How to Map Open Space for the Community Rating System
- CRS for Community Resilience Green Guide
- A Guide to Assessing Green Infrastructure Costs and Benefits for Flood Reduction

Reason: In the Salt Creek floodplain, the preservation of open space is critical to flood reduction strategies. Infiltration, storage capacity, uptake of water by vegetation, and more all have significant impact.

Opportunity: Preserving green space within the floodplain and throughout the community, Lincoln can potentially receive additional credits for their Community Rating System participation.

TECHNICAL MODELING/MAPPING

Source: Technical Mapping Advisory Council (TMAC)

Topic: **Mapping and Residual Risk**

Resources:

- TMAC National Floodplain Mapping Review
- TMAC Annual Report – 2017
- TMAC Future Conditions Risk Assessment and Modeling Report

Reason: Residual risk areas associated with levees and dams are of great concern. "Residual risk" is the risk that remains after consideration of natural or human-induced measures to reduce known risks.

Opportunity: Awareness of FEMA floodplain mapping trends allows the City of Lincoln to consider and prepare for the impacts of these changes before they are rolled out and perhaps to get involved in the conversation that will develop future guidance.

OPERATIONS

Source: Federal Emergency Management Agency and Army Corps of Engineers

Topic: **Levee**

Resources:

- Fact Sheet - Meeting the Criteria for Accrediting Levee Systems
- FEMA - Levees Frequently Asked Questions
- CFR 44 65.10 - Mapping of areas protected by levee system

Reason: Revising operations and maintenance plans to align with FEMA regulations will not result in accredited levees – the Salt Creek levee system is designed to overtop during the 2 percent annual chance flood event.

Opportunity: These materials can still provide a resilience benefit by assisting with planning for operations and emergencies, so the community is safer and better prepared.

Source: National Oceanic and Atmospheric Administration (NOAA)

Topic: **Disaster Preparedness**

Resources:

- Preparation Before a Flood
- Informed Response During a Flood
- Proper Action After a Flood
- NOAA National Weather Service Flood Safety Tips and Resources

Reason: Preparation and awareness are critical before, during, and after a disaster.

Opportunity: Establish a culture of preparedness and a well-informed public. The City of Lincoln or Lincoln-Lancaster County Emergency Management could share information with community using these ready-made resources.

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CLIMATE EVALUATION AND RESILIENCY STANDARDS

Why use future climate predictions to evaluate resiliency?

Historical data, existing precipitation patterns, and future climate predictions can be used to help understand the potential magnitude of future storm magnitudes and flood discharges. These analyses of the future potential flood hazards can then be used to develop strategies to minimize future flood impacts.

How are floodplain maps created?

Floodplain designations are established or revised when new and more accurate information becomes available. Flood Insurance Rate Maps (FIRMs) are developed based on statistical analyses of records of streamflow, rainfall, hydrologic and hydraulic analyses, topographic surveys, and information obtained through consultation with the community.

What is discharge and how is it measured?

Discharge is the volume of water moving down a stream, commonly expressed in cubic feet per second (cfs). In general, stream discharge is computed by multiplying the area of water in a channel cross section by the average velocity of the water in that cross section. (1 cubic foot per second = 450 gallons per minute)

What is a hydrologic analysis?

An analysis of the rates of precipitation over time, the quantity of water produced, the rate of surface runoff, and the timing of its arrival at a point.

What is a hydraulic analysis?

An analysis of the movement of water flow in rivers, streams, and storm drain networks.

What data was used to create the City of Lincoln's "existing" floodplain conditions, which is what is depicted on the current floodplain maps?

Precipitation values derived from U.S. Weather Bureau's Technical Paper No. 40, which dates from 1961, and the associated stream discharges.

What data is used to create the City of Lincoln's "updated" floodplain conditions?

Precipitation values from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Volume 8 and associated stream discharges. This is the most current data set and represents the current flood risks.

What data is used to create the "future" floodplain conditions?

Future conditions include updated precipitation values from NOAA Atlas 14 along with precipitation changes that are forecasted by climate change and the associated stream discharges, as well as the influences of future land use changes.

What is the difference between the "existing" and "updated" floodplain conditions?

The "updated" conditions (NOAA Atlas 14 data) shows that discharges are approximately 12% higher for the one percent annual chance flood and approximately 27% higher for the .2 percent annual chance flood when compared to the "existing" floodplain conditions.

What is the difference between the "existing" and "future" floodplain conditions?

