UPPER JOACHIM CREEK FLOODPLAIN MANAGEMENT PLAN DRAFT FINDINGS

U.S. Army Corps of Engineers
St. Louis District
June 20, 2019

US Army Corps of Engineers®

AGENDA

1. Introduction of partners
2. Background and coordination of Floodplain Management Plan
3. Report contents
4. Summary of Findings
5. Highlights of significant measures to reduce flood risk
6. Action Plan
7. Potential Funding Sources
8. Next Steps
9. Q&A
10. End of formal meeting / opportunity to meet with partners

PARTNERS

Flood Forum, USA

City of De Soto, MO

Citizen's Committee for Flood Relief

FLOODPLAIN MANAGEMENT PLANNING

Follows a 10-step planning process:

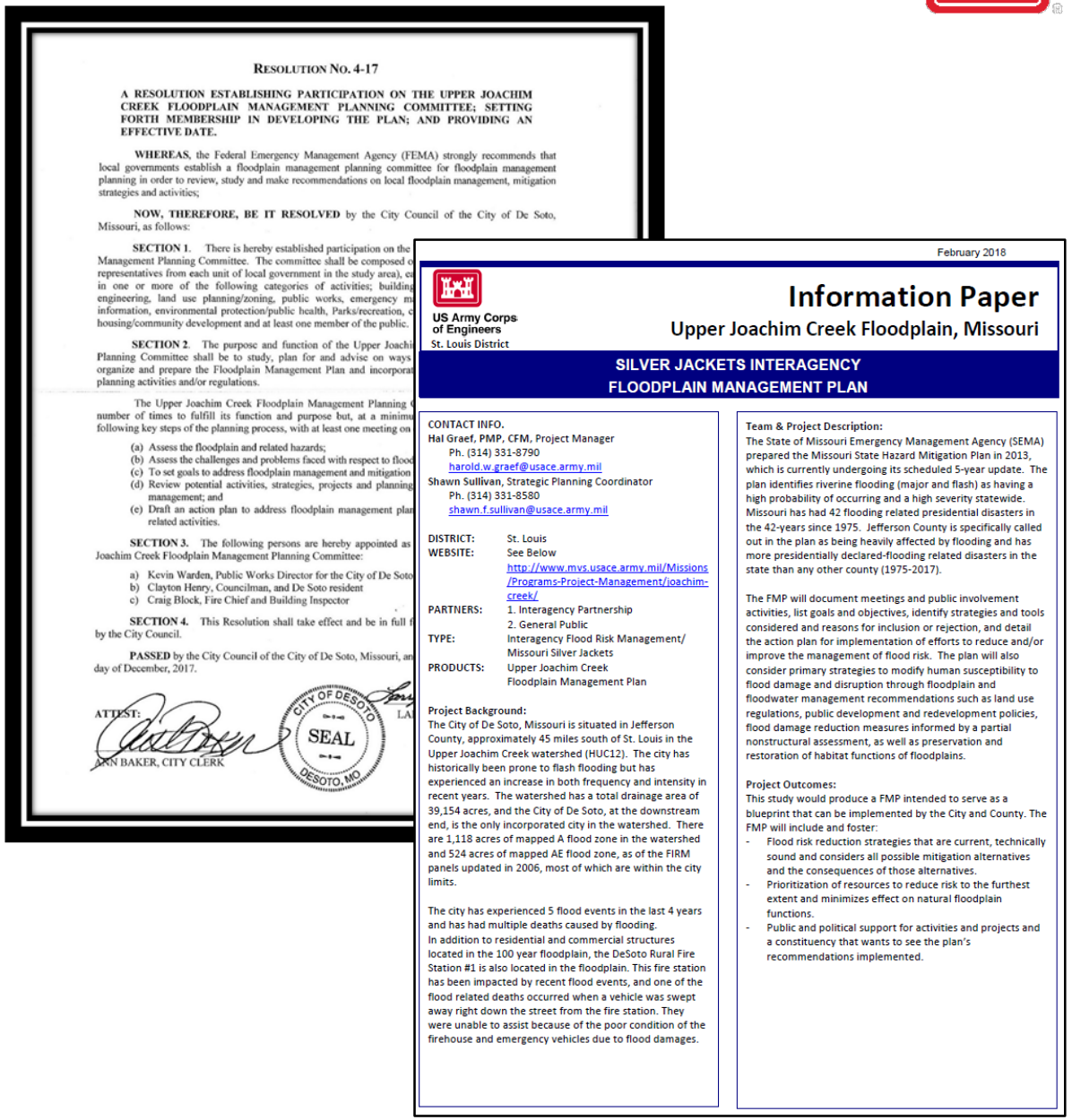
Step 1. Organize
Step 2. Involve the public
Step 3. Coordinate
Step 4. Assess the hazard
Step 5. Assess the problem
Step 6. Set goals
Step 7. Review possible activities
Step 8. Draft an action plan
Step 9. Adopt the plan
Step 10. Implement, evaluate, revise.

Steps included in FMP Schedule

Step performed by communities

STUDY BACKGROUND AND COORDINATION

Meeting Name	Date
Kick-Off Meeting	January 24, 2018
Public Workshop	February 28, 2018
Partner Update	July 11, 2018
Pre-Nonstructural Meeting	August 15, 2018
Nonstructural Assessments	August 27-30, 2018
Goals & Objectives Setting Call #1	August 21, 2018
Goals & Objectives Setting Call #2	September 7, 2018
De Soto Site Visit	September 26, 2018
Goals and Objectives Finalization Meeting	October 25, 2018
Partner Update	February 27, 2019
Presentation of Draft Report to Partners	May 9, 2019



RESOLUTION NO. 4-17

A RESOLUTION ESTABLISHING PARTICIPATION ON THE UPPER JOACHIM CREEK FLOODPLAIN MANAGEMENT PLANNING COMMITTEE; SETTING FORTH MEMBERSHIP IN DEVELOPING THE PLAN; AND PROVIDING AN EFFECTIVE DATE.

WHEREAS, the Federal Emergency Management Agency (FEMA) strongly recommends that local governments establish a floodplain management planning committee for floodplain management planning in order to review, study and make recommendations on local floodplain management, mitigation strategies and activities;

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of De Soto, Missouri, as follows:

SECTION 1. There is hereby established participation on the Management Planning Committee. The committee shall be composed representatives from each unit of local government in the study area), in one or more of the following categories of activities; building engineering, land use planning/zoning, public works, emergency information, environmental protection/public health, Parks/recreation, housing/community development and at least one member of the public.

SECTION 2. The purpose and function of the Upper Joachi Planning Committee shall be to study, plan for and advise on ways organize and prepare the Floodplain Management Plan and incorporat planning activities and/or regulations.

The Upper Joachim Creek Floodplain Management Planning number of times to fulfill its function and purpose but, at a minimu following key steps of the planning process, with at least one meeting on

(a) Assess the floodplain and related hazards;
(b) Assess the challenges and problems faced with respect to flood
(c) To set goals to address floodplain management and mitigation
(d) Review potential activities, strategies, projects and planning management; and
(e) Draft an action plan to address floodplain management plan related activities.

SECTION 3. The following persons are hereby appointed as Joachim Creek Floodplain Management Planning Committee:

a) Kevin Warden, Public Works Director for the City of De Soto
b) Clayton Henry, Councilman, and De Soto resident
c) Craig Block, Fire Chief and Building Inspector

SECTION 4. This Resolution shall take effect and be in full f by the City Council.

PASSED by the City Council of the City of De Soto, Missouri, an day of December, 2017.

ATTEST:

ANN BAKER, CITY CLERK

CITY OF DESOTO SEAL DESOTO, MO

February 2018

US Army Corps of Engineers
St. Louis District

Information Paper

Upper Joachim Creek Floodplain, Missouri

SILVER JACKETS INTERAGENCY FLOODPLAIN MANAGEMENT PLAN

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DISTRICT: St. Louis
WEBSITE: See Below
http://www.mvs.usace.army.mil/Missions/Programs-Project-Management/joachim-creek/
PARTNERS: 1. Interagency Partnership
2. General Public
TYPE: Interagency Flood Risk Management/ Missouri Silver Jackets
PRODUCTS: Upper Joachim Creek Floodplain Management Plan

Project Background:
The City of De Soto, Missouri is situated in Jefferson County, approximately 45 miles south of St. Louis in the Upper Joachim Creek watershed (HUC12). The city has historically been prone to flash flooding but has experienced an increase in both frequency and intensity in recent years. The watershed has a total drainage area of 39,154 acres, and the City of De Soto, at the downstream end, is the only incorporated city in the watershed. There are 1,118 acres of mapped A flood zone in the watershed and 524 acres of mapped AE flood zone, as of the FIRM panels updated in 2006, most of which are within the city limits.

The city has experienced 5 flood events in the last 4 years and has had multiple deaths caused by flooding.
In addition to residential and commercial structures located in the 100 year floodplain, the DeSoto Rural Fire Station #1 is also located in the floodplain. This fire station has been impacted by recent flood events, and one of the flood related deaths occurred when a vehicle was swept away right down the street from the fire station. They were unable to assist because of the poor condition of the firehouse and emergency vehicles due to flood damages.

Team & Project Description:
The State of Missouri Emergency Management Agency (SEMA) prepared the Missouri State Hazard Mitigation Plan in 2013, which is currently undergoing its scheduled 5-year update. The plan identifies riverine flooding (major and flash) as having a high probability of occurring and a high severity statewide. Missouri has had 42 flooding related presidential disasters in the 42-years since 1975. Jefferson County is specifically called out in the plan as being heavily affected by flooding and has more presidentially declared-flooding related disasters in the state than any other county (1975-2017).

The FMP will document meetings and public involvement activities, list goals and objectives, identify strategies and tools considered and reasons for inclusion or rejection, and detail the action plan for implementation of efforts to reduce and/or improve the management of flood risk. The plan will also consider primary strategies to modify human susceptibility to flood damage and disruption through floodplain and floodwater management recommendations such as land use regulations, public development and redevelopment policies, flood damage reduction measures informed by a partial nonstructural assessment, as well as preservation and restoration of habitat functions of floodplains.

