

# Technical Memorandum

**To:** Amber Doschadis  
Administrator – Upper Minnesota River  
Watershed District

**From:** Lisa Odens PE, CFM  
Houston Engineering, Inc.

**Subject:** **DRAFT** - Toelle Coulee Summary

**Date:** December 4, 2020

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am duly Licensed Professional Engineer under the laws of the State of MN

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Lisa D Odens      Date  
Reg. No. 51685

## INTRODUCTION

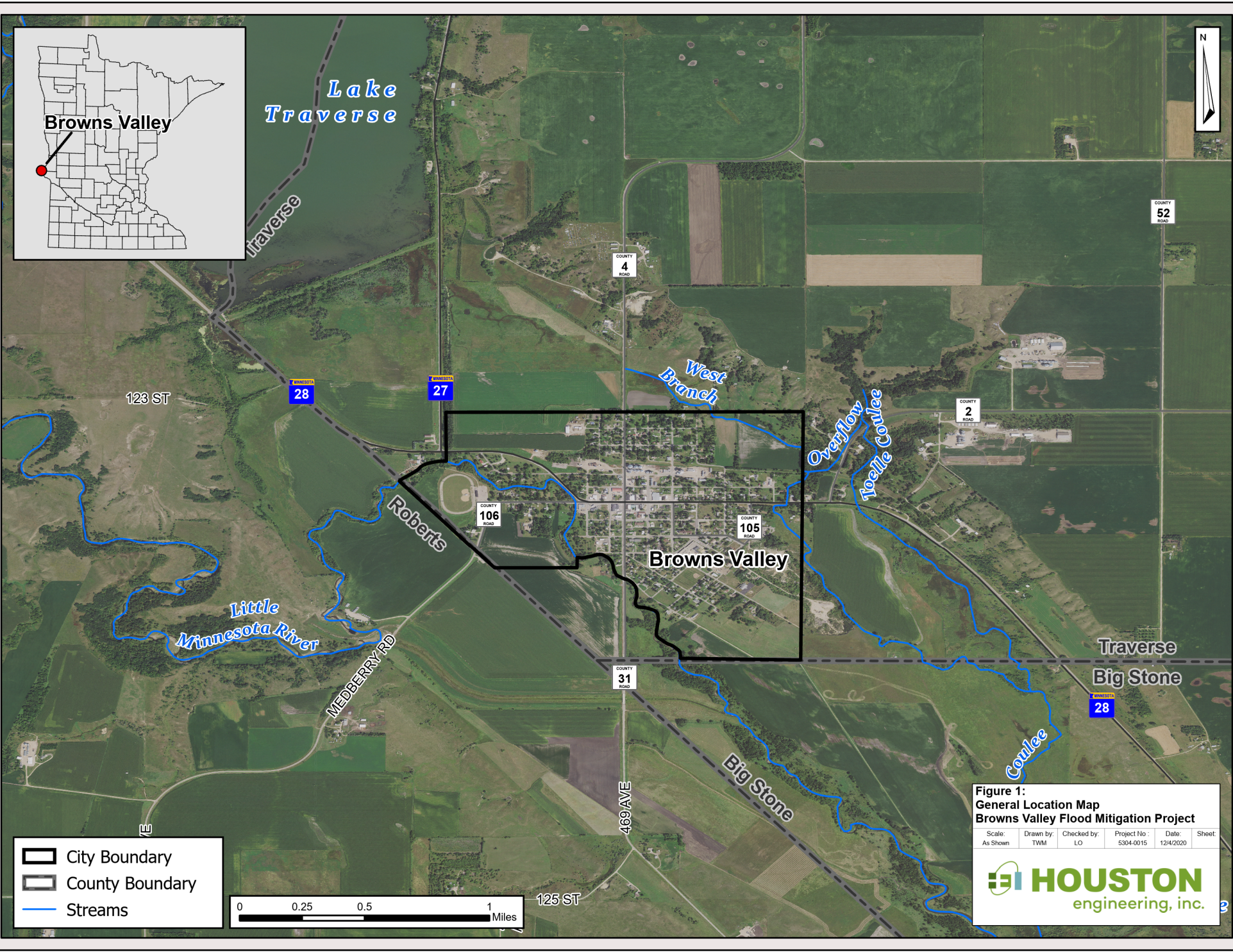
The purpose of this memorandum is

1. to provide a summary of the purpose, components, and benefits of the flood mitigation projects that have previously been constructed to protect the City of Browns Valley from flooding.
2. to discuss the purpose, components, and benefits of future project components.