The "future" conditions shows that discharges are approximately 28% higher for the one percent annual chance flood and approximately 45% higher for the .2 percent annual chance flood when compared to the "existing" floodplain conditions.

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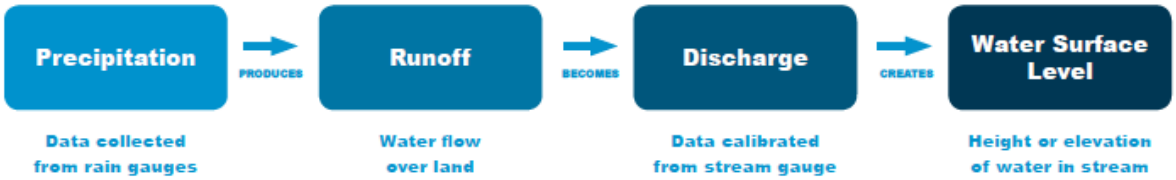
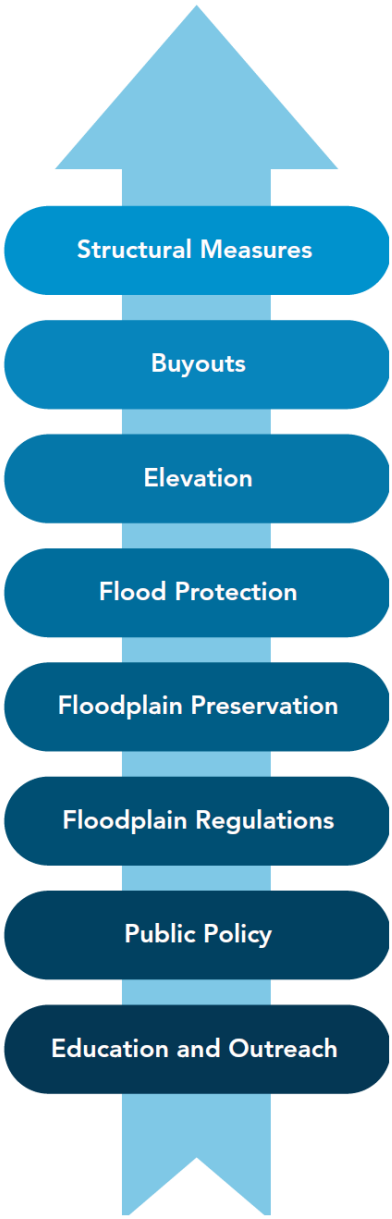
Hydrology and Hydraulic Analysis



Floodplain Models

Existing	Technical Paper 40	Runoff	Discharge	Current Floodplain Map (FIRM)
Updated	NOAA Atlas 14	Runoff	Discharge	New Profile
Future	All precipitation data + model precipitation to 2100	Runoff + Land Use (future land use map)	Discharge	New Profile

NON-STRUCTURAL RECOMMENDATION



Voluntary Buyout Program

For structures located in the floodplain an offer to purchase the property and removal of the structures to prevent future damage or loss.

Setbacks and Riparian Preservation

Offer a larger buffer to protect life and property from risk and reduce the impacts.

Cluster Subdivisions

In sensitive areas grouping houses on smaller lots outside flood prone areas and preserving green space and reducing risk.

Overlay Zoning District

Additional zoning guidance and restrictions for areas within a floodplain. Restrictions could include type of use, building standards to protect from flood hazards, setbacks to keep structures out of harms way.

Low Impact Development Regulations

Benefits of LID are stormwater quality improvements, reducing runoff rate, and diminishing impacts of impervious surfaces.

Higher Floodplain Management Standards

Increase regulatory standards for freeboard and restricting allowable uses within flood prone areas.

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FUNDING EVALUATION

Federal Emergency Management Agency (FEMA)

Pre-disaster Mitigation (PDM) Grant Program provides funding for HMPs and the implementation of mitigation projects prior to a disaster. Non-structural floodplain management activities such as property acquisition, structure relocation, and dry floodproofing are just a few of the eligible activities.

Flood Mitigation Assistance (FMA) Grant Program provides funding to implement measures that reduce or eliminate the long-term risk of flood damage to buildings insured under the National Flood Insurance Program (NFIP). The FMA Grant Program is focused on mitigating repetitive loss structures.

Hazard Mitigation Grant Program (HMGP) provides funding to implement long-term hazard mitigation measures after a major disaster declaration. HMGP funds may be used to fund projects that will reduce or eliminate the losses from future disasters.