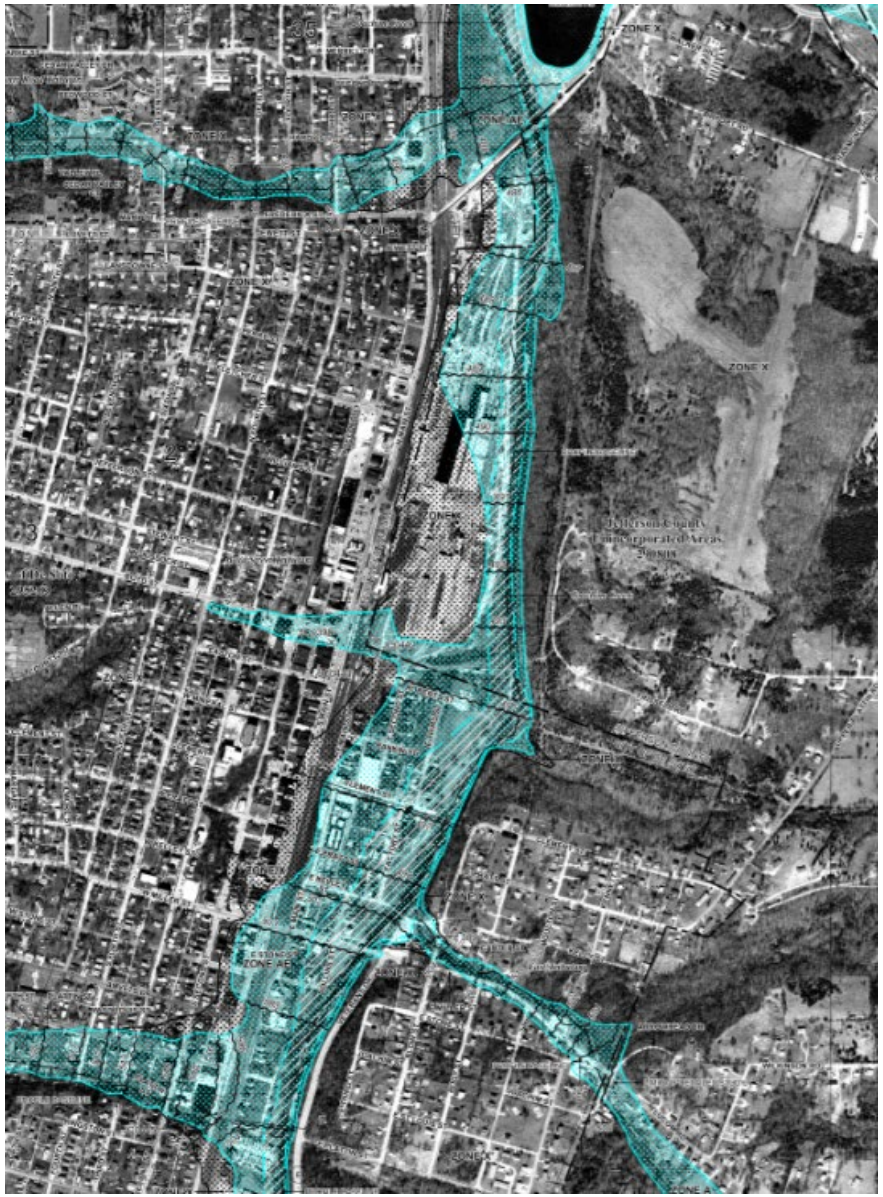
Project Outcomes:
This study would produce a FMP intended to serve as a blueprint that can be implemented by the City and County. The FMP will include and foster:
- Flood risk reduction strategies that are current, technically sound and considers all possible mitigation alternatives and the consequences of those alternatives.
- Prioritization of resources to reduce risk to the furthest extent and minimizes effect on natural floodplain functions.
- Public and political support for activities and projects and a constituency that wants to see the plan's recommendations implemented.

REPORT CONTENTS

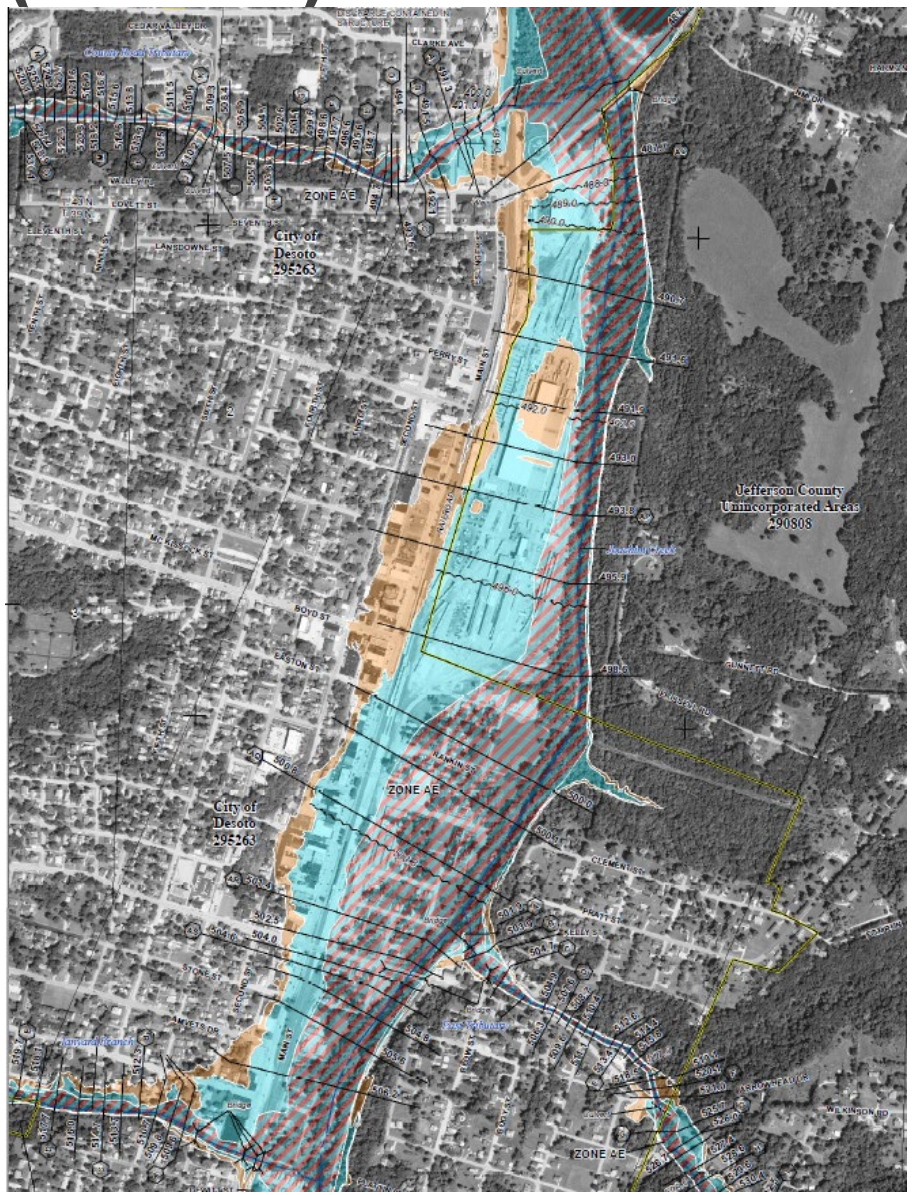
SUMMARY OF FINDINGS

TOOLS		
Land Use Policies and Regulations	EFFECTIVE	RECOMMENDED
Public Alert Flood Warning System	EFFECTIVE	RECOMMENDED
Warning Dissemination, Multi-Media	EFFECTIVE	RECOMMENDED
Flood Emergency Preparedness Plans (or EAP)	EFFECTIVE	RECOMMENDED
Development Policies – Moratorium	EFFECTIVE	NOT RECOMMENDED
Structure Elevations	EFFECTIVE	RECOMMENDED
Buyouts (Structure and Land Acquisition)	EFFECTIVE	RECOMMENDED
Flood proofing (Wet & Dry)	EFFECTIVE	RECOMMENDED
Community Education and Advocacy	EFFECTIVE	RECOMMENDED
Temporary Flood Risk Adaptive Measures	EFFECTIVE	RECOMMENDED
Information and Education	EFFECTIVE	RECOMMENDED
Flood Insurance	EFFECTIVE	RECOMMENDED
Community Rating System (CRS)	EFFECTIVE	RECOMMENDED
Local Drainage and Utility Protection	EFFECTIVE	FURTHER EVALUATION NEEDED
Tax Adjustments	EFFECTIVE	FURTHER EVALUATION NEEDED
Post-Flood Recovery Processes	EFFECTIVE	RECOMMENDED
Wetlands, Stream, and Riparian Protection and Restoration	EFFECTIVE	RECOMMENDED
Enhancement of Recreation and Education Opportunities	EFFECTIVE	RECOMMENDED
Dredging of Joachim Creek to Increase Channel Capacity	NOT EFFECTIVE	NOT RECOMMENDED
Accumulated Sediment Deposit/Debris Removal from Joachim Creek	EFFECTIVE	FURTHER EVALUATION NEEDED
National Guard Involvement	EFFECTIVE	FURTHER EVALUATION NEEDED
Bridge and Highway (re) Construction	-----	ANALYSIS NOT PERFORMED
Detention/Retention Basins	EFFECTIVE	FURTHER EVALUATION NEEDED
Levees and Floodwalls	EFFECTIVE	FURTHER EVALUATION NEEDED

FEMA FLOODPLAIN MAPS (FIRMS)