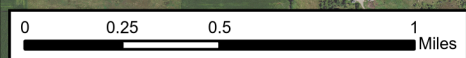
The City of Browns Valley is in a unique geologic setting, at the continental divide between the Red River and the Minnesota River, which leads to susceptibility to flooding. Flooding has historically come from two potential sources:

- The Little Minnesota River, which flows from the west through town and then south towards Big Stone Lake; and
- Toelle Coulee a flashy tributary east of Browns Valley which during very large rainfalls has overtopped its banks and overflowed into the west branch which is west of County State Aid Highway (CSAH) 2. This has contributed to flooding on the east side of town. This overflow occurs due to a combination of an undersized culvert crossing at CSAH 2 and excavation of an embankment that occurred during construction of CSAH 2.

**Figure 1** shows the location of the city and flooding sources.



- City Boundary
- County Boundary
- Streams



**Figure 1:**  
**General Location Map**  
**Browns Valley Flood Mitigation Project**

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## PROJECT GOALS (2007)

To address these flooding concerns, the City, the Upper Minnesota River Watershed District (UMRWD), and Traverse County established the Browns Valley Flood Mitigation Task Force (BVFMTF) to plan permanent flooding solutions. The BVFMTF confirmed the following project goals during their September 2007 meeting:

- Provide flood protection for the 1% chance (100-year) or a less frequent flood (providing the additional protection is at nominal additional cost) within the Corporate Limits for the City of Browns Valley.
- Provide flood protection for the 1% chance (100-year) or a less frequent flood (providing the additional protection is at nominal additional cost) for a buffer area extending some distance beyond the Corporate Limits for the City of Browns Valley;
- Provide for a distribution of flows between Lake Traverse and the Little Minnesota River based upon an understanding of the historic distribution.
- Incorporate a safety factor into the design of the flood mitigation solution reflecting the unpredictable nature of the flood mechanism within Browns Valley (e.g., summer floods versus spring floods caused by ice);
- Avoid moving the flood problem downstream, based upon criteria for the increase in elevation within Big Stone Lake and historic flows to Lake Traverse.
- Use the least amount of land possible for construction of the project features for the
- selected alternative.
- Maintain minimum flows less than the 5-year recurrence interval within the Little Minnesota River through Browns Valley to provide for ecological integrity within the river through town; and
- Technical feasibility.

Following the development of a plan, the UMRWD initiated a watershed district project in accordance with MN statute 103D. This watershed district project included multiple project phases, which enabled project benefits to be realized as project funding for each phase was obtained.

## PROJECT PHASES CONSTRUCTED TO DATE

### Little Minnesota River Flood Diversion Project Components

The first phase of the watershed project was the construction of the Little Minnesota River Flood Diversion in 2009. The diversion project generally consisted of:

- a floodway channel, to convey flows from the Little Minnesota River following extreme rainfall events,
- a diversion dam to redirect extreme flows into the channel,
- levees along the diversion channel to protect adjacent properties,
- and two bridges to cross the diversion channel.

This project resulted substantial reductions in the area of Browns Valley inundated by the 100-year flood event, and likely has prevented significant flood damages in the City which otherwise would have resulted from large rainfalls in the last 10 years.

## Toelle Coulee Phase 1

Several project components related to Toelle Coulee, including those along a tributary on the east side of Browns Valley (referred to as the “West Branch”) were conceptualized to prevent the 100-year flood from entering the northeast part of Browns Valley, while also protecting homes near the Coulee itself. The report described several alternatives to address flooding from Toelle Coulee. The details of these alternatives will be discussed in greater detail in subsequent sections of this memorandum. All alternatives noted the need for improvements to the West Branch due to local flooding.

No project components to alleviate flooding on Toelle Coulee were incorporated into construction of the Little Minnesota River Diversion Project. In 2017 funds were allocated by the MN Legislature for the purpose of flood mitigation in the City of Browns Valley which was received via a Flood Mitigation Grant. The funds received were insufficient to construct all of the proposed alternatives in their entirety. However, several project components on the West Branch are necessary for all three Toelle Coulee alternatives. These components provide flood reduction benefit as a stand-alone project. The UMRWD proceeded with these West Branch project components, which included:

- a. Channel widening and cleaning along West Branch
- b. Lowering of railroad embankment at West Branch
- c. Additional culvert capacity under Trunk Highway (TH) 28.

Construction for these components was completed in 2020. This project reduced water surface elevations downstream of TH 28 by 0.8 feet and makes possible the future project alternatives.