United States Army Corps of Engineers (USACE)

Flood Plain Management Services provides technical assistance for effective floodplain management.

Continuing Authorities Program provides study, design, and construction for small flood control projects.

Planning Assistance to States provides technical assistance for comprehensive plans for the development, utilization, and conservation of water and related land resources.

Natural Resource Conservation Service (NRCS)

Watershed Protection and Flood Prevention Program (WFPO) provides funding and technical assistance for projects. Works together with Federal and local agencies to prevent erosion; floodwater and sediment damage; to further the conservation development, use and disposal of water; and to further the conservation and proper use of land in authorized watersheds.

Nebraska Natural Resource Commission (NRC)

Water Sustainability Fund (WSF) provides funding to eligible projects, programs, and activities that lead to the sustainability of Nebraska's water resources. Eligible types of projects include flood control, reducing threats to property damage, agricultural uses, municipal and industrial uses, recreational benefits, wildlife habitat, conservation, and preservation of water resources projects.

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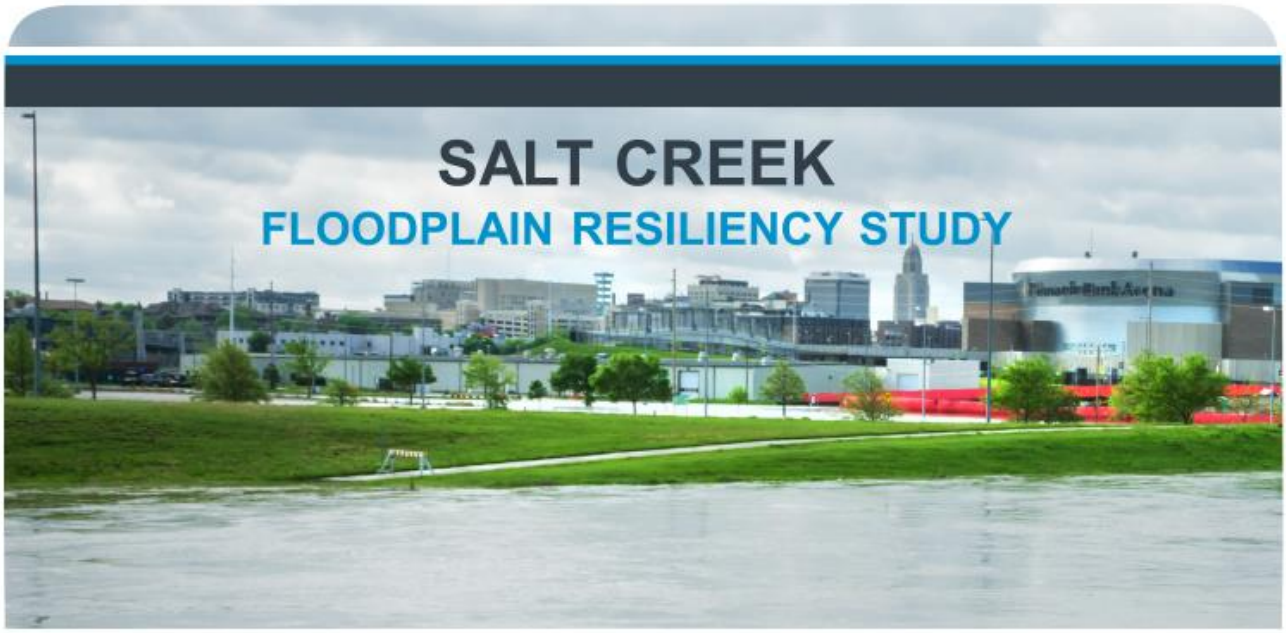
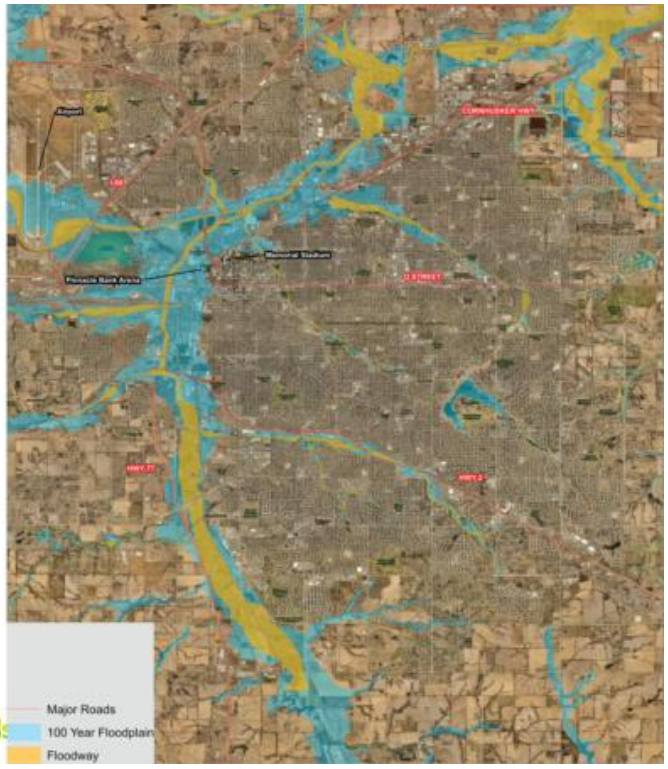