Flood Insurance Rate Map **2006**

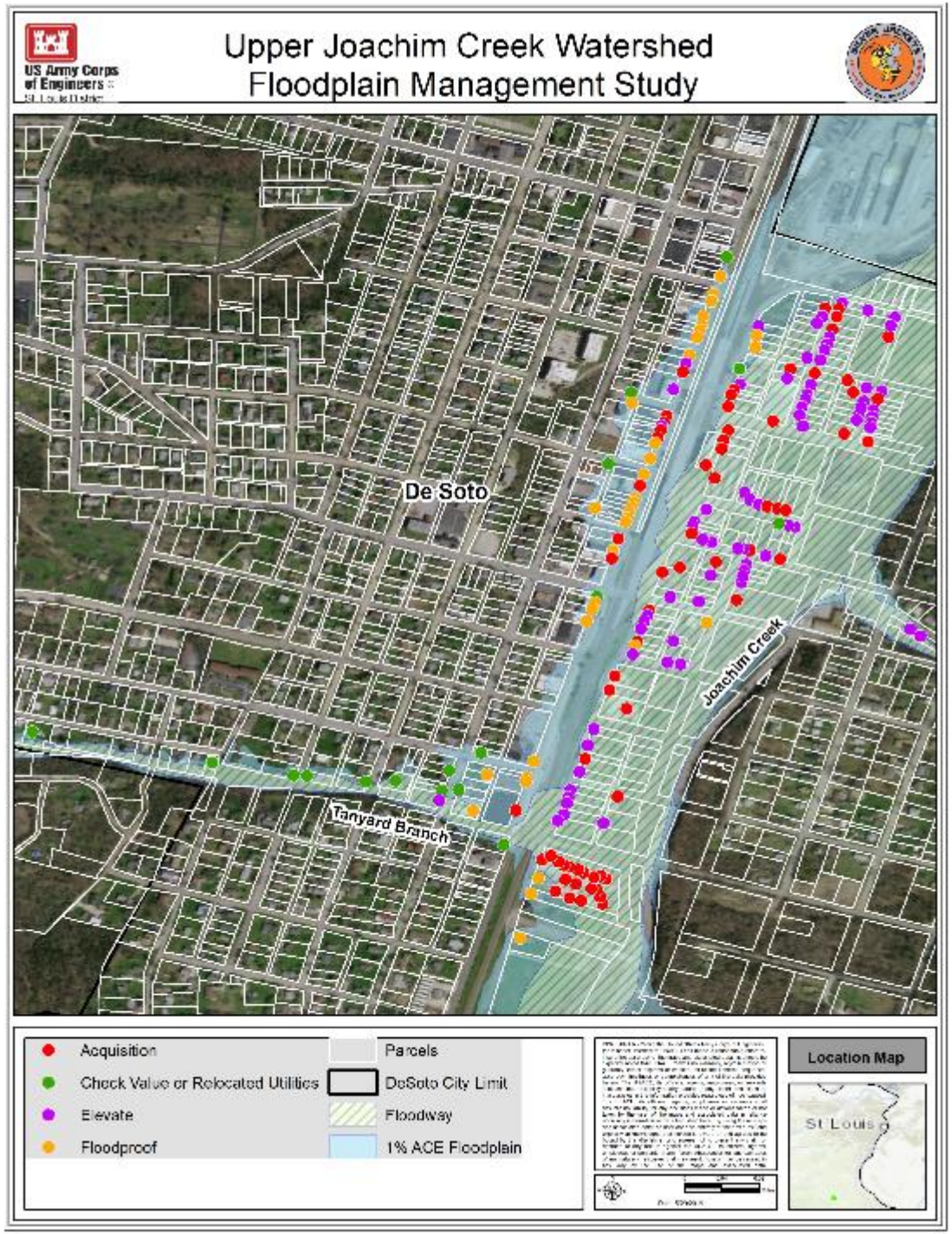


Flood Insurance Rate Map **2019**

CONSEQUENCES / STATISTICS

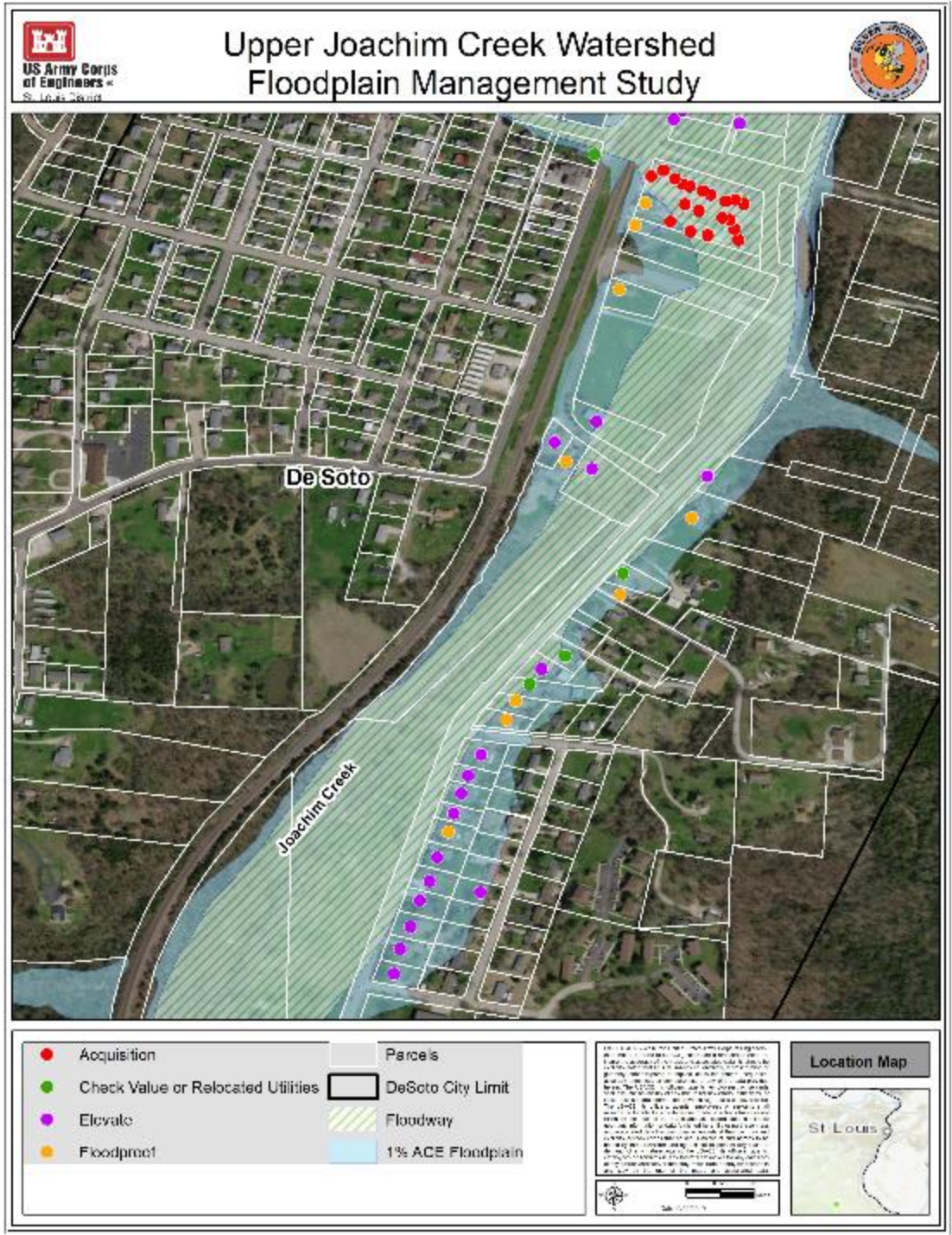
- The 1-percent ACE flood event recommendations identify the cost and approach to mitigating all 229 structures that are expected to be damaged during such a potential flood event.

- Of the structures located within the floodplain in De Soto,
  - 85 (39%) are recommended to be elevated,
  - 70 (31%) are recommended to be acquired,
  - 42 (19%) are recommended to be flood proofed, and
  - 32 (11%) had inundation below the first floor, and therefore only required either a sewer check valve or relocation of utilities.



These maps are on display

*Based on 2019 FIRMs



LIST OF POTENTIAL MEASURES

Structural Measures	Nonstructural measures	Nonstructural and Nonphysical Measures
Levees	Elevation	Flood Warning Systems
Large Floodwalls	Relocation	Flood Insurance
Large Berms	Buyout/Acquisition	Floodplain Mapping (FIRM)
Flood Gates	Dry Floodproofing	Flood Emergency Preparedness Plans
	Wet Floodproofing	Land Use Regulations
	Small Berms	Evacuation Plans
	Small Floodwalls	Risk Communication

LAND USE POLICIES AND REGULATIONS

EFFECTIVE

City of De Soto

- Adopted revised floodplain ordinance on **April 15, 2019**
- Inclusive of FEMA's revised FIRMs
- Includes requirements for building in FEMA zones A or AE
- Includes requirement that residential construction in these zones must be elevated to Base Flood Elevation (BFE) plus 2 ft. **BFE +2 ft.**
  (higher standard than previous BFE +1)

RECOMMENDED

Jefferson County

- Floodplain ordinance adopted in March 2006 and recently revised on **May 28, 2019**.
- Regulation aimed at restricting new development in the floodplain
- Includes requirements for building in Special Flood Hazard Areas (SFHA)
- Includes requirement that residential and non-residential construction in SFHA shall be elevated to **BFE +3 ft.**

