Livingston Risk MAP update

July 15, 2025

Flood Study Update

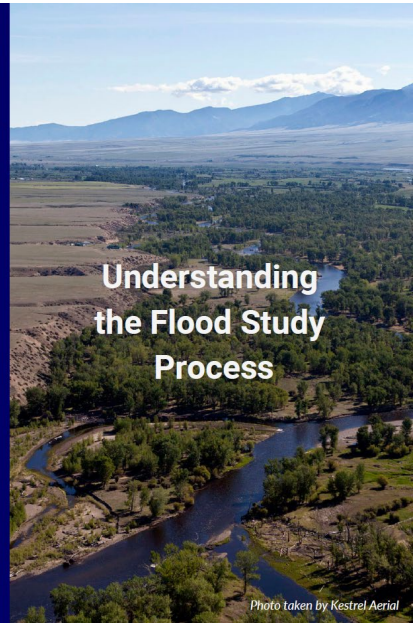
Summary

Developing regulatory floodplain maps is a complex process that uses the most accurate data available. The result is a reliable map of the areas in a community that are prone to flooding.

Floodplain maps are utilized by emergency responders, the insurance industry, community planners, developers, and mortgage lenders. The maps are also critical tools for local floodplain managers, and local, state, and federal emergency management for communicating and managing flood risk.

The Montana Department of Natural Resources & Conservation

Montana Department of Natural Resources and Conservation
Water Resources Division
1424 9th Ave.
P.O.Box 201601
Helena, MT 59620-1601
Phone: (406) 444-0862



MONTANA DNRC

Flood Study Steps

Step 1 - Survey: measurements are made of the topography around the river, along with any culverts, bridges, and road crossings. LiDAR uses an airplane to collect ground elevation over a large area, and ground survey supplements the airborne data.

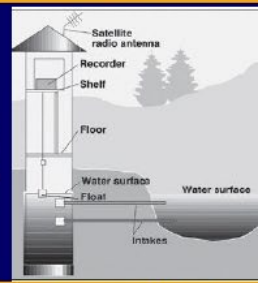
Step 2 - Hydrology: determines how much water there will be in the river during a flood event. Data from stream gages will tell how many cubic feet of water per second the river will carry during the flood.

Step 3 - Hydraulics: once the first two steps are complete, calculations can show where the water will go during the flood. The elevation data is combined with the flood flow data to determine where the water will go when it overflows the channel.

Step 4 - Mapping (delineation): the results from step 3 are combined with the elevation data and official maps to see how far the water will spread out. The area shown to be underwater during the flood is the regulatory floodplain.

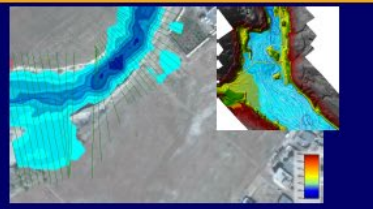
Step 1 - Survey:
The type of the survey depends on the size of the study area and type of study.

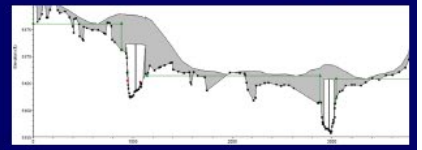
Step 2 - Hydrology:
Stream gage stations are an important tool to determine flow rates. If nearby stream gages aren't available, gage data from a similar location is used to determine the flow rate.



Step 3 - Hydraulics:
5 main components to the model

1) Hydrology (stream flow data)
2) Cross Sections (measurements of the river bottom at key locations)
3) Roughness (thickness of vegetation, land cover, etc determined by surveyors)
4) Structures (road crossings, culverts, bridges, etc.)
5) Downstream conditions





Step 4 - Mapping (delineation):
The result will be the floodplain boundary and a depth grid identifying the shallower and deeper areas of flooding.

Flood Study Update

PARK COUNTY COMMISSION
MONTANA

July 19, 2022

Steve Story, Chief
Montana DNRC Water Operations
1424 9th Ave
P.O. Box 201601
Helena, MT 59620-1601

Dear Mr. Story,

Given the unprecedented flooding event that took place on June 13th, 2022, the Park County Commission formally requests DNRC initiate the process for new floodplain maps for Park County. The Commission recognizes the value in updating our flood studies and existing floodplain maps in our county. We support updating the floodplain studies to replace our existing, outdated floodplain maps.

Park County is committed to protecting the river systems, managing flood risks and participating in the National Flood Insurance Program. Updated studies would be a benefit to Park County residents and current information would allow for better regulation of flood prone areas.

Thank you for the opportunity to participate in this effort to update floodplain studies in Park County. Having better available data will provide much needed support that the county has needed for a long time.

Sincerely,

Park County Commissioner, Steve Caldwell

Park County Commissioner, Clint Tinsley

Park County Commissioner, Bill Berg

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City Manager
Grant Gager

220 E Park Street
(406) 823-6000 phone

citymanager@livingtonmontana.org
www.livingstonmontana.org

City of Livingston

Incorporated 1889

Chairperson
Melissa Nootz

Vice Chair
Karrie Kahle

Commissioners
Mel Friedman
Quentin Schwarz
Torrey Lyons

April 4, 2023

Steve Story, Chief
Montana DNRC Water Operations
1424 9th Ave
P.O. Box 201601
Helena, MT 59620-1601