Welcome

Agenda

1. Stakeholder Meeting 1 Review
   - Review sheet
2. Salt Creek Floodplain Resiliency Study
   - Floodplain Best Management Practices
   - Best Management Practices Resources
3. Climate data and evaluation
   - Climate Evaluation summary sheet
4. Non- Structural Floodplain Measures
   - Summary Sheet
5. Structural Floodplain Measures
6. Funding Information
   - Summary Sheet
7. Wrap-up



Goal of the salt creek resiliency study

Evaluate adverse impacts from flooding to life and property from existing and future flood events.

Stakeholder Meeting 1

Summary

- Study
- Floodplain
- Precipitation
- Streamflow
- Levees
- Reservoirs
- Detention

Best Management Practices BMPs

What is floodplain management?

What are "Non-structural" floodplain management measures?

What are "Structural" floodplain management measures?

How can I get more information about BMPs?

BMP Resources

SALT CREEK FLOODPLAIN RESILIENCY STUDY

PUBLIC OUTREACH AND EDUCATION

Source: Federal Emergency Management Agency and Army Corps of Engineers

Topic: **Levee**

Resources:

- What is a Levee
- So, You Live Behind A Levee
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Reason: According to the National Levee Database, Salt Creek levee systems are associated with 1,229 structures at risk, 5,912 people at risk, and $847 million in property value. Effective outreach to residents affected by these levee systems could significantly improve flood preparedness and resiliency.

Opportunity: Lincoln could develop its own fact sheet that is specifically tailored to the Salt Creek levee systems.

Source: National Oceanic and Atmospheric Administration (NOAA)

Topic: **Disaster Preparedness**

Resources:

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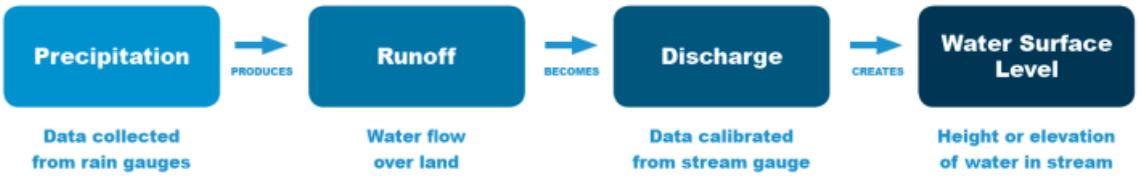
- Proper Action After a Flood

Reason: Preparation and awareness are critical before, during, and after a disaster.

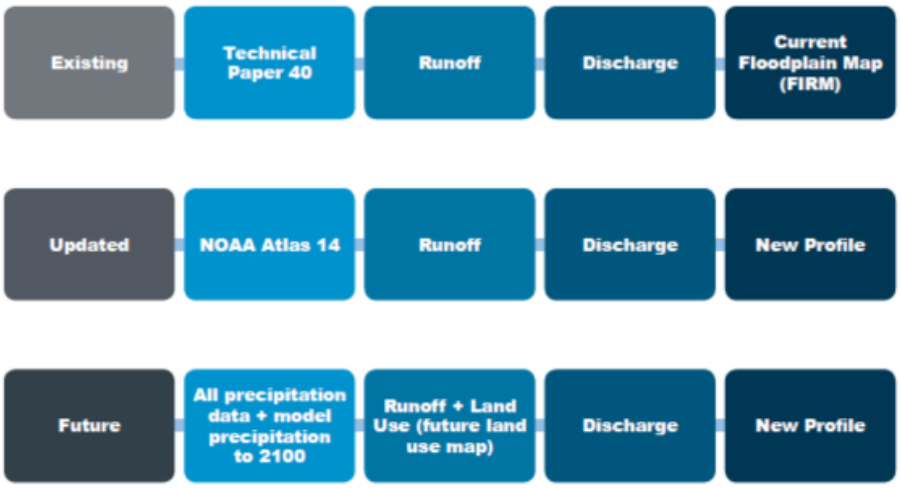
Opportunity: Institutionalizing NOAA's Weather Ready Nation principles can help the City of Lincoln increase its resilience to extreme weather and flooding.

