

# Flood Management Evaluation Memorandum

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DATE: April 12, 2023

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PROJECT: LCRA Contract No. 5809  
Halff AVO 43796.001  
FNI HAF21363

SUBJECT: **FME ID: 101000043**  
**Project Sponsor:** City of Fredericksburg  
**Project Name:** Edison Street at Barons Creek

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On September 15, 2022, the Lower Colorado-Lavaca Regional Flood Planning Group (RFPG) approved the evaluation of this Flood Management Evaluation (FME) to identify, evaluate and recommend additional potentially feasible Flood Mitigation Projects (FMP).

## Introduction

The City's 2016 Drainage Master Plan (DMP) proposed local drainage improvements to Edison Street at Barons Creek. This action is included in the adopted Regional Flood Plan as a recommended FMP that anticipated local drainage improvements to include increasing the capacity of an existing channel and upsizing two culverts to provide safe access to adjacent houses. The project was identified and prioritized based on staff knowledge rather than detailed modeling. Based on the Sponsor request, the Regional Flood Planning Group (RFPG) recommended inclusion in the Regional Flood Plan (RFP) as FME 101000043.

Mr. Garret Bonn, Assistant City Engineer, and Interim Director of Development Services, was contacted to confirm the City's support to have the RFPG perform this FME, as described herein, as part of the Task 12 effort. Mr. Bonn confirmed the general nature of the flood problem, is supportive of the study, and assisted with local information and will review the report deliverables.

This FME includes updating the FEMA flood hazard analysis and mapping with ATLAS 14 rainfall data and evaluation of mitigation alternatives. This FME also includes preliminary capital cost estimates, quantification of flood risk reduction benefits, benefit-cost analyses, adverse impacts evaluation, and a high-level evaluation of potential constraints including environmental permitting, utility relocations, right-of-way acquisition, and constructability issues in accordance with adopted FMP screening criteria.



## Hydrology

In the original HEC-RAS 1D BLE model, a Regression Equation was applied to calculate the peak flows. There is no HEC-HMS model available for the entire BLE area. To update the hydraulic model with NOAA Atlas 14 rainfall, a HEC-RAS 2D Rain-on-Grid model was developed to generate peak flows for the HEC-RAS 1D BLE model.

- Modeling Software: HEC-RAS version 6.3.1
- Rainfall Data: NOAA Atlas 14, 24-hour duration (2-, 5-, 10-, 25-, 50-, 100-, and 500-year frequency storms).
- Loss Method: NRCS Curve Number loss rate method

## Hydraulics

Because the study area is outside the main channel of Barons Creek the HEC-RAS 2D rain-on-grid model with the Atlas 14 computed flows and utilized for hydraulic analysis. Structure data for the existing channel was developed using the LiDAR data and verified using plans developed for the proposed City design.

- Modeling Software: HEC-RAS version 6.3.1, 2D unsteady-state simulation.
- Hydrologic Data: see above.
- Boundary Conditions: Downstream normal depth

## Existing Condition Flood Risk

The initial project was developed based on previous staff knowledge of street flooding and access issues in the vicinity of Edison Street at Peach Street. The streets within the study are considered residential and neighborhood collectors ranging in width from approximately 28- to over 50-ft wide. Curbs vary from non-existent to 12-inches. Based on model results the maximum 100-year water depths in Edison Street and Bowie Street are approximately 1.31 and 1.71 feet, respectively. In addition, the maximum 100-year water surface elevation along the rear property lines between Edison and Bowie Streets is approximately 0.98 feet.