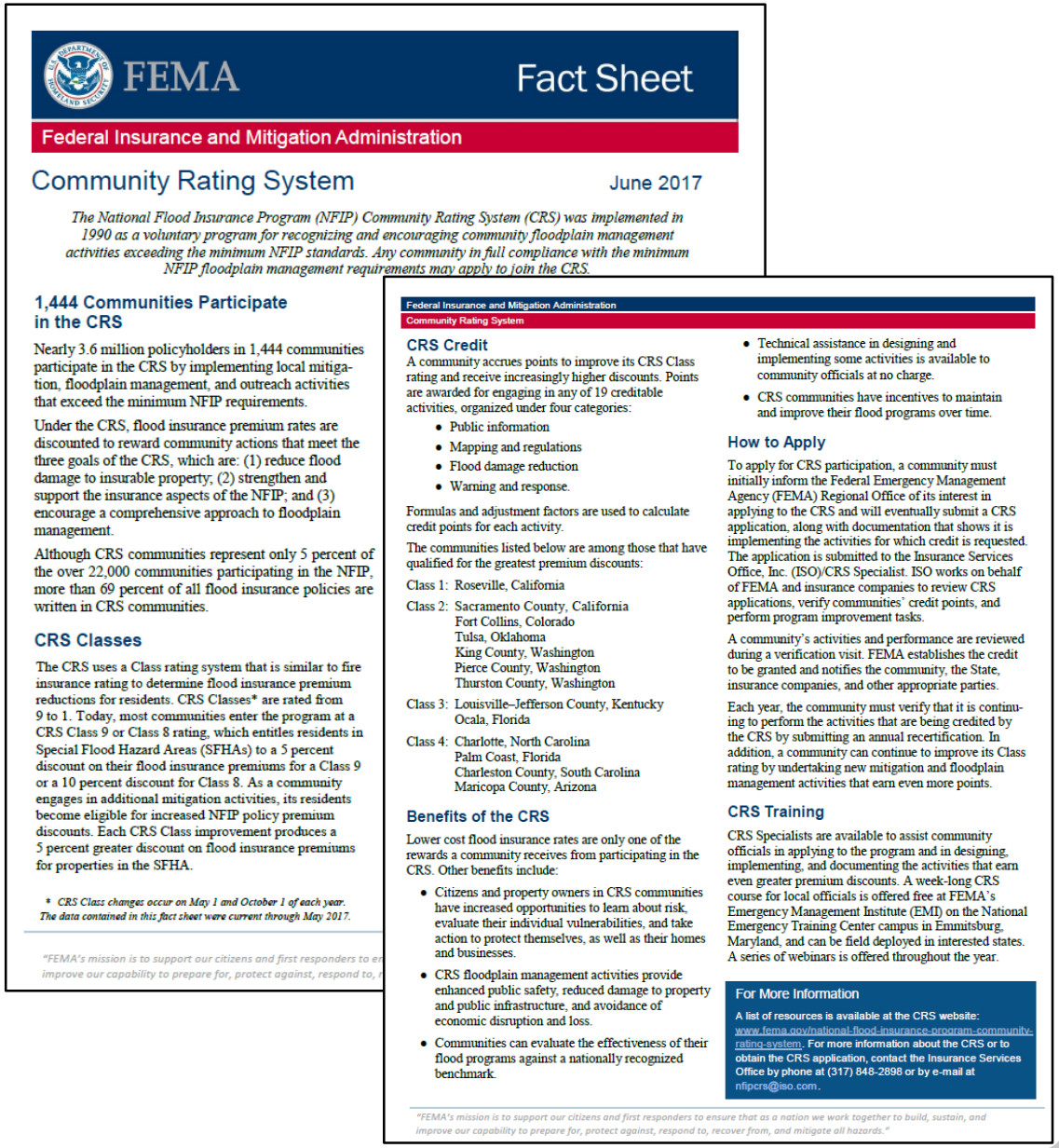
COMMUNITY RATING SYSTEM (CRS)

EFFECTIVE RECOMMENDED

- The CRS is a national program through FEMA and the National Flood Insurance Program (NFIP) that evaluates a community's floodplain management efforts and rewards those efforts with reductions on National Flood Insurance premiums based on the community's floodplain management performance.

- FEMA is currently reviewing the draft Floodplain Management Plan and will assign preliminary CRS points

- FEMA's comments/recommendations will be incorporated into the final FMP.



FEMA Fact Sheet

Federal Insurance and Mitigation Administration

Community Rating System

June 2017

The National Flood Insurance Program (NFIP) Community Rating System (CRS) was implemented in 1990 as a voluntary program for recognizing and encouraging community floodplain management activities exceeding the minimum NFIP standards. Any community in full compliance with the minimum NFIP floodplain management requirements may apply to join the CRS.

1,444 Communities Participate in the CRS

Nearly 3.6 million policyholders in 1,444 communities participate in the CRS by implementing local mitigation, floodplain management, and outreach activities that exceed the minimum NFIP requirements.

Under the CRS, flood insurance premium rates are discounted to reward community actions that meet the three goals of the CRS, which are: (1) reduce flood damage to insurable property; (2) strengthen and support the insurance aspects of the NFIP; and (3) encourage a comprehensive approach to floodplain management.

Although CRS communities represent only 5 percent of the over 22,000 communities participating in the NFIP, more than 69 percent of all flood insurance policies are written in CRS communities.

CRS Classes

The CRS uses a Class rating system that is similar to fire insurance rating to determine flood insurance premium reductions for residents. CRS Classes* are rated from 9 to 1. Today, most communities enter the program at a CRS Class 9 or Class 8 rating, which entitles residents in Special Flood Hazard Areas (SFHAs) to a 5 percent discount on their flood insurance premiums for a Class 9 or a 10 percent discount for Class 8. As a community engages in additional mitigation activities, its residents become eligible for increased NFIP policy premium discounts. Each CRS Class improvement produces a 5 percent greater discount on flood insurance premiums for properties in the SFHA.

** CRS Class changes occur on May 1 and October 1 of each year. The data contained in this fact sheet were current through May 2017.*

"FEMA's mission is to support our citizens and first responders to e... improve our capability to prepare for, protect against, respond to, ...

Federal Insurance and Mitigation Administration

Community Rating System

CRS Credit

A community accrues points to improve its CRS Class rating and receive increasingly higher discounts. Points are awarded for engaging in any of 19 creditable activities, organized under four categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Warning and response.

Formulas and adjustment factors are used to calculate credit points for each activity.

The communities listed below are among those that have qualified for the greatest premium discounts:

Class 1: Roseville, California

Class 2: Sacramento County, California
Fort Collins, Colorado
Tulsa, Oklahoma
King County, Washington
Pierce County, Washington
Thurston County, Washington

Class 3: Louisville–Jefferson County, Kentucky
Ocala, Florida

Class 4: Charlotte, North Carolina
Palm Coast, Florida
Charleston County, South Carolina
Maricopa County, Arizona

Benefits of the CRS

Lower cost flood insurance rates are only one of the rewards a community receives from participating in the CRS. Other benefits include:

- Citizens and property owners in CRS communities have increased opportunities to learn about risk, evaluate their individual vulnerabilities, and take action to protect themselves, as well as their homes and businesses.
- CRS floodplain management activities provide enhanced public safety, reduced damage to property and public infrastructure, and avoidance of economic disruption and loss.
- Communities can evaluate the effectiveness of their flood programs against a nationally recognized benchmark.
- Technical assistance in designing and implementing some activities is available to community officials at no charge.
- CRS communities have incentives to maintain and improve their flood programs over time.

How to Apply

To apply for CRS participation, a community must initially inform the Federal Emergency Management Agency (FEMA) Regional Office of its interest in applying to the CRS and will eventually submit a CRS application, along with documentation that shows it is implementing the activities for which credit is requested. The application is submitted to the Insurance Services Office, Inc. (ISO)/CRS Specialist. ISO works on behalf of FEMA and insurance companies to review CRS applications, verify communities' credit points, and perform program improvement tasks.

A community's activities and performance are reviewed during a verification visit. FEMA establishes the credit to be granted and notifies the community, the State, insurance companies, and other appropriate parties.

Each year, the community must verify that it is continuing to perform the activities that are being credited by the CRS by submitting an annual recertification. In addition, a community can continue to improve its Class rating by undertaking new mitigation and floodplain management activities that earn even more points.

CRS Training

CRS Specialists are available to assist community officials in applying to the program and in designing, implementing, and documenting the activities that earn even greater premium discounts. A week-long CRS course for local officials is offered free at FEMA's Emergency Management Institute (EMI) on the National Emergency Training Center campus in Emmitsburg, Maryland, and can be field deployed in interested states. A series of webinars is offered throughout the year.

For More Information

A list of resources is available at the CRS website: www.fema.gov/national-flood-insurance-program-community-rating-system. For more information about the CRS or to obtain the CRS application, contact the Insurance Services Office by phone at (317) 848-2898 or by e-mail at nfipcrs@iso.com.

"FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards."

COMMUNITY EDUCATION AND ADVOCACY

EFFECTIVE RECOMMENDED

- Communication between a unit of government and its constituents, at any and all levels, creates trust and a sense of shared responsibility for the citizens
- There must be a balance between community activism and governance
- It is **recommended** for the City to form an official committee or group that has representatives from the city government, private citizens, and any other county or municipal representatives deemed beneficial to the committee.
- The mission of this committee will be to openly communicate the risk of living in or near a floodplain and to host public meetings, both formal and informal, to help citizen and business owners prepare for and respond to all types of natural disasters (including flooding).

PUBLIC ALERT AND WARNING SYSTEM

EFFECTIVE RECOMMENDED

- Both Jefferson County and the City of De Soto participate in and promote the CodeRED system, each municipality administering its own system.
- Stream gage installed and began collecting readings in July 2018
- A set of flood warning lights tied to a USGS stream gage (USGS 07019500 Joachim Creek at De Soto, MO) is recommended to be located near the areas in De Soto and Jefferson County that experience the most severe flooding in a short amount of time.

EMERGENCY ACTION PLAN

EFFECTIVE RECOMMENDED

Inter-related to the flood warning system is an emergency preparedness plan for flooding. Generally speaking, emergency preparedness plans include several topics related to identifying the risk:

- Emergency operation plans based on indicators or stages of the magnitude of the risk;
- Emergency communication plans;
- Emergency evacuation plans;
- After action plans.

Jefferson County: has a formal Emergency Operations Plan

City of De Soto: no formal plan; does have a procedure for informing the public and evacuating when needed

DEVELOPMENT POLICIES - MORATORIUM

EFFECTIVE **NOT RECOMMENDED**

- A moratorium on development in the floodplain would prohibit any building in the floodplain by law until a specified time when solutions could be created to reduce the flooding impacts from Upper Joachim Creek.
- In researching the moratorium, it was determined that such a measure would only impact a very small number of vacant properties in the City and County and might be considered a "taking" if implemented. These factors do not lend to this tool being considered moving forward.