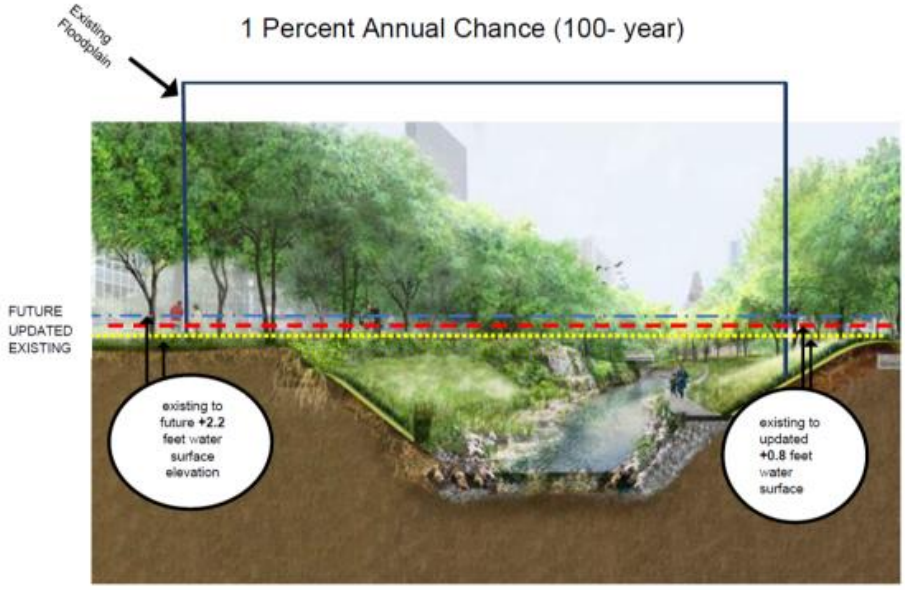
How are floodplain maps created?

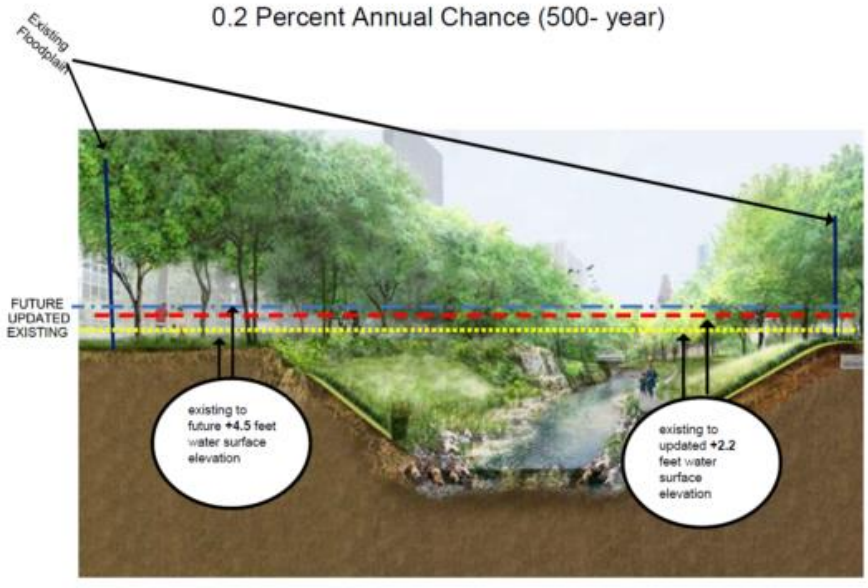
Hydrology and Hydraulic Analysis



Floodplain Models




1 Percent Annual Chance (100- year)
Existing Floodplain
FUTURE
UPDATED
EXISTING
existing to future +2.2 feet water surface elevation
existing to updated +0.8 feet water surface