Dear Mr. Story,

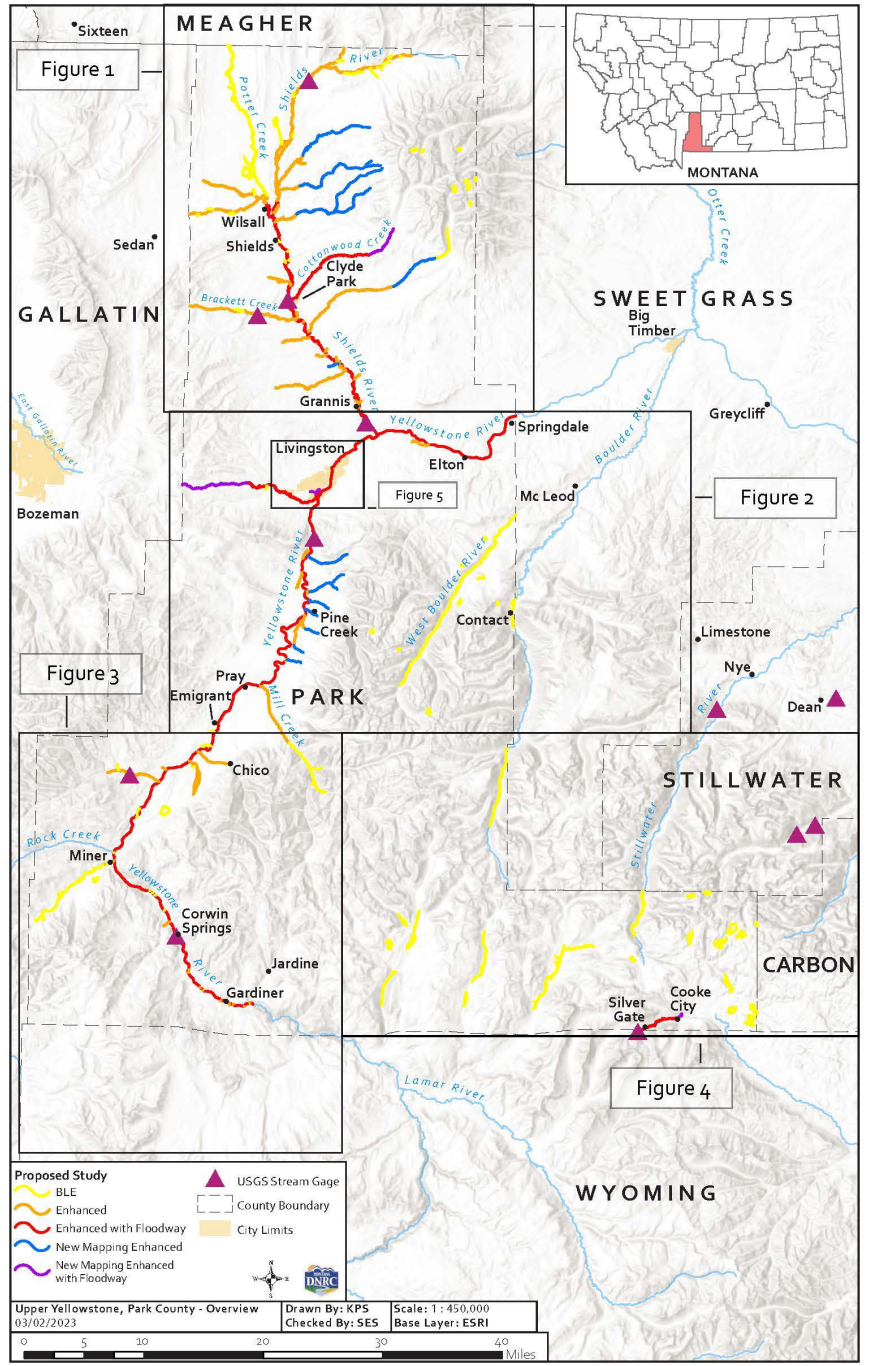
Given the unprecedented flooding event that took place on June 3rd, 2022, The City of Livingston formally requests The Montana Department of Natural Resources & Conservation (DNRC) initiate the process for new floodplain maps for Livingston. The City Commission recognizes the value in updating the City's flood studies and existing floodplain maps in our jurisdiction and we support your efforts to undertake this floodplain study so that we may update our existing, outdated floodplain maps.

The City of Livingston is committed to protecting the river systems in our community, responsibly managing flood risks, and participating in the National Flood Insurance Program. Current flood studies will benefit City residents and the new information resulting from this study will allow Livingston to better regulate its flood-prone areas.

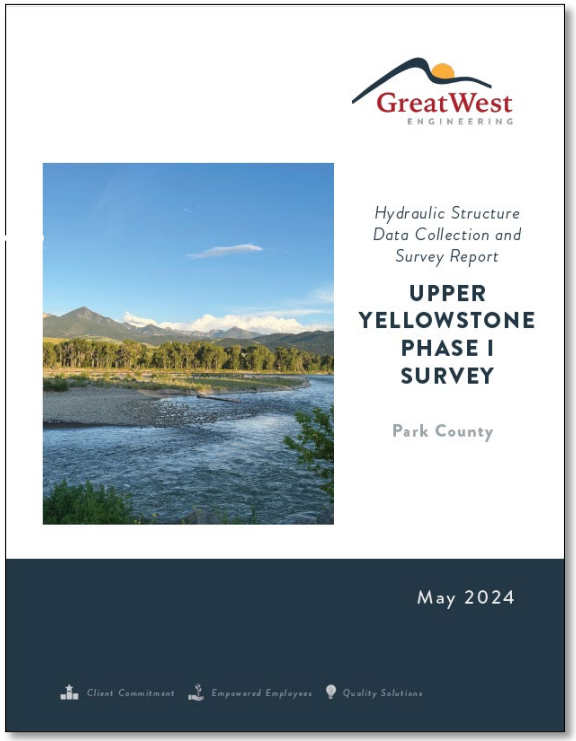
Thank you for the opportunity to participate in this effort to update existing floodplain data in Livingston and for providing this much-needed support to the City's floodplain regulatory efforts.