44 CFR 60.3(d)(3): *In the regulatory floodway, communities must prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge. (FEMA Regulation)*

TEMPORARY FLOOD RISK MEASURES

EFFECTIVE **RECOMMENDED**

Common temporary measures:

1) polyethylene sheeting attached or hung onto the structure exterior in combination with door and window closures;

2) clear liquid sealant applied to the structure exterior in combination with caulking of large cracks in the exterior and placement of door and window closures;

3) sandbag berms located around all or a portion of the structure;

4) any of the barriers certified through the National Flood Barrier Testing and Certification Program

FLOOD RISK ADAPTIVE MEASURES

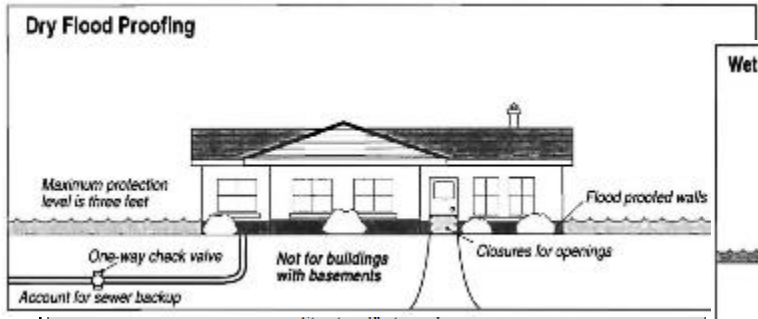
EFFECTIVE **RECOMMENDED**

USACE National Non-Structural Committee results documented in Appendix D

- Elevation
- Wet floodproofing
- Dry floodproofing
- Sewer check valves
- Relocate utilities

Appendix G

- Further environmental and economic analysis determined the final recommendations
- Full structure list with recommendations



Structure Photographs

Front

Rear

Structure Characteristics

Characteristic	Description
Occupancy -….	Residential (Single Family Dwelling).
Configuration -	One and one half story with crawlspace, rear addition(s), gable roof.
Construction -	Masonry (stone) foundation. Wood frame with siding.
Condition - …	Very good.
Other -……	Addition – One story, wood frame (rail car), siding, gable roof.

Structure and Flood Elevations

FF	LAG	CS	BFE	Δ BFE-FF	Δ BFE-LAG	Δ BFE-CS
501.1 ft	499.7 ft	*499.7 ft	506.5 ft	5.4 ft	6.8 ft	6.8 ft

ABBREVIATIONS:
FF – First Floor Elevation
B – Basement Floor Elevation
BFE – Base Flood Elevation
LAG – Low Adjacent Grade Elevation
CS – Crawl Space Ground Elevation
Δ – Delta (Elevation Difference)
* - Estimated

Site Visit Observations & Flood Risk

General: The structure was viewed/observed from the exterior and interior. The structure was occupied and in very good condition. The property owner was present during the site visit.

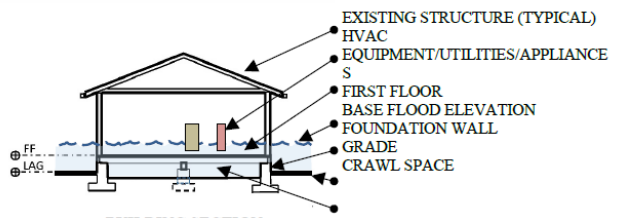
Site: The structure is situated on a suburban site and free standing on the property. The area around the structure is grass. The grade around the structure is level.

Structure: The structure is wood framed construction with a crawl space and gable roof. The exterior walls have siding. The structure was built around a railroad car frame and added onto over time.

Systems/Utilities: Existing systems and utilities on the first floor.

Flood Risk: The first floor is approximately 5.4 feet below the base flood elevation (BFE). The crawl space is below the BFE and would be totally inundated.

Diagrammatic Structure Section (Existing)

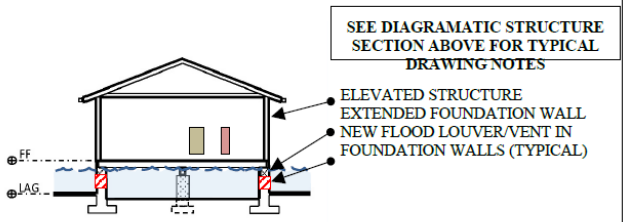


BUILDING SECTION
NOT TO SCALE

Recommendation

1. Relocate/elevate building utilities/systems/storage to upper level above BFE.
2. Fill crawl space to grade level (if necessary).
3. Elevate structure on new foundation.
4. Wet flood proof crawl space.

Diagrammatic Structure Section (Recommendation)



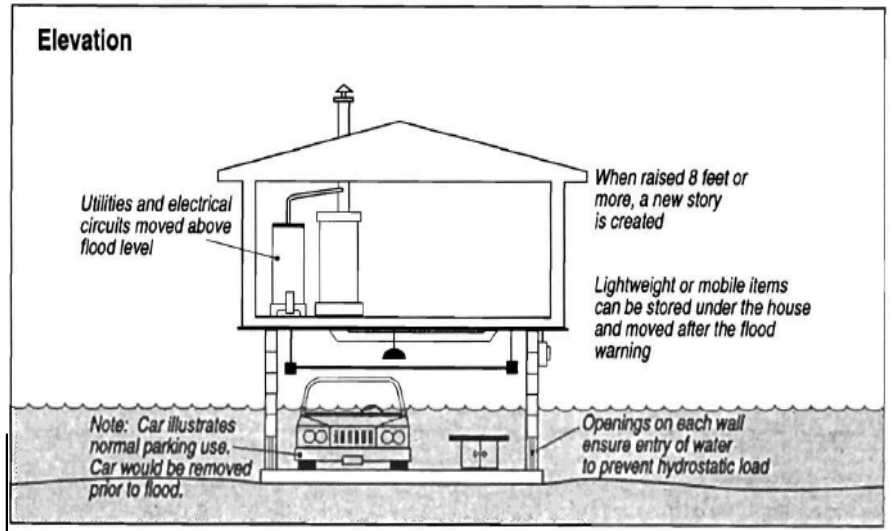
BUILDING SECTION
NOT TO SCALE

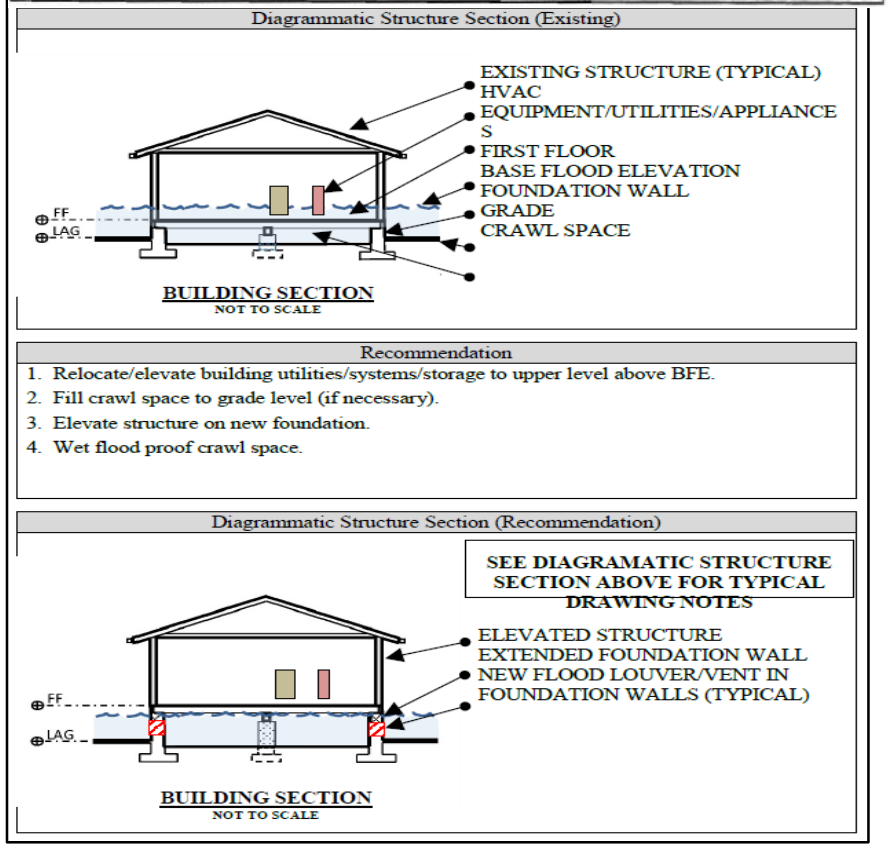
STRUCTURE ELEVATIONS

EFFECTIVE RECOMMENDED

- Elevating structures involves raising the structure in place to reduce frequency and/or depth of flooding during high-water events.

- Elevation can be completed on fill, foundation walls, piers, piles, posts or columns. Selection of proper elevation method depends on flood characteristics such as flood depth or velocity and condition of the structure and site.





ACQUISITION (STRUCTURE AND LAND BUYOUT)

EFFECTIVE RECOMMENDED

The rationale for acquisition was based on identification of acquisition as the least cost mitigation approach, except when:

- Total cost within 25% of other nonstructural measures

It was assumed that since acquisition completely removes the flood hazard into perpetuity, that the property owner and city would elect to acquire the structure rather than paying marginally more for a mitigation measure that does not fully remove the risk of damage.

Summary of Recommended Nonstructural Measures

	Count	Percentage
Acquisition	70	31%
Elevation	89	39%
Floodproof	44	19%
<1st Floor	26	11%
	229	

WETLAND RESTORATION, OPEN SPACE, & RECREATION

EFFECTIVE

Reducing flood risk through open space preservation and habitat restoration is a large scale proposition based on watershed size, topography and rainfall intensity.

In general, an effectively applied tool requires:

1. identification or mapping of available open space,
2. prioritization of parcels,
3. acquisition of property or educate/inform landowners about available incentivized conservation programs and
4. restoration of habitat types that attenuate or reduce the floodwater velocities.

RECOMMENDED

- The City parks and recreation system includes ten park sites, including general parkland, sports fields and courts, picnic facilities, natural resource areas and related support facilities.
- Open space along a stream provides for an area that is free and clear of man-made structures to allow stormwater runoff and flood waters to flow unobstructed, as nature intended.