0.2 Percent Annual Chance (500- year)
Existing Floodplain
FUTURE
UPDATED
EXISTING
existing to future +4.5 feet water surface elevation
existing to updated +2.2 feet water surface elevation

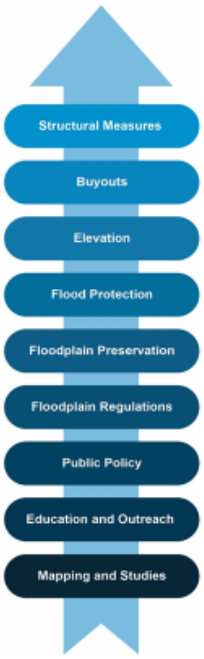
What is the difference between the **existing** and **updated** floodplain conditions?

When compared to the **"existing" floodplain condition:**

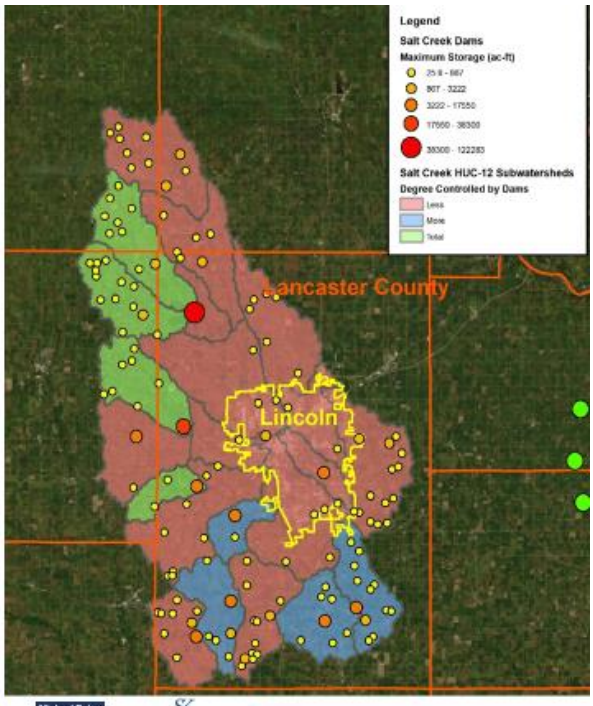
- **"updated"** conditions shows that discharges are approximately 12% higher for the one percent (100-year) annual chance flood
- **"updated"** conditions shows that discharges are approximately 27% higher for the .2 percent (500-year) annual chance flood

Non-Structural Recommendations

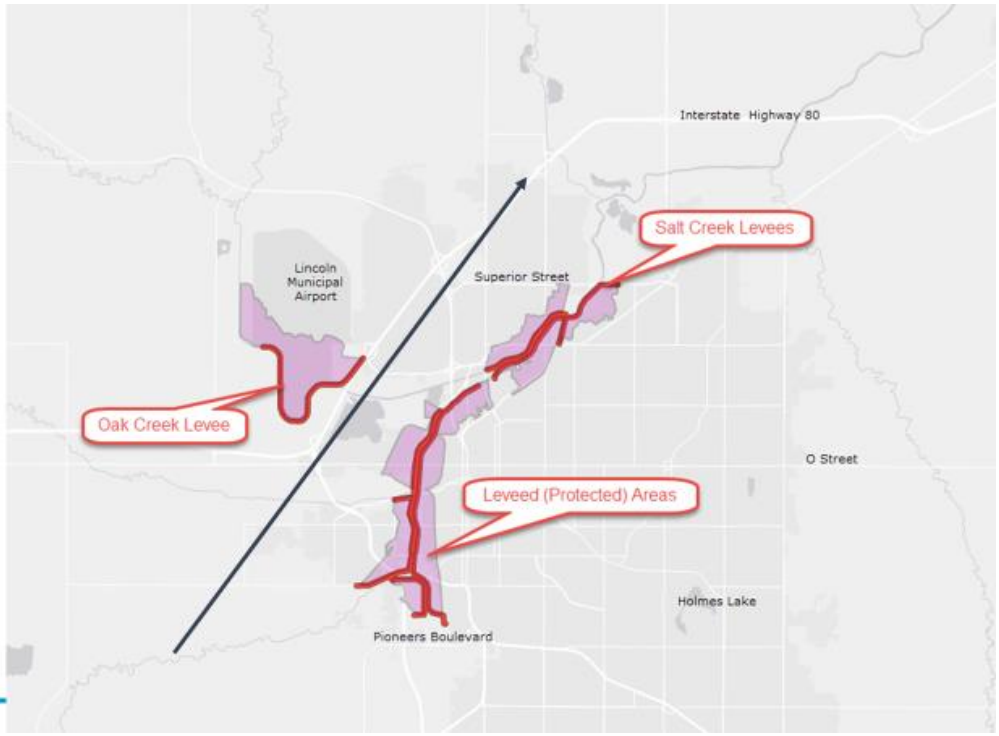
- Voluntary Buyout Program
- Setbacks and Riparian Preservation
- Cluster Subdivisions
- Overlay Zoning District
- Low Impact Development Regulations
- Higher Floodplain Management Standards