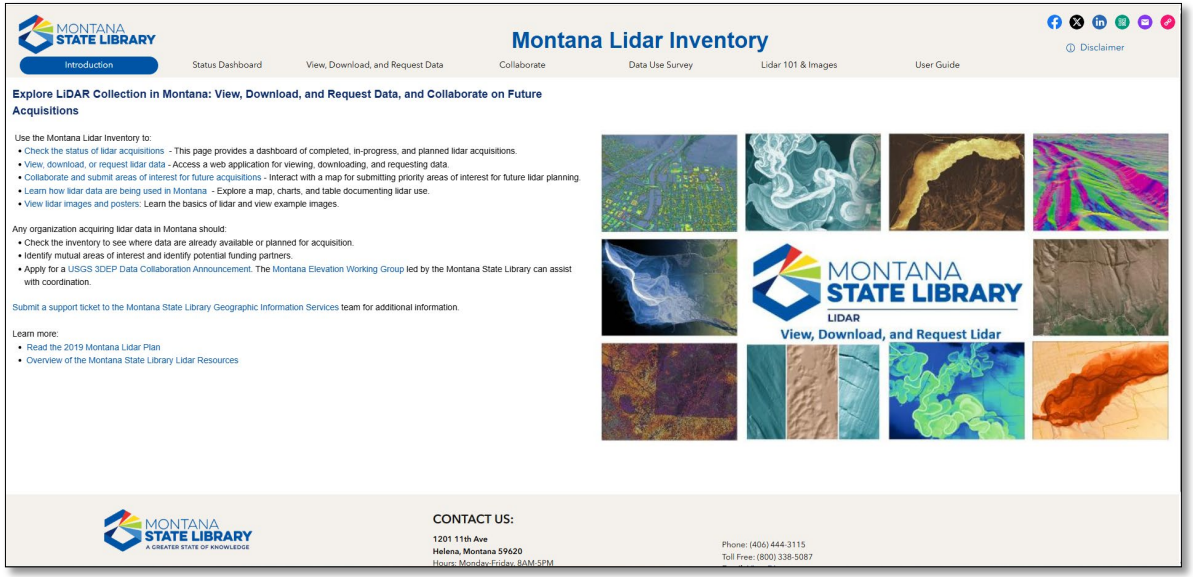
Sincerely,

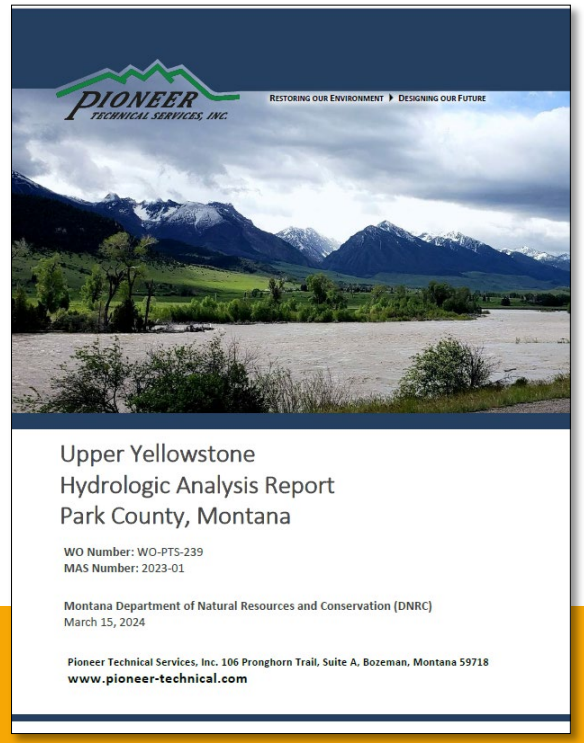
Melissa Nootz
Chair, Livingston City Commission

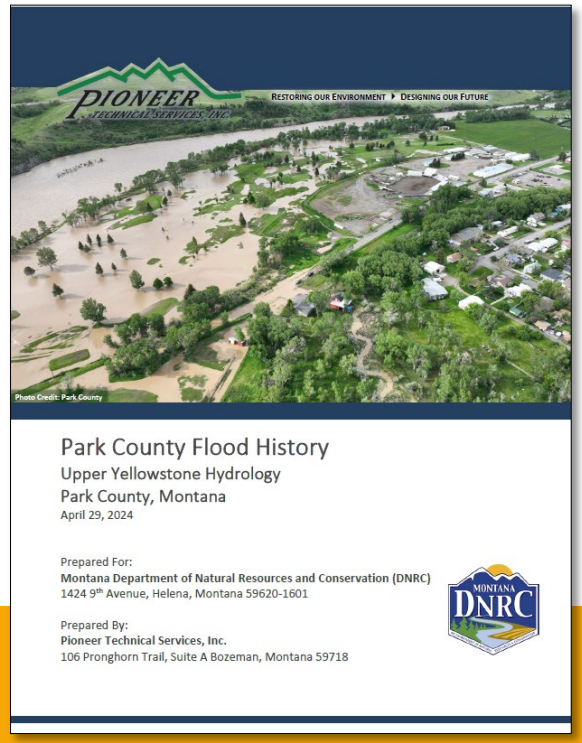


Flood Study Update









MONTANA DNRC

Levee analysis

- FEMA standards and guidance require that the levee would have to be certified to show a reduced flood risk.

Meeting the Criteria for Accrediting Levee Systems on Flood Insurance Rate Maps:
How-To Guide for Floodplain Managers and Engineers

The National Flood Insurance Program (NFIP) defines a levee system in Title 44, Chapter 1,Section 59.1 of the Code of Federal Regulations (44 CFR 59.1) as a flood risk reduction system that consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices to protect a hydraulically distinct area. Within the NFIP, a levee is a manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding.

As part of the flood mapping process, the Federal Emergency Management Agency (FEMA), and its State and local mapping partners, review and evaluate levee system data and documentation. Any community and/or other party seeking recognition or continued recognition of a levee system on a Flood Insurance Rate Map (FIRM) must provide FEMA with data and documentation, certified by a registered professional engineer, showing that the levee system is expected to provide 1-percent-annual-chance (base) flood risk reduction.

To be mapped on a FIRM as providing base flood risk reduction, levee systems must meet and continue to meet the NFIP minimum design, operation, and maintenance requirements described in Title 44, Chapter 1, Section 65.10 of the Code of Federal Regulations (44 CFR 65.10). FEMA has posted several guidance documents related to levee accreditation, mapping, and other topics. Please access the Levee Resources Library for updated guidance documents. To help clarify the responsibilities of community officials, levee owners, or other parties seeking recognition of a levee system identified during a study/mapping project, FEMA has posted several guidance documents related to levee accreditation, mapping, and other related topics. This document provides information regarding how FEMA maps levee systems, a checklist of the types of data and documentation that must be submitted for levee systems to be accredited on FIRMs, and an index of further resources.

A NOTE ABOUT FLOOD RISK AND FLOOD INSURANCE

Levee systems are designed to provide a specific level of protection. They can be overtopped or fail during flood events larger than those for which the system was designed. Levee systems also decay over time, which may increase the likelihood of failure. They require regular maintenance and periodic upgrades to retain their level of protection. When levees do fail, the resulting damage, including loss of life, may be much greater than if the levee system had not been built.

For all these reasons, FEMA strongly encourages people in levee-impacted areas to understand their flood risk, know and follow evacuation procedures, and protect their property by purchasing flood insurance, floodproofing their structure, or taking other precautionary measures. For more information on flood insurance, please visit FloodSmart.gov.

RISK MAPPING, ASSESSMENT, AND PLANNING PROGRAM (RISK MAP)
The Federal Emergency Management Agency's Risk MAP Program delivers quality data that increases public awareness and leads to action to reduce risk to life and property. Risk MAP is a nationwide program that works in collaboration with States, Tribes, and Local communities using best available science, rigorously vetted standards, and expert analysis to identify risk and promote mitigation action, resulting in safer, more resilient communities.