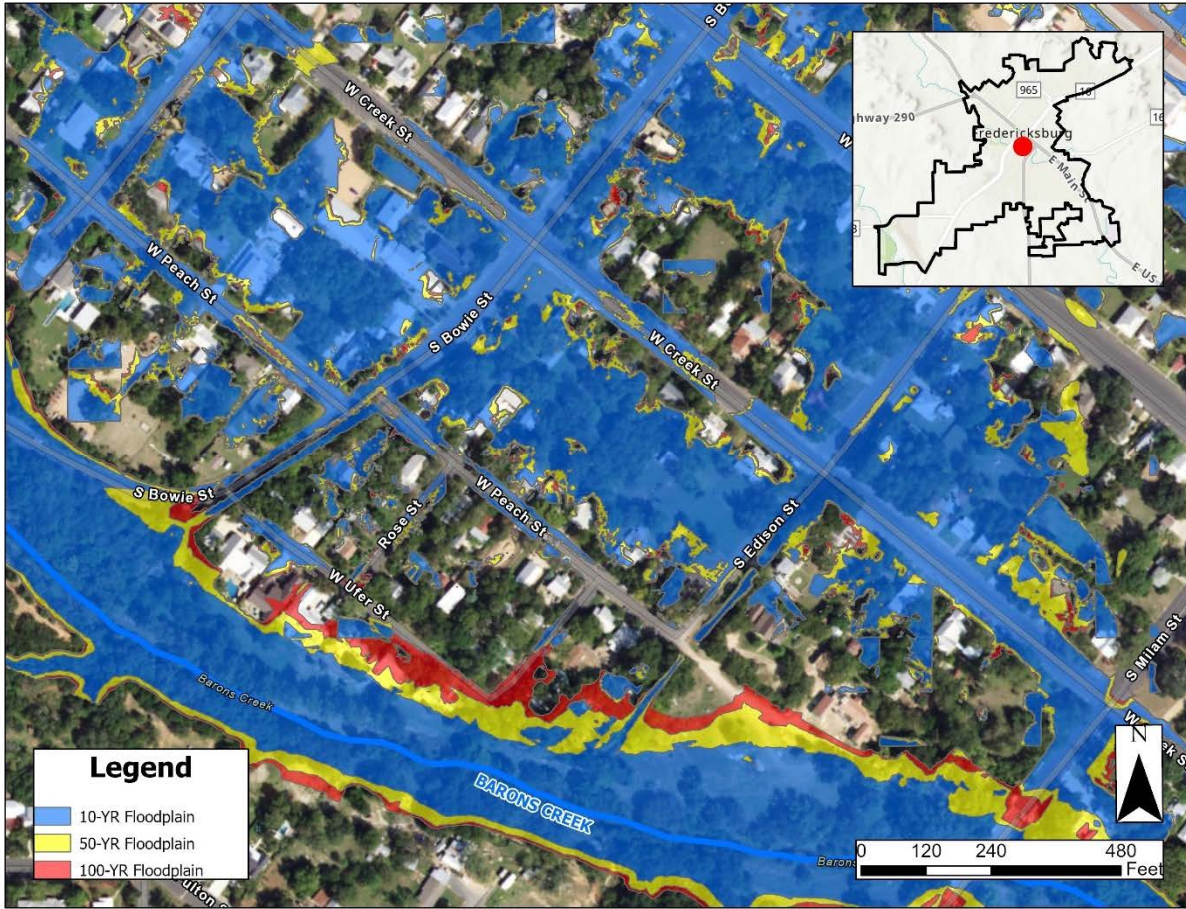
**Table 1** presents maximum water surface depths for the 10-, 25- and 100-year events in Edison Street, Bowie Street, and at the rear property lines for the properties between the two streets. The existing inundation map is presented in **Figure 2**.

It is important to note that although the inundation map shows some structures within the study area are at-risk, the city does not have records of structural flooding. This is common for preliminary studies based on LiDAR data. The inundation limits reflect water surface elevations based on LiDAR generated contours and do not reflect constructed finished floor elevations. **Figure 3** is the street view of one of the potentially at-risk structures that shows the finished floor elevated above the nearest adjacent ground.