DREDGING TO INCREASE CHANNEL CAPACITY

NOT EFFECTIVE NOT RECOMMENDED

While there are some instances where dredging can be used to reduce flooding, it is not normally used in a flood risk management capacity.

Other dredging considerations include:

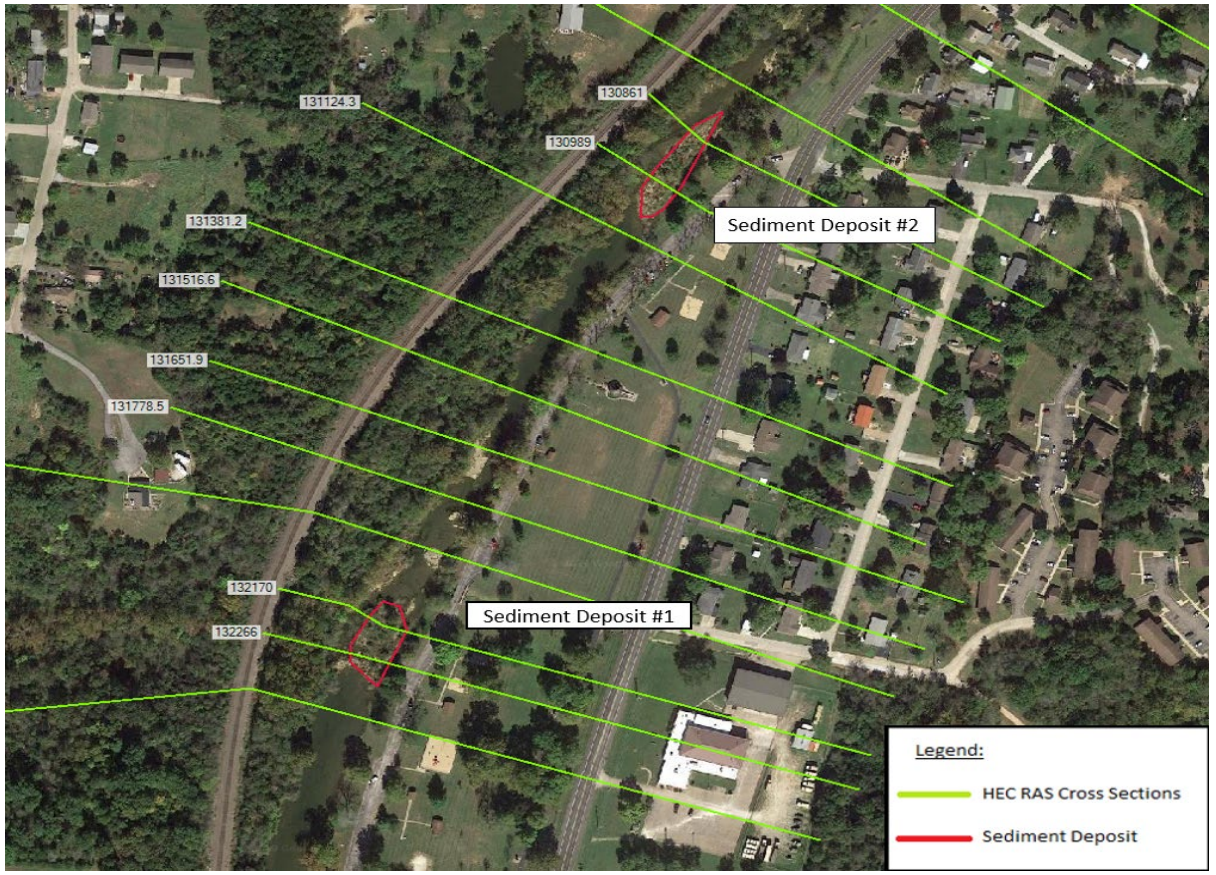
- Dredging is expensive and includes hauling and disposal of the dredged material and long-term maintenance to remove future accumulated sediment.
- Dredging rarely reduces water levels in any significant way.
- Dredging in one part of the channel can induce flooding in other areas.
- Dredging can impact the environment often requiring compensatory mitigation.

SEDIMENT DEPOSITS / DEBRIS REMOVAL

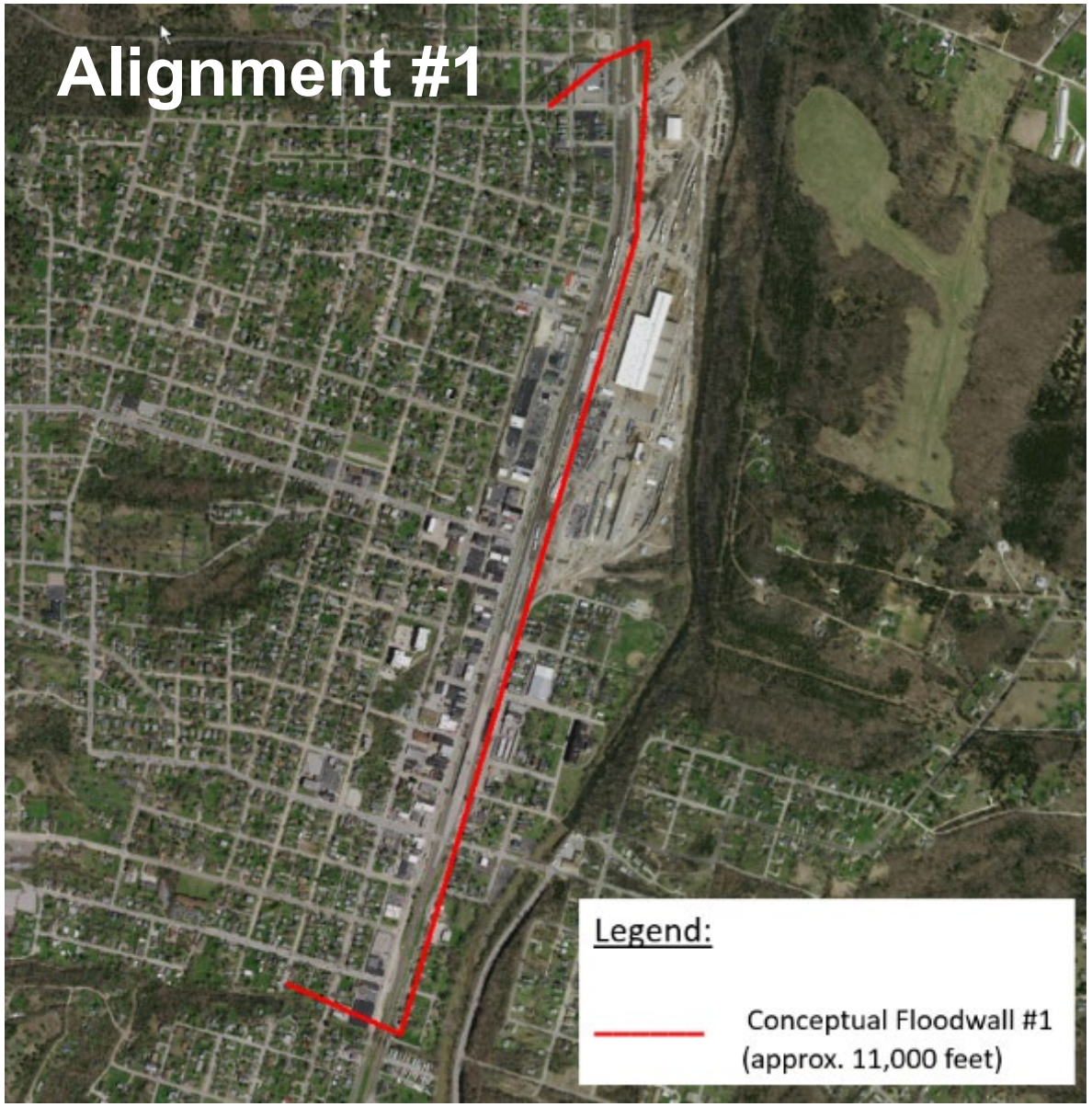
EFFECTIVE **FURTHER EVALUATION NEEDED**

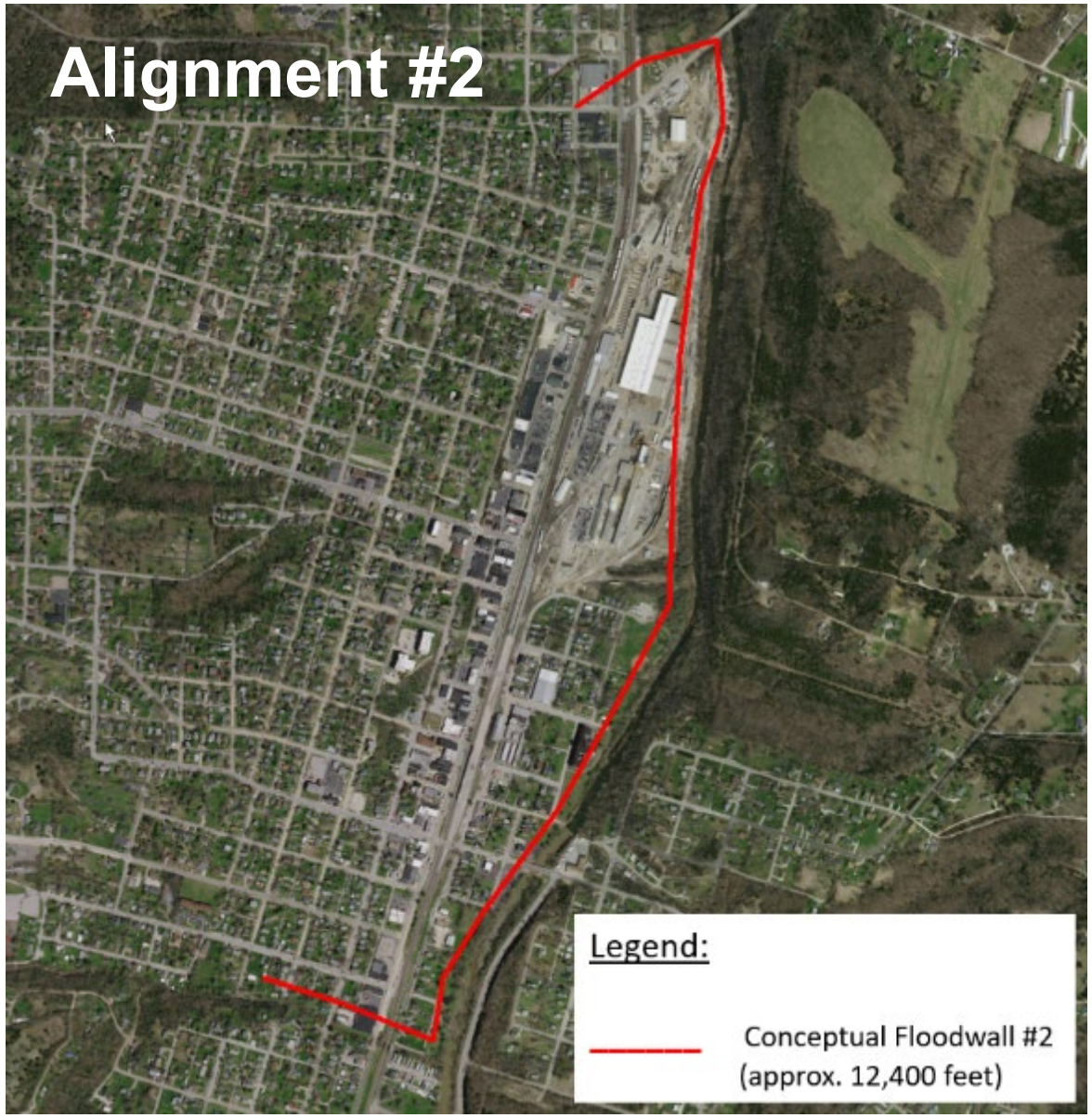
Sediment deposits are a natural way of the creek depositing material during low flow conditions.