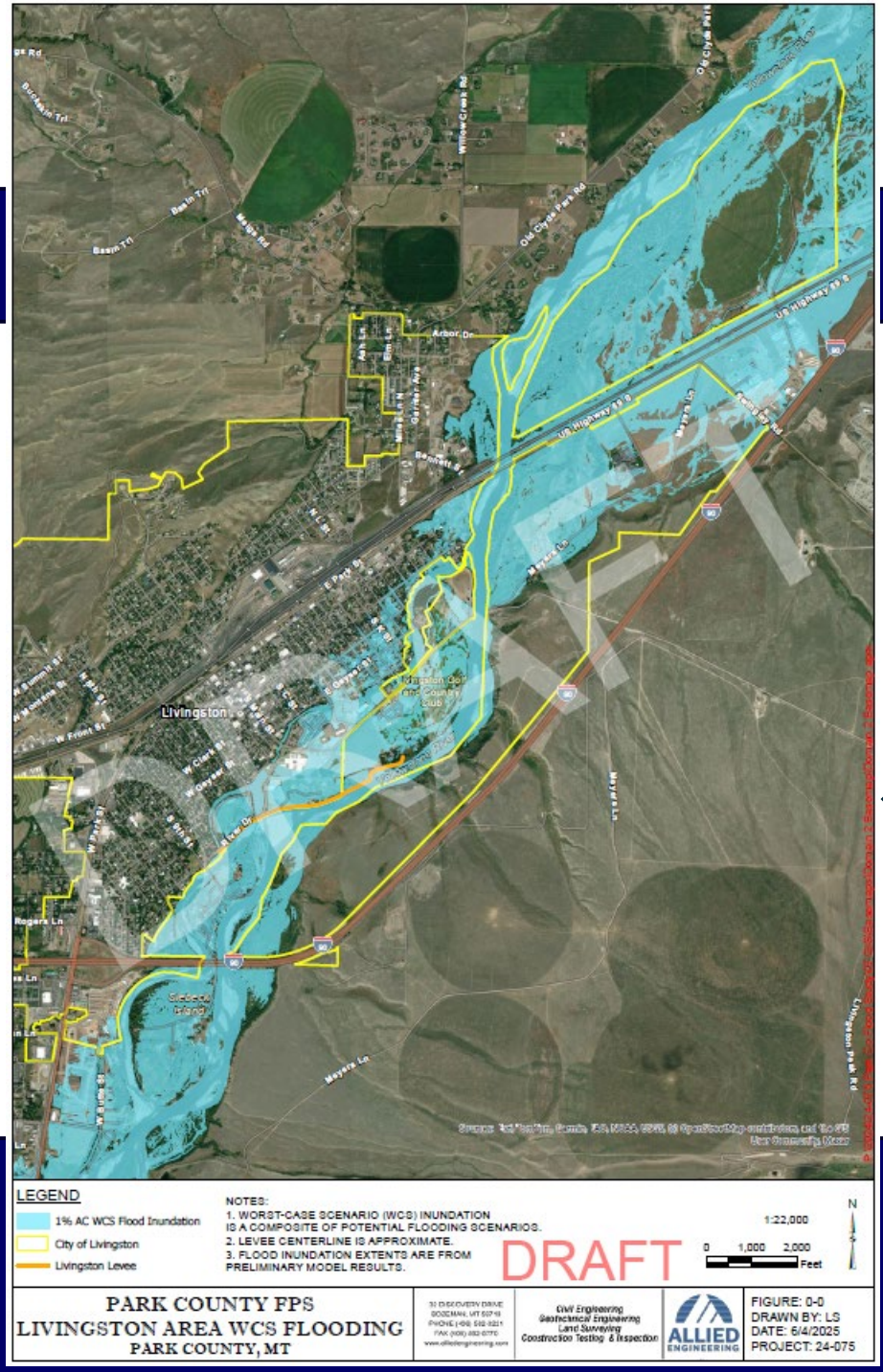
RiskMAP
Increasing Resilience Together

FEMA

MONTANA DNRC

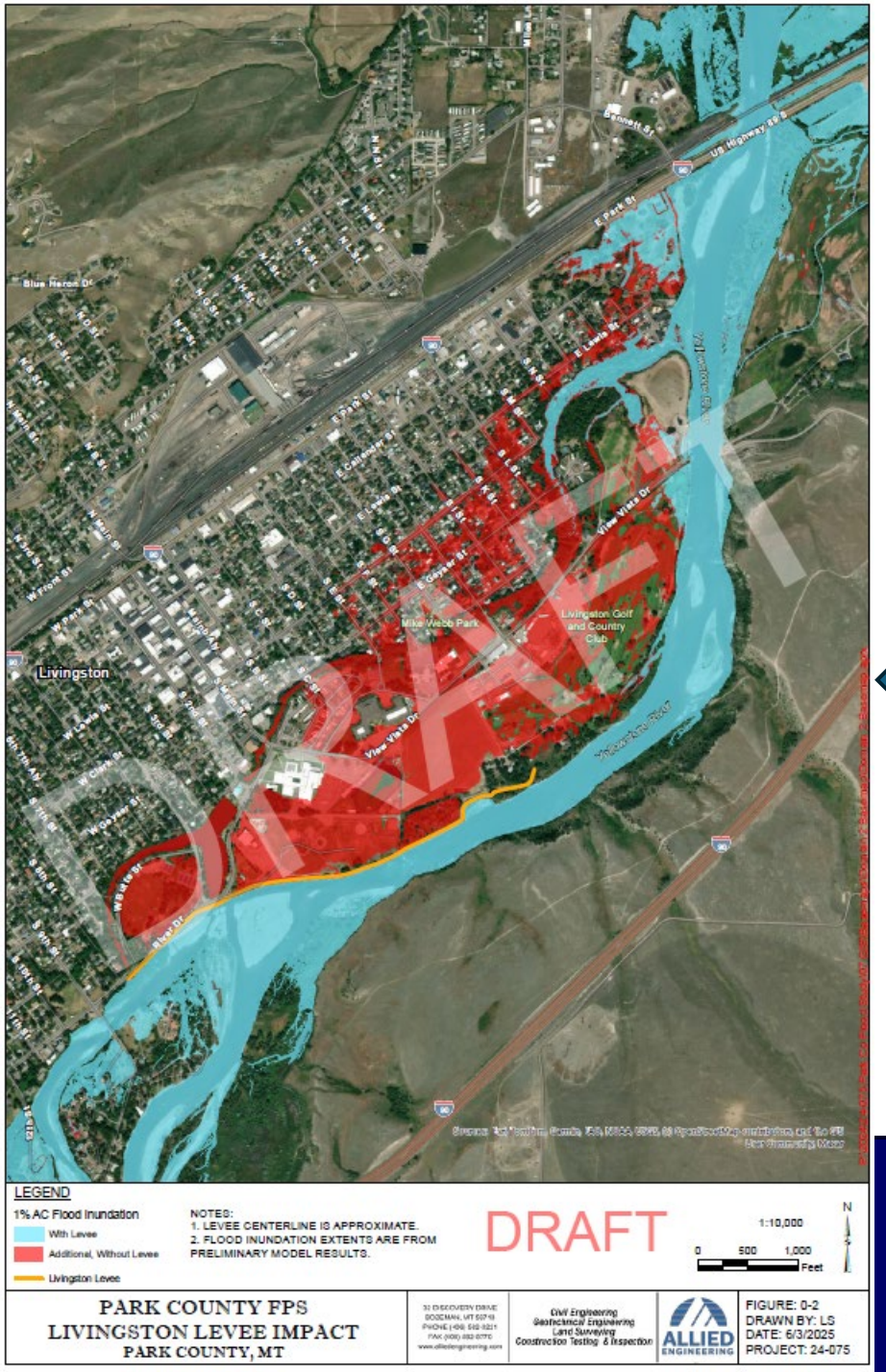
Early flood study results

** very early results some areas could change as the full study continues**

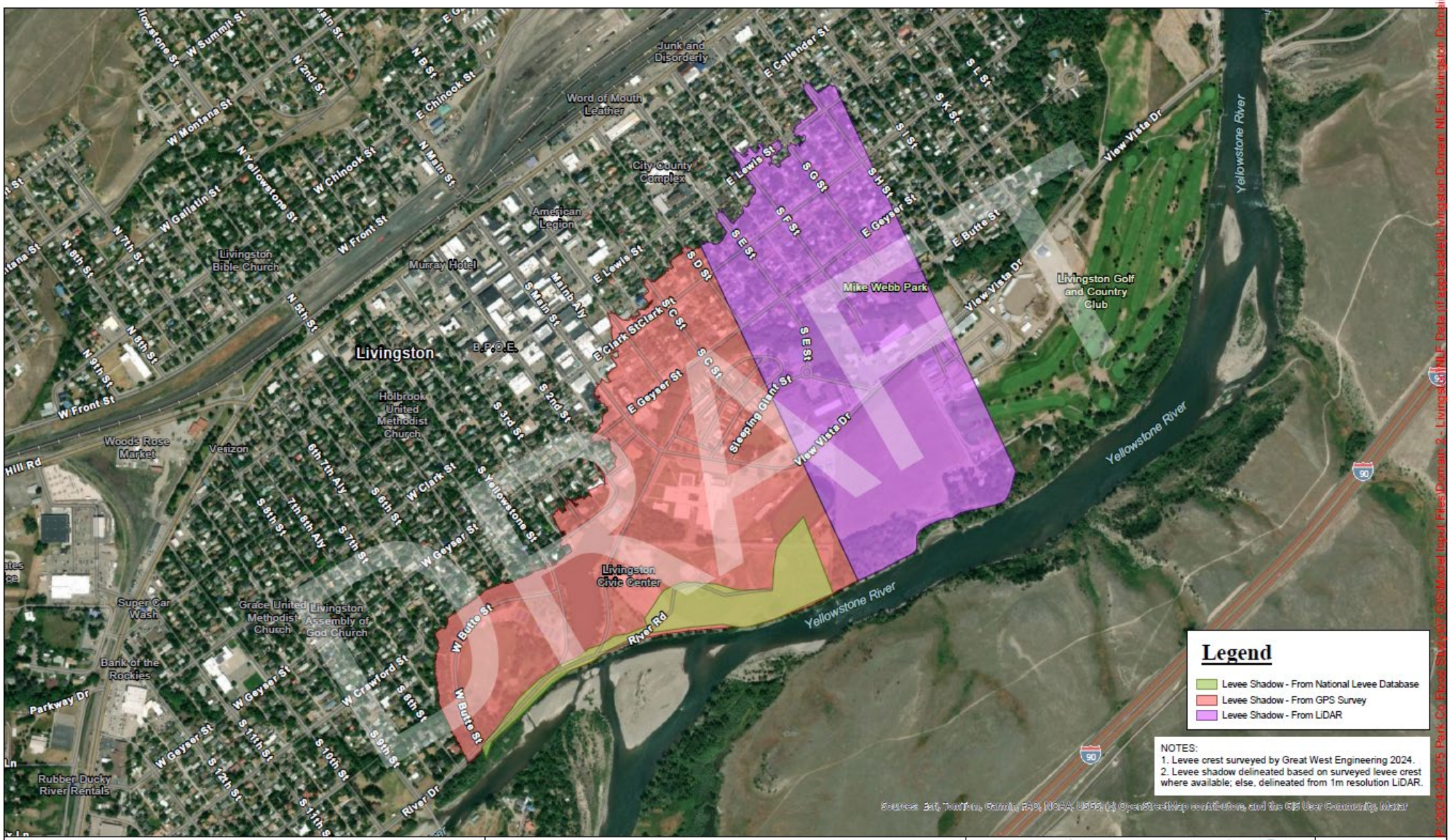


Worst Case Scenario flooding

Yellowstone River only



Levee impact area



PARK COUNTY FPS
LIVINGSTON LEVEE SHADOW
PARK COUNTY, MT