**Table 1: Peak Water Surface Depths**

	10-yr (ft)	25-yr (ft)	100-yr (ft)
Edison Street	1.50	1.65	1.83
Bowie Street	1.81	1.98	2.09
Rear Property Line	1.25	1.35	1.57

**Figure 2: Existing Condition Flood Risk**



**Figure 3: Example of Elevated Finished Floor**



## Proposed Improvements

Alternatives evaluated included the originally proposed design and two alternatives. The alternate design included:

- Original Proposed Design – Modifications to upsize the existing channel and culverts on the east side of Edison Street.
- Alternate 1 – Expand the original design to include a swale along the rear property lines (between Bowie and Edison Streets), install an area inlet and culvert to capture and convey flows to the improved channel on Edison Street.
- Alternate 2 – Expand the proposed storm drains (consisting of curb inlets and 8' x 6' RCB trunk lines) to capture and convey runoff directly to Barons Creek in Acorn Street, Bowie Street, and Edison Street.

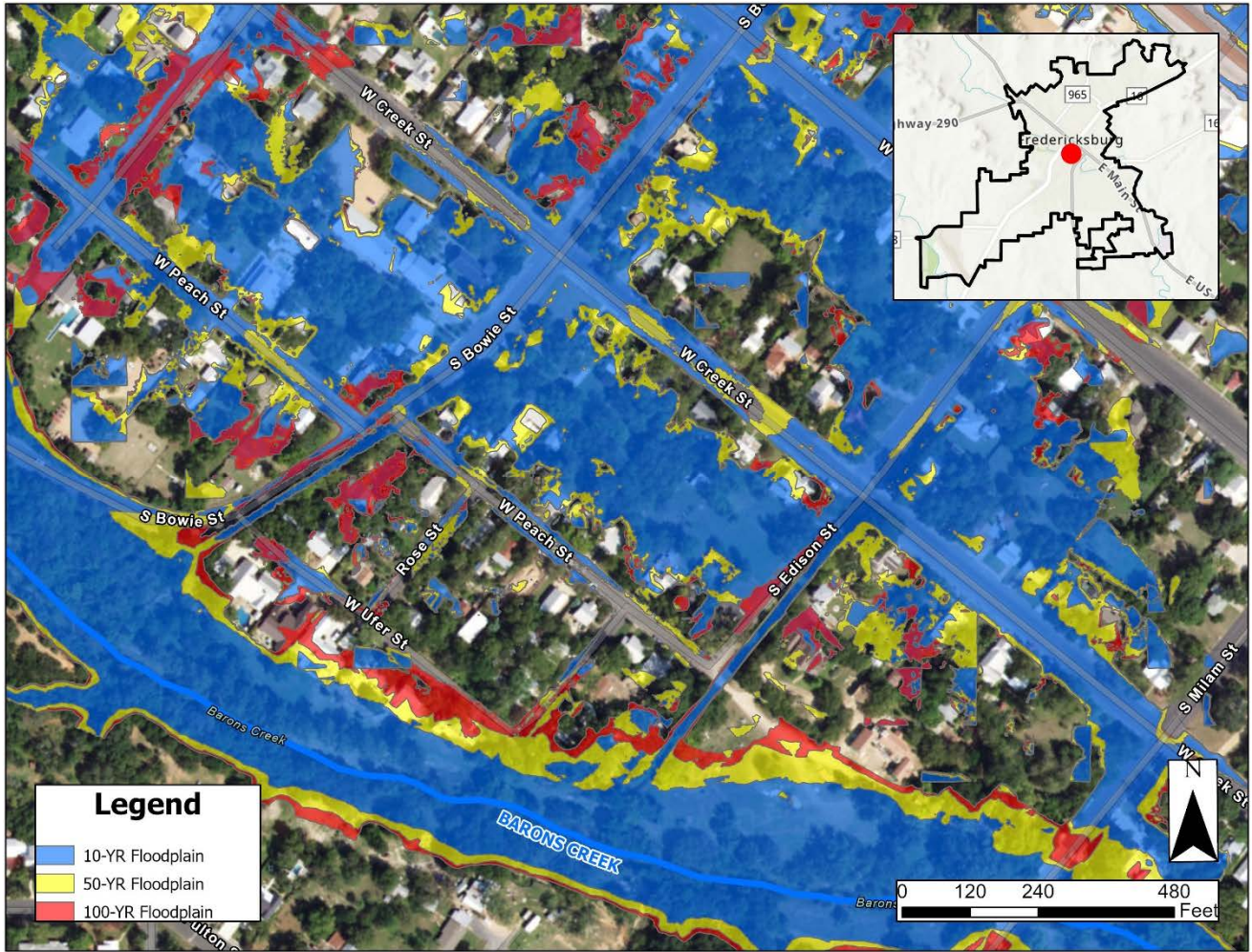
A comparison of the maximum water surface depths is presented in **Table 2**.