- Results indicate approximate 0.1 to 0.6 foot flood reduction for 10% ACE discharge and 0.1 to 0.5 foot flood reduction for 1% ACE discharge;
- In 2 areas, removing the sediment deposit allowed more water to flow downstream, therefore, approximate 0.1 to 0.9 foot flood induction.
- Future maintenance may be needed in these areas.



CONCEPTUAL FLOODWALL ALIGNMENTS





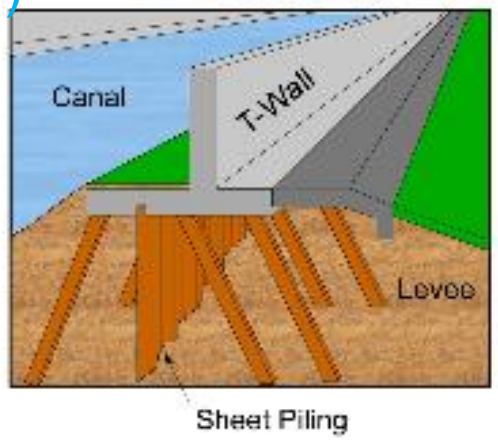
FLOODWALLS

EFFECTIVE **FURTHER EVALUATION NEEDED**

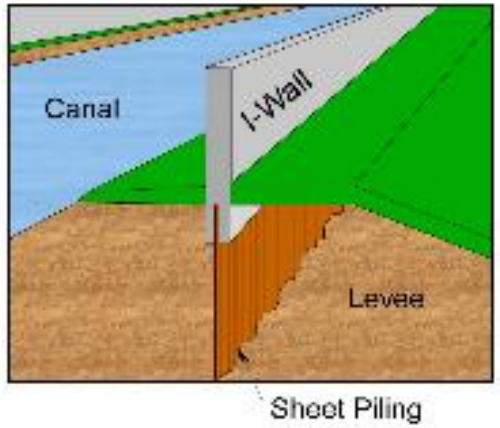
- Floodwalls are utilized for urban settings and where real estate is limited for flood protection.
- The floodwall would need to be continuous and continue upstream Tanyard Branch and upstream Ball Branch, to protect against backwater from Joachim Creek.

Example Floodwall

- 11,000-12,400 linear foot of floodwall needed (conceptual level estimate)
- $6,000-$7,000 per linear foot for T-Type floodwall
- $66M-$86M plus cost of other features



- 3 foot freeboard needed for 1% ACE (per FEMA)
- Constructed to a height of 6-9 ft. above ground level



- Road closure(s), gravity drain(s) and pump station(s) needed (O&M requirements)

LEVEES

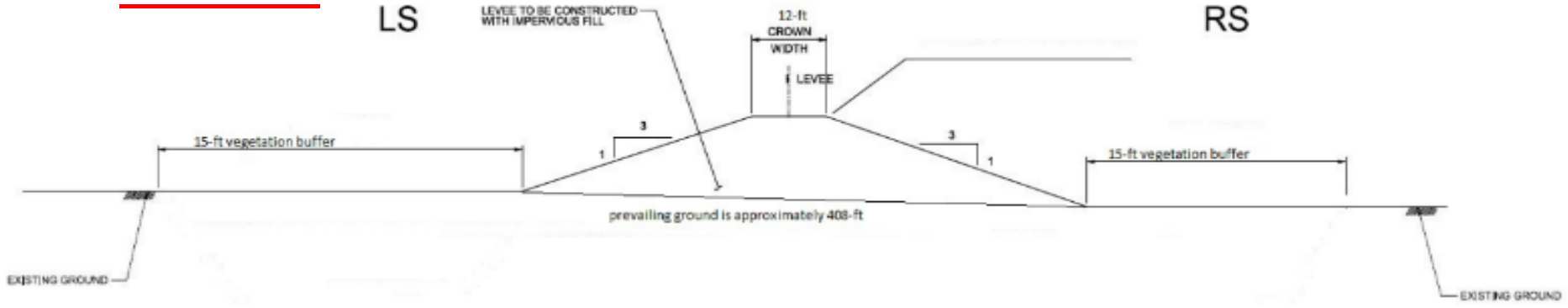
EFFECTIVE **FURTHER EVALUATION NEEDED**

- Levees are earthen structures, typically 10 foot top width, and typically 1 on 3 slopes.
- Levees require regular inspections and have annual operation/maintenance costs.

USACE Preliminary Assessment:
Due to the lack of real estate and large footprint needed, levee option is not feasible.

Example levee

- 1:3 (vertical:horizontal)
- 10 ft. tall
- 12 ft. crown
- 72 ft. wide
- 15 ft. vegetation buffer zone (both sides)
- O&M requirements may be high
- Cost per Cubic Yard of levee embankment (plus swing gate, gravity drain, ps, etc.)



NATIONAL GUARD PARTICIPATION

EFFECTIVE FURTHER EVALUATION NEEDED

- The City/County can request assistance from the National Guard through the proper channels.
- The National Guard operates with a specific mission directive and authority.
- Communication between the City/County through SEMA is critical.
- Each National Guard unit has its own unique mission and capability.
- Ultimately, the National Guard's mission is authorized by the Governor or, in some cases, the President.
- It is recommended to continue communication and education to understand the National Guard's role in emergency response situations.

ACTION PLAN

Upper Joachim Creek Floodplain Management Plan Action Plan:

1) Adopt the Upper Joachim Creek FMP
2) Develop a comprehensive public outreach plan
3) Adopt higher regulatory floodplain management standards ✓
3) Maintain and expand the existing flood warning systems
4) Join the Community Rating System (CRS)
5) Implement nonstructural recommendations

POTENTIAL FUNDING SOURCES

State Funding Sources	Federal Funding Sources	Federal Funding Sources
Missouri DNR: Soil and Water Conservation Program	FEMA: Hazard Mitigation Grant Program, Public Assistance Program, Pre-Disaster Mitigation (PDM) Grant Program, Flood Mitigation Assistance Program,	EPA: Clean Water State Revolving Loan Fund
	Internal Revenue Service: Disaster Assistance and Emergency Relief for Individuals and Businesses	USACE: In-Lieu Fee Compensatory Mitigation Program, Continuing Authorities Program (CAP)
	Small Business Administration (SBA): Disaster Loan Program	National Park Service: Rivers, Trails, and Conservation Assistance Program
	HUD: Community Development Block Grant State Program (CDBG), CDBG Disaster Program, Section 108 Guarantee Program	USDA: Water and Waste Disposal Loan & Grant Program, Emergency Watershed Protection (EWP) Program, Rural Housing Service Housing Preservation Grants, Emergency Conservation Program, Farm Service Agency Conservation Reserve Program (CRP)
	Department of Commerce: Economic Development Administration Disaster Recovery	

NEXT STEPS

Tentative Timeline:

- July, 2019– FEMA Preliminary CRS Review Complete (estimated)
- August, 2019 – Final Report Transmitted to Partners

City of De Soto and Jefferson County may then formally adopt the final FMP.