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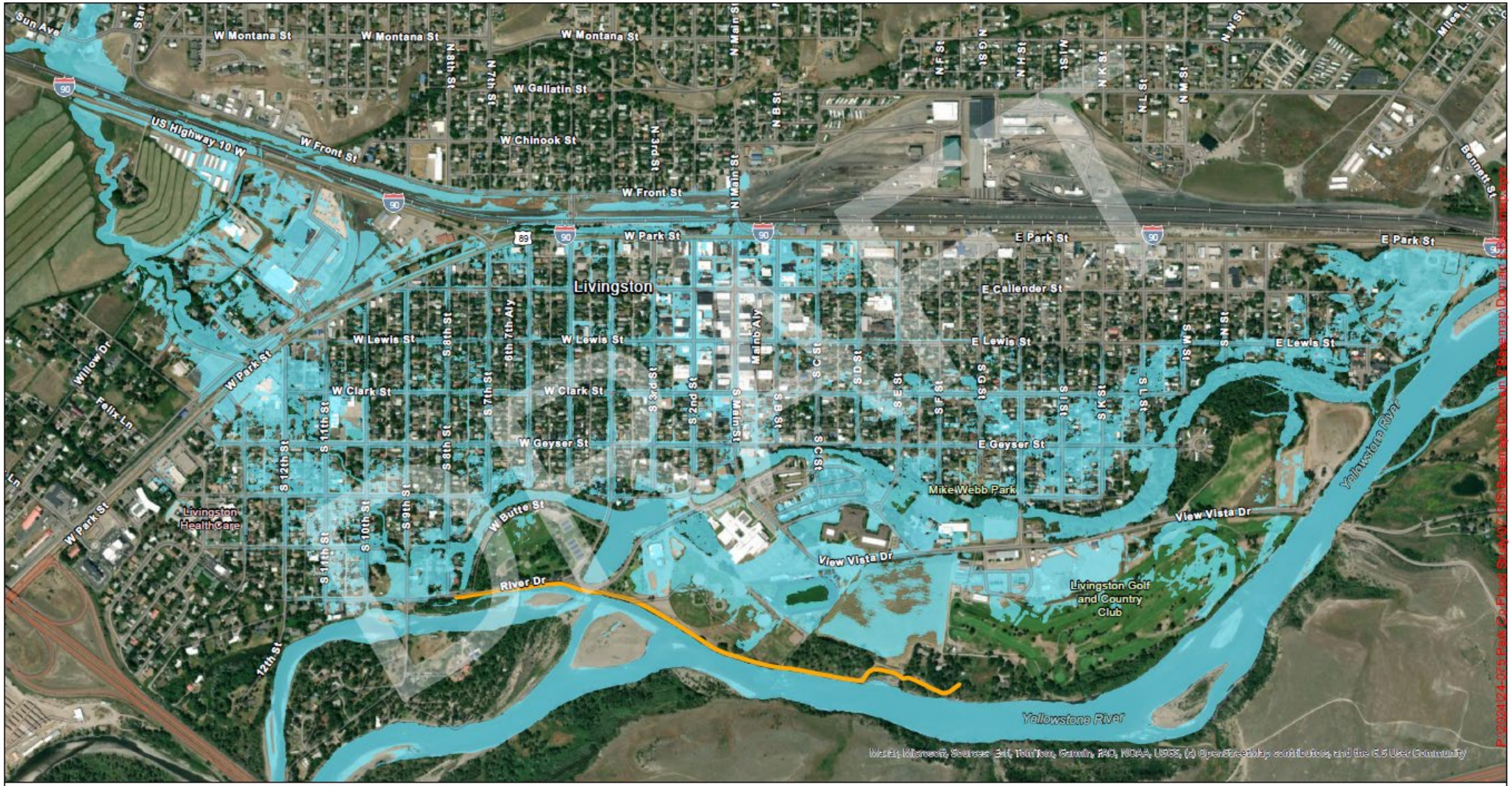
FAX (406) 582-5770
www.alliedengineering.com

Civil Engineering
Geotechnical Engineering
Land Surveying
Construction Testing & Inspection

FIGURE: 0-1
DRAWN BY: AKH
DATE: 6/4/2025
PROJECT: 24-075



LEGEND

1% AC Flood Inundation

Livingston Levee

NOTES:
1. FLOOD INUNDATION EXTENTS ARE FROM PRELIMINARY MODEL RESULTS.