**Table 2: Peak Water Surface Depths**

	10-yr (ft)			25-yr (ft)			100-yr (ft)		
	Original	Alt 1	Alt 2	Original	Alt 1	Alt 2	Original	Alt 1	Alt 2
Edison Street	1.37	1.37	1.05	1.42	1.42	1.14	1.77	1.77	1.31
Bowie Street	1.79	1.79	0.63	1.93	1.93	0.80	2.08	2.08	1.71
Rear Property Line	1.20	1.20	0.16	1.28	1.28	0.47	1.50	1.50	0.98

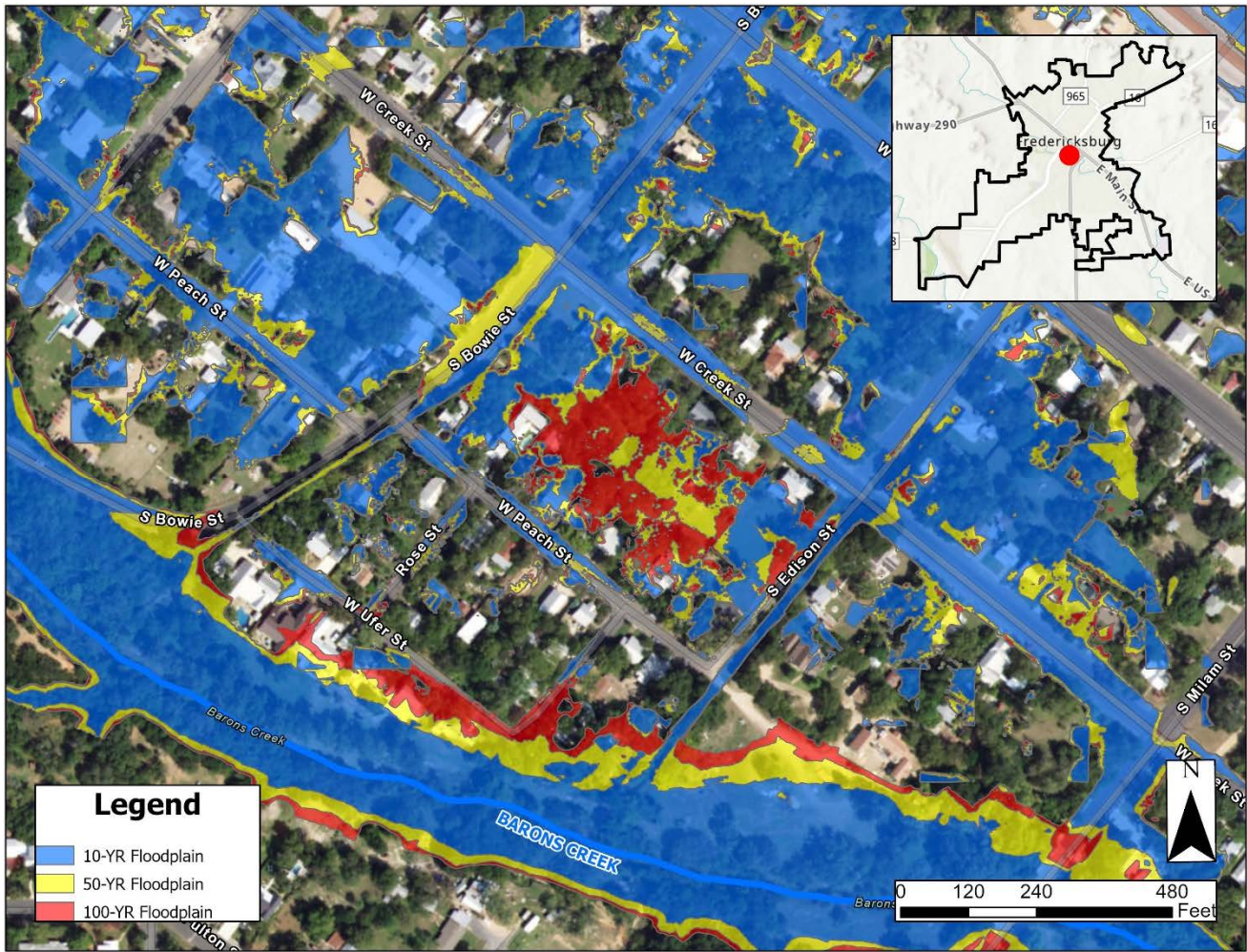
The proposed inundation maps are shown in **Figures 4 and 5**. Because there is no measurable difference between the original design and Alternate 1 both are represented in Figure 4.