Existing Structural Measures



Salt Creek Floodplain Study Results



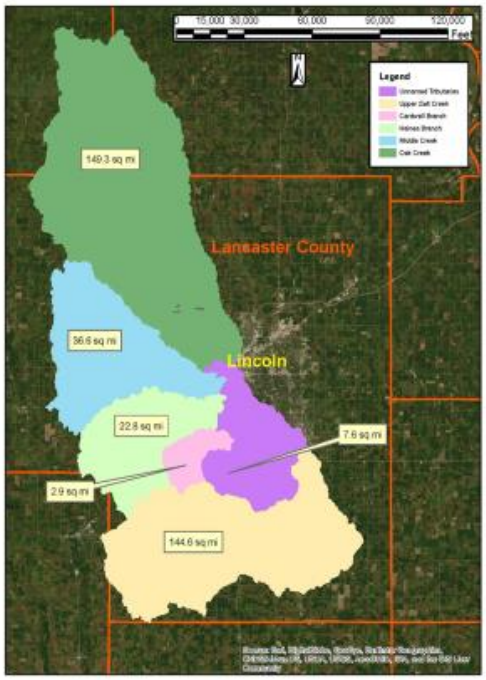
Streamflow south to north

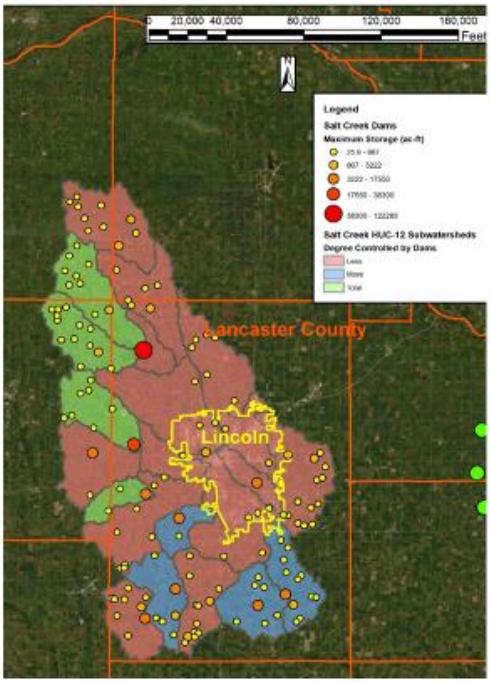
EXISTING FLOODPLAIN

EXISTING FLOODPLAIN
UPDATED FLOODPLAIN

EXISTING FLOODPLAIN
UPDATED FLOODPLAIN
FUTURE FLOODPLAIN

To preserve the updated condition, 16 flood control structures in the Salt Creek basin were conceptually analyzed.