1:10,000
0 500 1,000 Feet

DRAFT

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FLESHMAN CREEK INUNDATION
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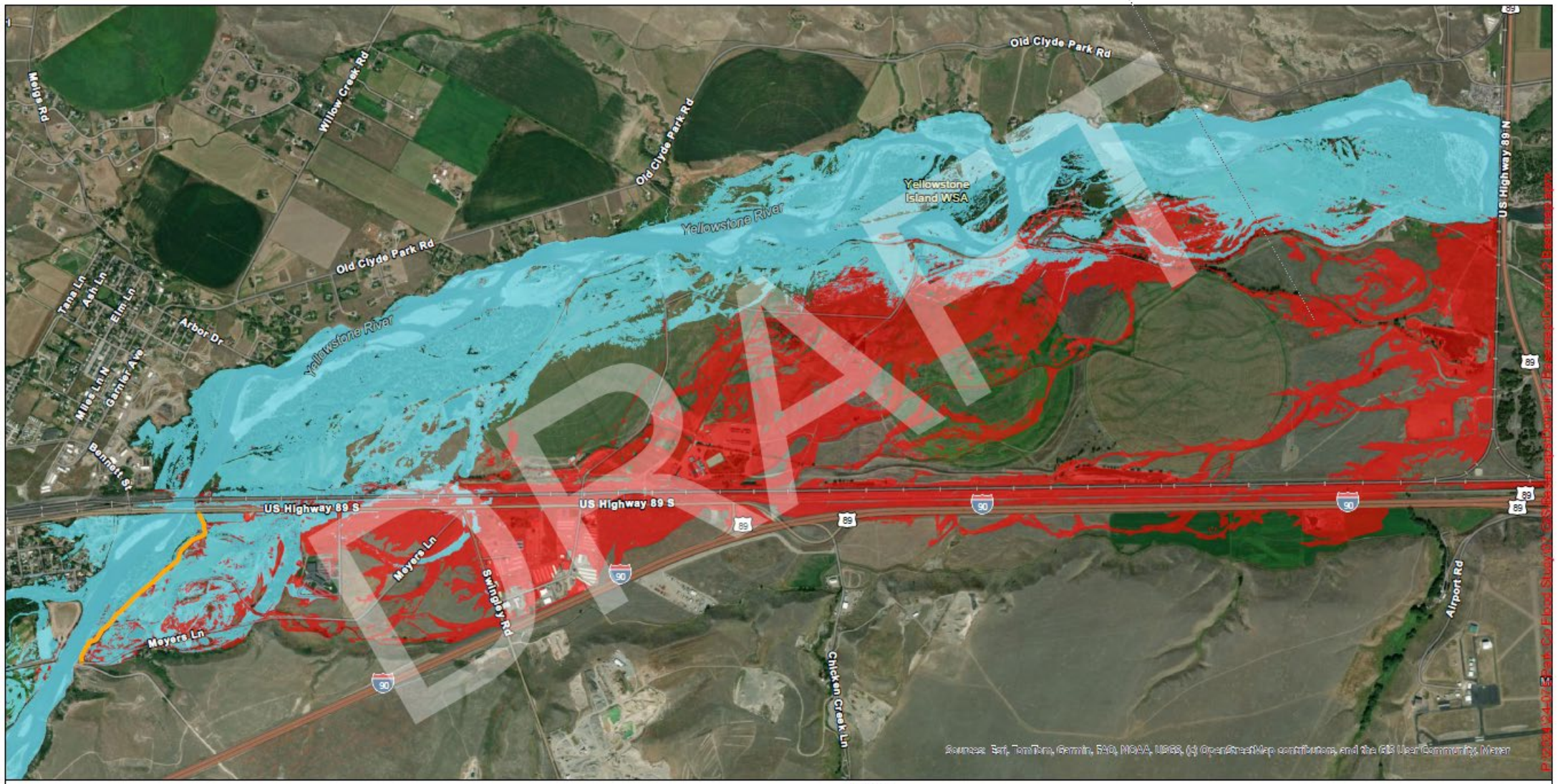
Geotechnical Engineering
Land Surveying
Construction Testing & Inspection

ALLIED ENGINEERING

FIGURE: 0-5
DRAWN BY: LS
DATE: 6/4/2025
PROJECT: 24-075



LEGEND

1% AC Flood Inundation

Non-Levee Feature (NLF)

Natural Valley Scenario

Additional, NLF Removed

NOTES:
1. A NON-LEVEE FEATURE (NLF) IS A PHYSICAL FEATURE THAT IS NOT DESIGNED, CONSTRUCTED, OPERATED, OR MAINTAINED AS A FLOOD CONTROL STRUCTRUE, BUT MAY INADVERTENTLY CONFINE FLOW DURING SOME FLOOD EVENTS (FEMA 2021).
2. FLOOD INUNDATION EXTENTS ARE FROM PRELIMINARY MODEL RESULTS.