Figure 4: Original Design and Alternative 1 Inundation Mapping



PRELIMINARY

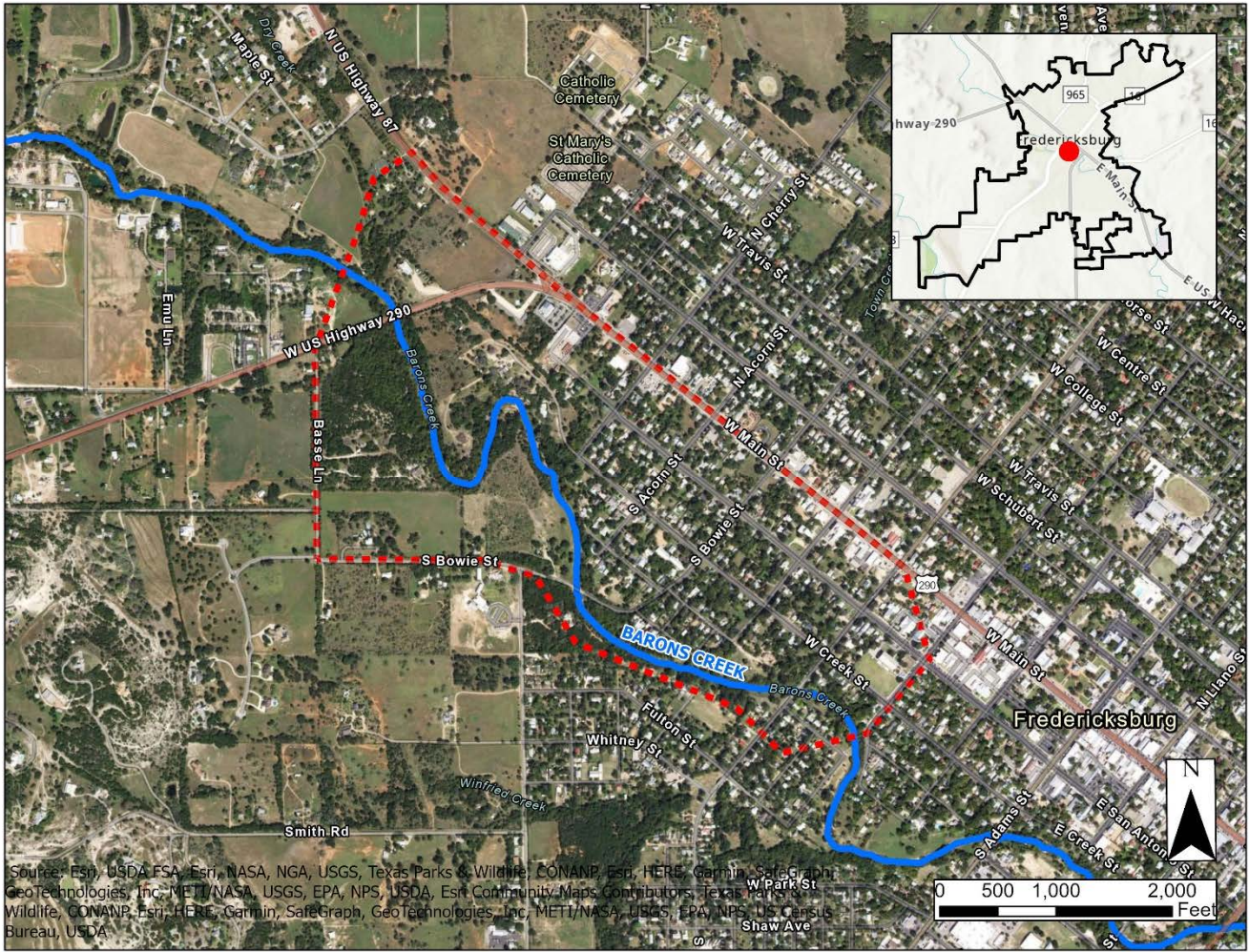
**Figure 5: Alternative 2 Inundation Mapping**