QUESTION AND ANSWER PERIOD

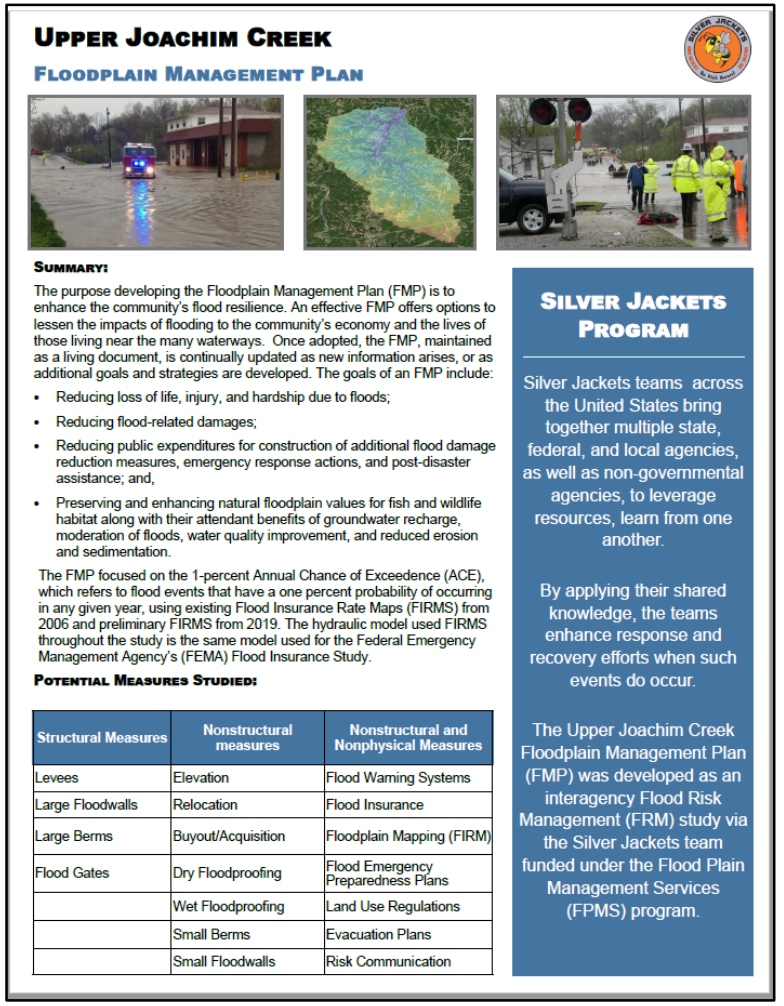
Ground rules:

1. No questions pertaining to pending litigation.
2. Ask questions pertaining to the whole group; individual property questions can be addressed one-on-one with the Partners after the Q&A portion of the meeting.
3. Q&A will end in 25 minutes so that there is time to speak with the Partners individually.

END OF PRESENTATION

Additional Public Engagement

- Partners in the Room
- Summary of Findings Sheet
- Website Access (LINK)



Upper Joachim Creek

Floodplain Management Plan

Summary:

The purpose developing the Floodplain Management Plan (FMP) is to enhance the community's flood resilience. An effective FMP offers options to lessen the impacts of flooding to the community's economy and the lives of those living near the many waterways. Once adopted, the FMP, maintained as a living document, is continually updated as new information arises, or as additional goals and strategies are developed. The goals of an FMP include:

- Reducing loss of life, injury, and hardship due to floods;
- Reducing flood-related damages;
- Reducing public expenditures for construction of additional flood damage reduction measures, emergency response actions, and post-disaster assistance; and,
- Preserving and enhancing natural floodplain values for fish and wildlife habitat along with their attendant benefits of groundwater recharge, moderation of floods, water quality improvement, and reduced erosion and sedimentation.

The FMP focused on the 1-percent Annual Chance of Exceedence (ACE), which refers to flood events that have a one percent probability of occurring in any given year, using existing Flood Insurance Rate Maps (FIRMS) from 2006 and preliminary FIRMS from 2019. The hydraulic model used FIRMS throughout the study is the same model used for the Federal Emergency Management Agency's (FEMA) Flood Insurance Study.

Potential Measures Studied:

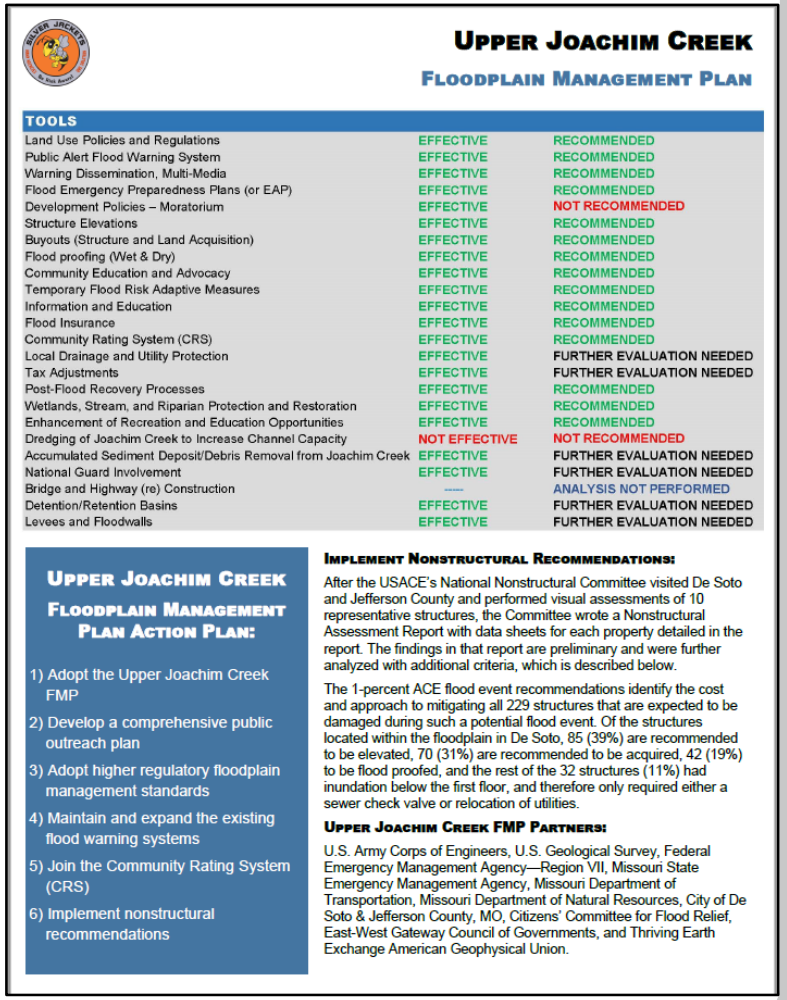
Structural Measures	Nonstructural measures	Nonstructural and Nonphysical Measures
Levees	Elevation	Flood Warning Systems
Large Floodwalls	Relocation	Flood Insurance
Large Berms	Buyout/Acquisition	Floodplain Mapping (FIRM)
Flood Gates	Dry Floodproofing	Flood Emergency Preparedness Plans
	Wet Floodproofing	Land Use Regulations
	Small Berms	Evacuation Plans
	Small Floodwalls	Risk Communication

Silver Jackets Program

Silver Jackets teams across the United States bring together multiple state, federal, and local agencies, as well as non-governmental agencies, to leverage resources, learn from one another.

By applying their shared knowledge, the teams enhance response and recovery efforts when such events do occur.

The Upper Joachim Creek Floodplain Management Plan (FMP) was developed as an interagency Flood Risk Management (FRM) study via the Silver Jackets team funded under the Flood Plain Management Services (FPMS) program.



Upper Joachim Creek

Floodplain Management Plan

Tools		
Land Use Policies and Regulations	EFFECTIVE	RECOMMENDED
Public Alert Flood Warning System	EFFECTIVE	RECOMMENDED
Warning Dissemination, Multi-Media	EFFECTIVE	RECOMMENDED
Flood Emergency Preparedness Plans (or EAP)	EFFECTIVE	RECOMMENDED
Development Policies – Moratorium	EFFECTIVE	NOT RECOMMENDED
Structure Elevations	EFFECTIVE	RECOMMENDED
Buyouts (Structure and Land Acquisition)	EFFECTIVE	RECOMMENDED
Flood proofing (Wet & Dry)	EFFECTIVE	RECOMMENDED
Community Education and Advocacy	EFFECTIVE	RECOMMENDED
Temporary Flood Risk Adaptive Measures	EFFECTIVE	RECOMMENDED
Information and Education	EFFECTIVE	RECOMMENDED
Flood Insurance	EFFECTIVE	RECOMMENDED
Community Rating System (CRS)	EFFECTIVE	RECOMMENDED
Local Drainage and Utility Protection	EFFECTIVE	FURTHER EVALUATION NEEDED
Tax Adjustments	EFFECTIVE	FURTHER EVALUATION NEEDED
Post-Flood Recovery Processes	EFFECTIVE	RECOMMENDED
Wetlands, Stream, and Riparian Protection and Restoration	EFFECTIVE	RECOMMENDED
Enhancement of Recreation and Education Opportunities	EFFECTIVE	RECOMMENDED
Dredging of Joachim Creek to Increase Channel Capacity	NOT EFFECTIVE	NOT RECOMMENDED
Accumulated Sediment Deposit/Debris Removal from Joachim Creek	EFFECTIVE	FURTHER EVALUATION NEEDED
National Guard Involvement	EFFECTIVE	FURTHER EVALUATION NEEDED
Bridge and Highway (re) Construction	----	ANALYSIS NOT PERFORMED
Detention/Retention Basins	EFFECTIVE	FURTHER EVALUATION NEEDED
Levees and Floodwalls	EFFECTIVE	FURTHER EVALUATION NEEDED

Upper Joachim Creek Floodplain Management Plan Action Plan:

1) Adopt the Upper Joachim Creek FMP
2) Develop a comprehensive public outreach plan
3) Adopt higher regulatory floodplain management standards
4) Maintain and expand the existing flood warning systems
5) Join the Community Rating System (CRS)
6) Implement nonstructural recommendations

Implement Nonstructural Recommendations:

After the USACE's National Nonstructural Committee visited De Soto and Jefferson County and performed visual assessments of 10 representative structures, the Committee wrote a Nonstructural Assessment Report with data sheets for each property detailed in the report. The findings in that report are preliminary and were further analyzed with additional criteria, which is described below.

The 1-percent ACE flood event recommendations identify the cost and approach to mitigating all 229 structures that are expected to be damaged during such a potential flood event. Of the structures located within the floodplain in De Soto, 85 (39%) are recommended to be elevated, 70 (31%) are recommended to be acquired, 42 (19%) to be flood proofed, and the rest of the 32 structures (11%) had inundation below the first floor, and therefore only required either a sewer check valve or relocation of utilities.

Upper Joachim Creek FMP Partners:

U.S. Army Corps of Engineers, U.S. Geological Survey, Federal Emergency Management Agency—Region VII, Missouri State Emergency Management Agency, Missouri Department of Transportation, Missouri Department of Natural Resources, City of De Soto & Jefferson County, MO, Citizens' Committee for Flood Relief, East-West Gateway Council of Governments, and Thriving Earth Exchange American Geophysical Union.