1:20,000
0 1,000 2,000 Feet

DRAFT

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LIVINGSTON HOSPITAL AREA
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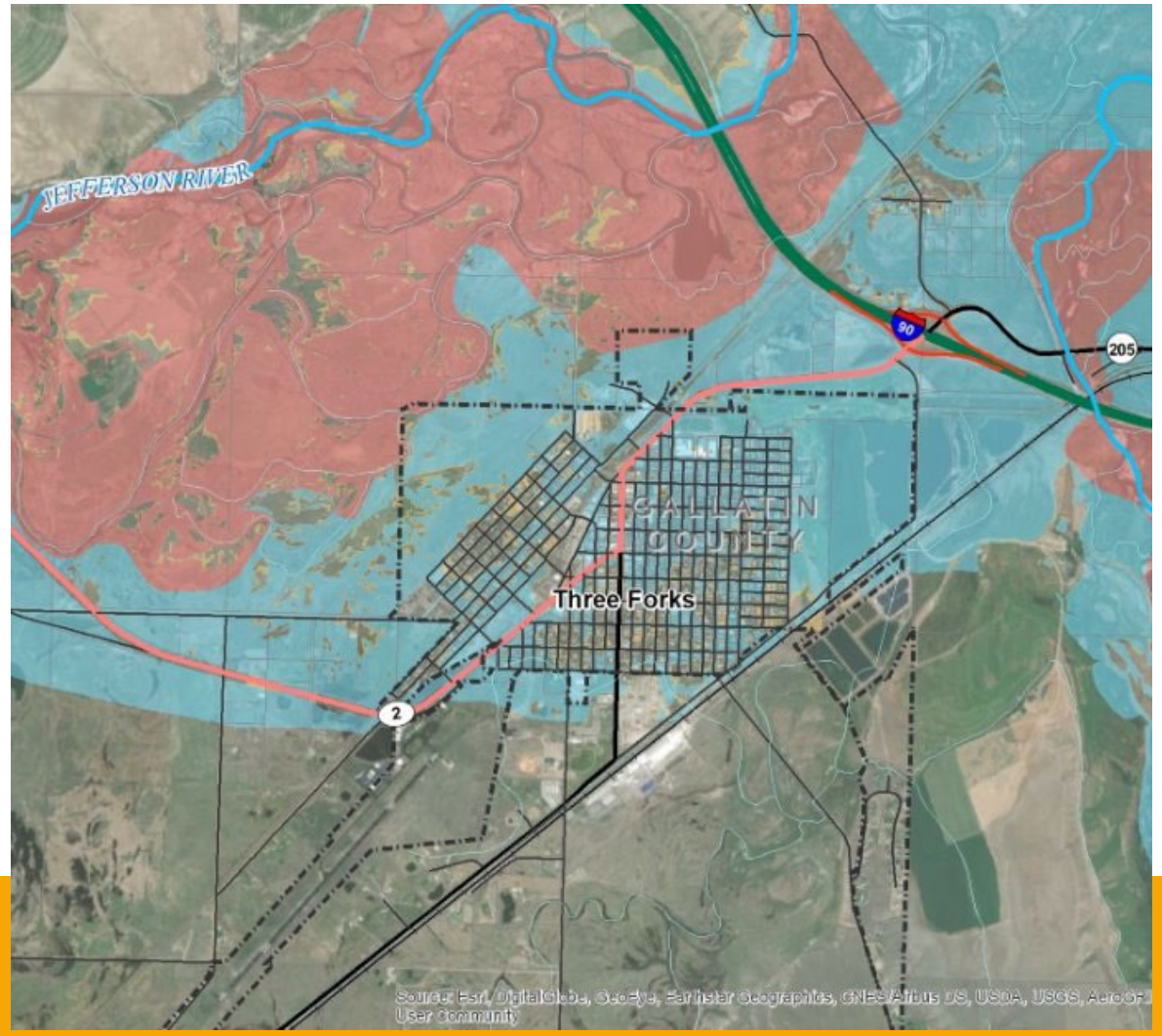
FIGURE: 0-6
DRAWN BY: LS
DATE: 6/3/2025
PROJECT: 24-075

Mitigation Technical Assistance Three Forks

EFFECTIVE



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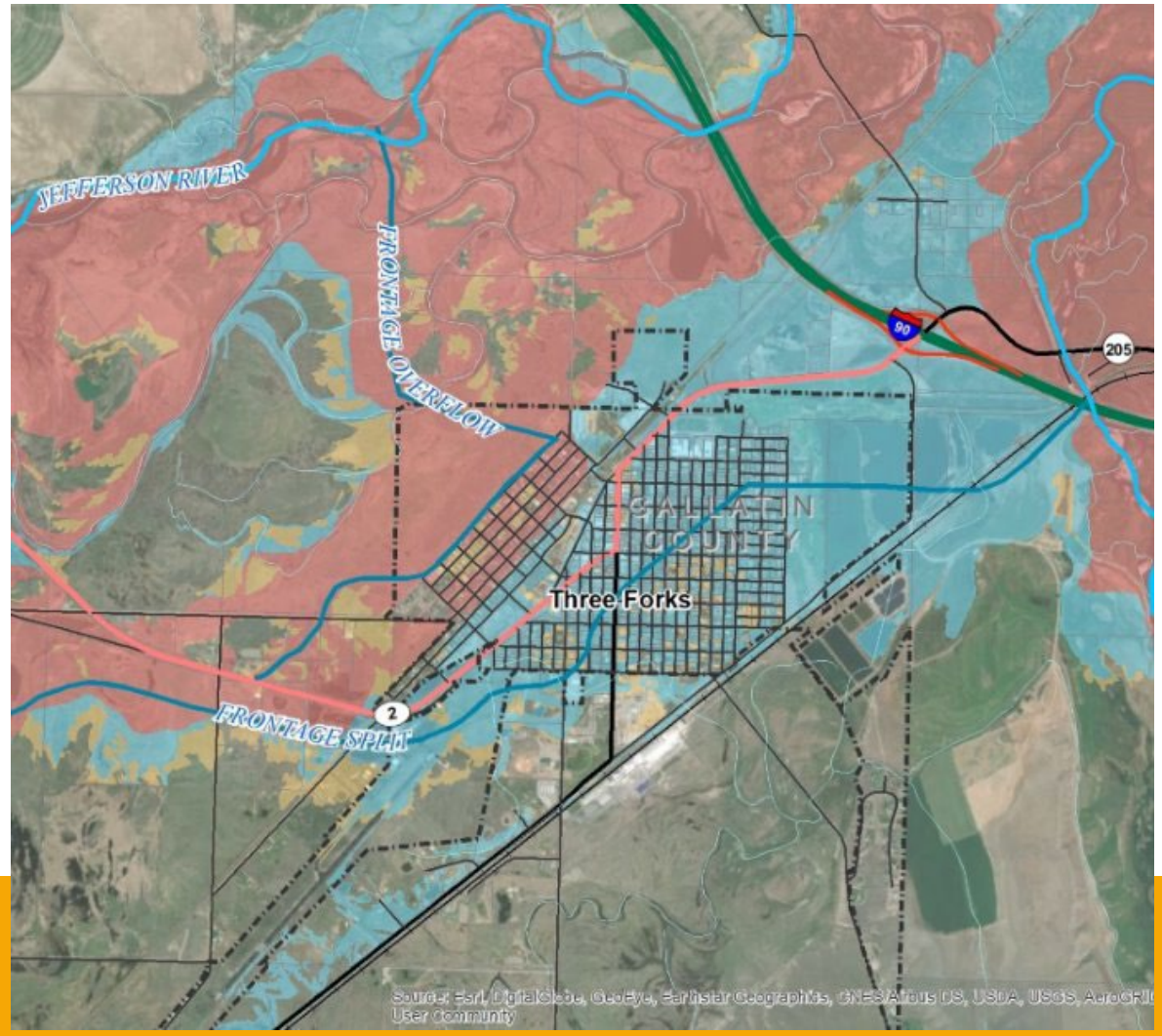

Mitigation Technical Assistance

Michael Baker INTERNATIONAL

We Make a Difference

TO: DOUG BRUGGER, TIFFANY LYDEN, NADENE WADSWORTH, MONTANA DNRC
FROM: ANDREW PARK-FRIEND
SUBJECT: THREE FORKS MITIGATION STRATEGIES
DATE: SEPTEMBER 11, 2020
CC: KEVIN DOYLE, RUSS ANDERSON, OLIVIA CECIL

Under contract to Montana Department of Natural Resources and Conservation (DNRC), Michael Baker International (Baker) has recently completed hydraulic analysis and floodplain mapping for the Jefferson and Madison River flooding sources in the vicinity of Three Forks, Montana. The hydraulic analysis and mapping are based on updated hydrologic data, topographic information, and advanced study methods (two-dimensional analyses used to inform one dimensional regulatory models). The results of the analysis and mapping indicates significant flooding risks from Jefferson River overbank flooding sources not previously identified on the effective Special Flood Hazard Area (SFHA). The overbank flooding sources were confirmed by calibration to the USGS gaging station and verification with aerial photography.