Freese and Nichols discussed the results of the alternatives evaluation with Mr. Garret Bonn. Mr. Bonn indicated that based on the limited flood risk reduction and potential cost of the system, the project is not feasible he would not support moving forward. However, he did indicate the city has concerns with outfalls from the TxDOT system along Main Street (Highway 89/290) as well as other upstream road crossings on Barons Creek. After further discussion, Mr. Bonn stated his preference to modify the existing Flood Management Evaluation (FME) to study the area southwest of Main Street from upstream of State Highway 16 to upstream of U.S. 290.

Based on the limited flood reduction benefits versus cost of this FME, and discussions with the city, it is recommended that FME101000043 be modified to reflect a more comprehensive evaluation of the area reflected in Figure 6.

Figure 6: Revised Future Study Area



- End of Memorandum -

PRELIMINARY



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# Technical Memorandum Attachments

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**Attachment 1.** Flood Mitigation Project

- FMP Summary Sheet

PRELIMINARY DRAFT

# Flood Management Evaluation (FME) STUDY

Lower Colorado-Lavaca  
**REGIONAL FLOOD  
PLANNING GROUP**

Title **Barons Creek Watershed - Southwest City** ID# **101000043**  
Sponsor (note if City or County) **Fredericksburg (Municipality)** Commitment  Yes  No

**REGION 10**

## Study Type

Emergency preparedness  Floodplain modeling, mapping and risk assessment  Feasibility study  Preliminary project engineering  
 Other

## Problem Area

City **Fredericksburg** County **Gillespie**  
Watershed name(s) **Pedernales**  
Tributary(ies) **Barons Creek**  
HUC#(s) **12090206** Stream miles (est.) **1.55**  
Drainage area: square miles, est **0.28** or acreage, est **182.13**  
Social Vulnerability Index (SVI) **0.10**  
*(SVI score 0.0 indicates least vulnerable; 1.0 indicates most vulnerable.)*  
Other **Drainage System and Roadway/Crossing Improvements**



## Flood Risk Description

This study evolved out of the previous Edison Street at Barons Creek Study. The project was identified based on staff knowledge and was intended to reduce local street flooding, mobility, with possible structural risk reduction. The project was evaluated under Task 12 of the planning process. A 2D rain-on-mesh model was developed to analyze proposed local drainage improvements and related alternatives. Due to the limited local flood risk reduction benefits the city amended the action to include a broader study to evaluate potential drainage system and/or roadway improvements for the residential areas upstream of Milam Street.

Population at risk **830** Structures at risk **274** Critical facilities at risk (number) **0**  
Farm/Ranch land impacted (acres) **0** Roadway(s) impacted (miles) **1.49**

## Scope of Study

Study will include hydrologic and hydraulic modeling (with Atlas 14 rainfall), preliminary design of improvements, risk reduction analysis, verification of no adverse impact, preparation of cost estimate and a benefit-cost-analysis, and an evaluation of potential constraints (environmental, utility conflicts, right-of-way needs, and constructability).

## Related Goal(s)

6.1 Reduce the number of structures and critical facilities that are at high risk of repetitive loss through the implementation of structural flood mitigation project.

## Estimated Study Cost

Cost **\$150,000** Potential funding source(s) **TBD**