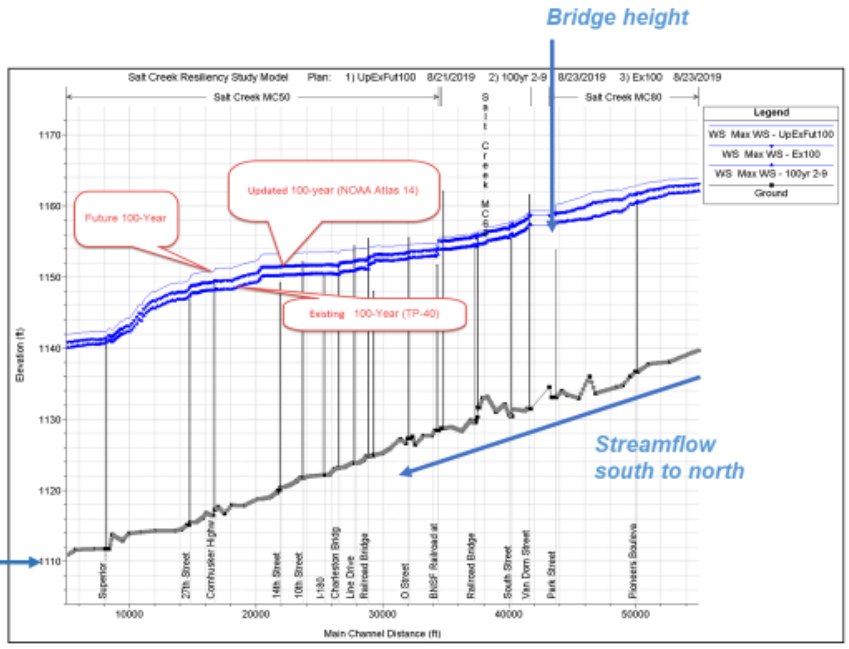
Funding Opportunities

- Federal Emergency Management (FEMA)
- United States Army Corps of Engineers (USACE)
- Natural Resource Conservation Service (NRCS)
- Nebraska Natural Resource Commission (NRC)
- Nebraska Environmental Trust (NET)
- Nebraska Department of Environment and Energy (NDEE)

Salt Creek without Structural Flood Control

Flood profiles of Salt Creek Levee area 100 year (1%)

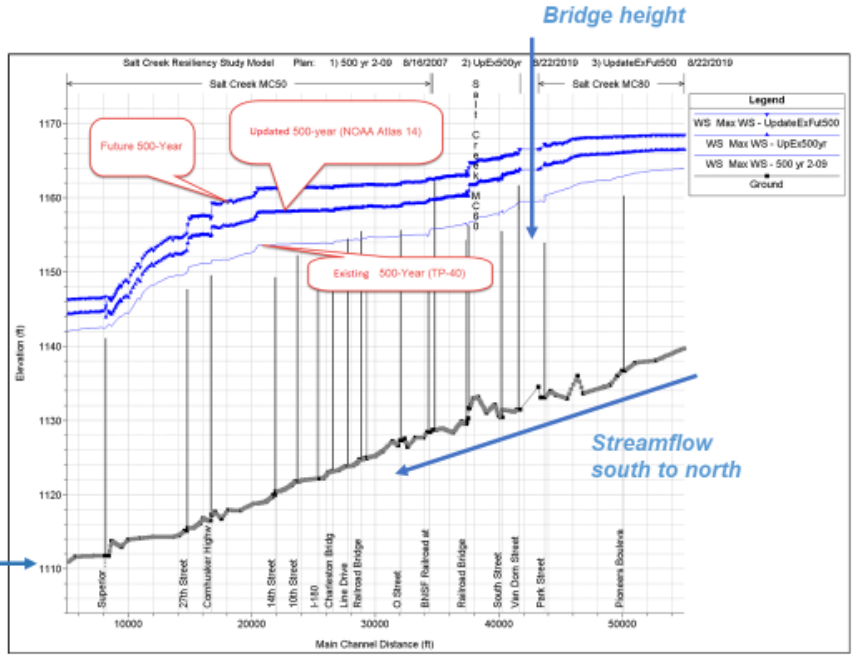
Salt Creek channel ground level



Salt Creek without Structural Flood Control

Flood profiles of Salt Creek Levee area 500 year (.2%)

Salt Creek channel ground level



2.3 Stakeholder Meeting 3

Stakeholder Meeting 3 is planned for April 2020.

3. WEBSITE

For the content and materials for this project a website was developed, https://www.saltcreekstudy.com. The purpose of the website was to be a tool for staff, stakeholders, and the public to navigate the study content. The first stakeholder meeting included basic information about floodplain management. The second stakeholder meeting covered information about climate models and provided a summary of the study including recommended best management practices. The final stakeholder meeting will provide a full review the study and discussion of the executive summary. The website documents are designed to link users to source documents and additional information.

4. PUBLIC MEETING

The Lower Platte South Natural Resource District will review the study at their April 15, 2020 board meeting. The City Council will review the study at their April 20, 2020 council meeting. A public meeting will be scheduled the week of April 27, 2020, for public review of the final study and stakeholder meeting documents.

SALT CREEK RESILIENCY STUDY

Lincoln, NE - 2020

March 2020

Olsson Project No. 019-0175