Given Baker's findings, DNRC has requested that Baker perform feasibility investigations and analyses of flood risk mitigation options that may reduce the flood risk to the City of Three Forks. The purpose of this memo is to describe the existing flood hazard in the City of Three Forks, to show the general impact of reduction of this flood risk, and to demonstrate the hydraulic feasibility of multiple mitigation options that may reduce the flood risk to the City of Three Forks.

1. **EXISTING FLOOD HAZARDS IN THE CITY OF THREE FORKS**

The existing flood risk in the City of Three Forks is significant. The hydraulic analysis and floodplain mapping recently completed by Baker shows that most of the structures within the city are likely to experience flooding during the 1-percent-annual-chance flood event.

The flooding depicted in the Baker analysis is generally more extensive than the flooding shown on the effective Flood Insurance Rate Map (FIRM). The most important reasons for this change in calculated flood risk are 1) the improvement in study methods for the Baker study (two dimensional modeling was used to inform one dimensional modeling, and 2) the greater spatial extent of the Baker study, which allowed for a fuller understanding of overbank flow on the Jefferson River.

1655 S. Union Blvd., Suite 200 | Lakewood, CO 80228
Office: 720.514.1100 | Fax: 720.479.3157

crossings at three road embankments: a Private Drive, Front Road, and Frontage Road. Three variations under Option 2 explore the effectiveness of re-establishing historic floodplain flowpaths to bring overbank flows back to the Jefferson River prior to entering the City of Three Forks. These options evaluate various channel sizes and culvert scenarios in this area to redirect flow to the Jefferson River. The streams and cross sections in the Baker existing conditions model were realigned and modified to better model the catchment channel and the three road crossings for these scenarios. The specific dimensions of the channel and culverts are not meant to be prescriptive – for example, culverts are modeled for these options, but could easily be replaced with bridge openings of similar dimensions. Similarly, the exact location of the channel and openings is flexible.

Figure 6 - Location of Option 2 Mitigation possibilities (Left – Topography (green/blue = low, red= high); Right – Aerial imagery)

Option 2A – 4 foot deep catchment channel with Double 6'x12' road crossing culverts
For this option, the model was modified to revise the existing channel dimensions into a larger channel. The modeled channel is approximately four feet deep, 90 feet wide at the base, and has 3:1 side slopes, and has a similar slope as the surrounding terrain. Three roadways are located in the hypothetical flowpath that would intercept overbank flows and return flows to

Three Forks. In fact, it should capture all flow during the 1-percent-annual chance flood event, leaving no flow to reach the City of Three Forks from this direction.

5. **RECOMMENDATION**

The mitigation alternatives described in the preceding sections provide several different solutions which could reduce the flood risk to City of Three Forks to varying degrees. All options appear to be feasible and within NFIP regulations. The impacts of these five options are detailed in **Table 1**.

Table 1 – Impact of Mitigation Alternatives

Mitigation Alternative	Discharge on Frontage Split (cfs)
NONE – Existing Conditions	1,800
1A – Frontage Road Bridge Expansion	1,790
1B – Frontage Road Bridge Expansion and Jefferson Channel Expansion	1,400
2A – 4' Deep Catchment Channel, Double 6'x12' Crossings	900
2B – 4' Deep Catchment Channel, Double 6'x12' Crossings, Upgrade Existing Culverts	100
2C – 7' Deep Catchment Channel, Quad 6'x12' Crossings	0

We recommend further exploration of all alternatives, with particular emphasis of Option 2B and 2C – a catchment channel with new openings under the Private Drive, Front Road, and Frontage Road, as well as augmenting the existing culverts under Frontage Road. These options have the benefit of removing most or all flow from the Frontage Split and Frontage Road Overflow that would otherwise inundate the City of Three Forks. With these alternatives, the City would still be susceptible to flooding from the Madison River or from the Upper Jefferson Split, as well as "local" flooding (ie., from rain that falls in or nearby the city). However, the most significant flooding source that impacts the greatest area of Three Forks during the 1-percent-annual-chance flood event – which arrives from the Jefferson River via the Frontage Split and Frontage Road Overflow – would be eliminated. These options also have the benefit of having additional capacity to significantly reduce flood hazards during the 0.2-percent-annual-chance-flood even and other more extreme events. Overall, these mitigation alternatives have the potential to provide great flood risk reduction for the City of Three Forks.

Flood Study Project Timeline

PARK COUNTY MONTANA

RiskMAP
Increasing Resilience Together

MONTANA DNRC
The Montana Department of Natural Resources & Conservation

This is an estimated timeline for project completion

Completed in 2024	Hydraulics 2025	TBD	TBD	TBD
Measurements are made of the topography around the river, along with any culverts, bridges, and road crossings. LiDAR uses an airplane to collect ground elevation over a large area, and ground survey supplements the airborne data. Flood flow data determines how much water there will be in a river during a flood event.	The elevation and survey data are combined with flood flow data to determine where the water will go and how far it will spread out. The area shown to be underwater and at high risk is mapped as the regulatory floodplain.	Draft data is delivered to the communities. Public open houses will be held to review the information.	FEMA Preliminary Maps are produced and ready for public review and comment period. 90-day official comment & appeal period	FEMA Flood Insurance Rate Maps finalized.
Data gathering	**Engineering and floodplain modeling**	**Draft Data available public review**	**Preliminary Data public comment and appeal period**	**Flood Insurance Rate Maps become effective**

Steps of a flood study.

1) Survey & LiDAR
2) Hydrology (flood flow)
3) Hydraulics (engineering)
4) Mapping (delineation)

Public Review

A public open house is held after draft data is available and before preliminary maps are released.

During this time public comments are encouraged. There will be an official 90-day appeal period after the maps become preliminary.

Resiliency and Mitigation efforts

Once the flood study is completed the community can determine what mitigation efforts it would like to pursue to reduce flood risks.

Community Work

Update local floodplain ordinances.

Prepare initiatives to reduce flood risk.

Thank you

Photo by Pioneer Engineering