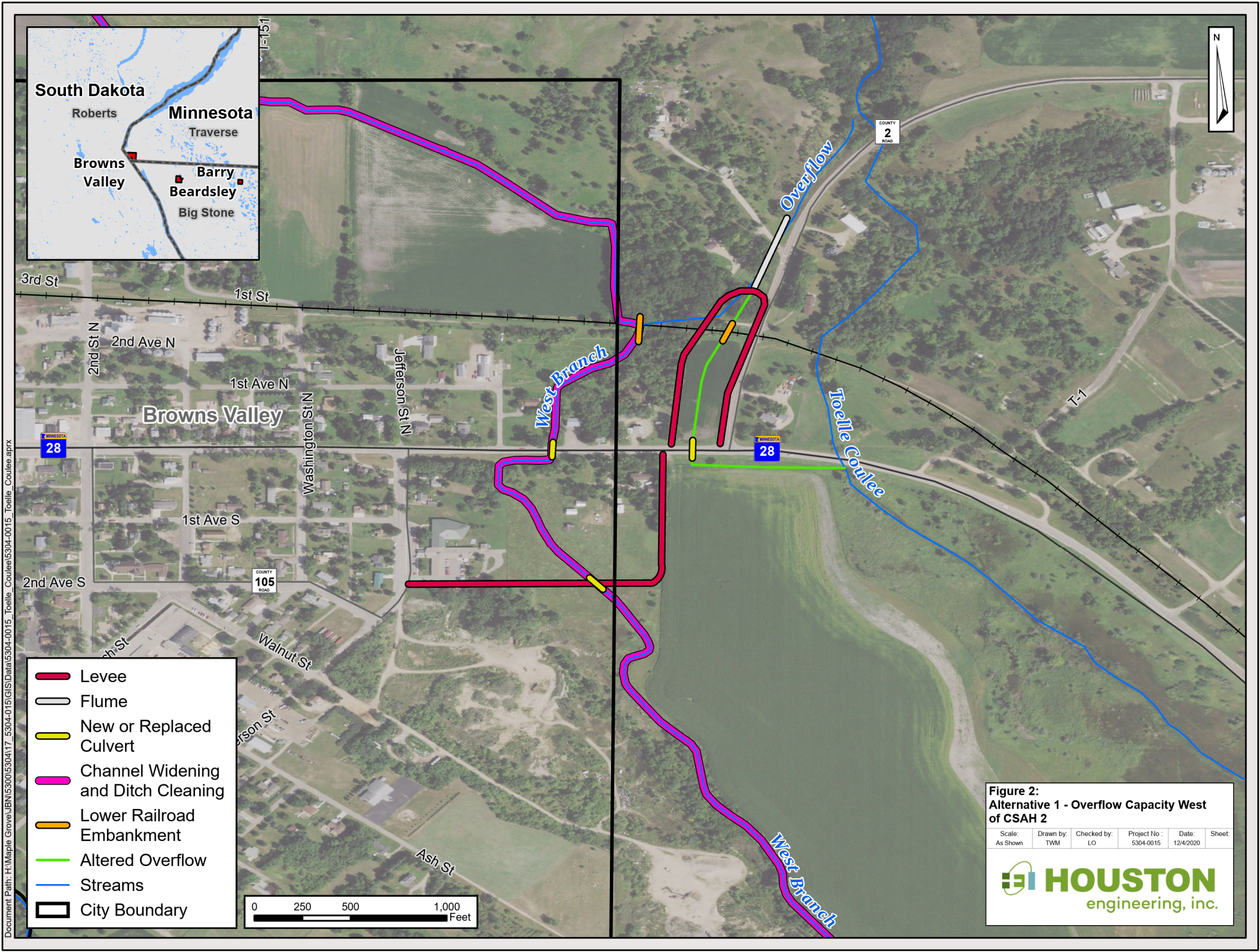
## **FUTURE PROJECT COMPONENTS – TOELLE COULEE ALTERNATIVES**

Flooding in the east side of Browns Valley is primarily the result of flows which overtop the banks of Toelle Coulee and flow down the west side of CSAH 2. In 2008, three alternatives were conceptualized and evaluated:

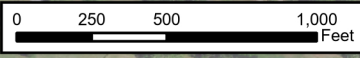
1. Overflow Capacity West of CSAH 2: Allow overtopping to the west side of CSAH 2 but provide levees and adequate capacity along the CSAH 2 overflow.
2. Toelle Coulee Capacity: Block flow to the west and provide adequate capacity and levees east of CSAH 2 along Toelle Coulee.
3. Toelle Coulee Impoundment: Prevent the overflow to the west side of CSAH 2 and decrease the peak flows in Toelle Coulee by impounding water upstream of CSAH 2.

Each of these solutions would decrease the frequency of flooding at the east side of the City of Browns Valley and decrease the likelihood of damage to public infrastructure such as the TH 28 roadway. This would result in approximately 90 acres removed from the 100-year floodplain north of TH 28.

The following is a summary of the component, advantages, and disadvantages of each alternative. These alternatives are shown in **Figure 2**, **Figure 3**, and **Figure 4**.



- Levee
- Flume
- New or Replaced Culvert
- Channel Widening and Ditch Cleaning
- Lower Railroad Embankment
- Altered Overflow
- Streams
- City Boundary

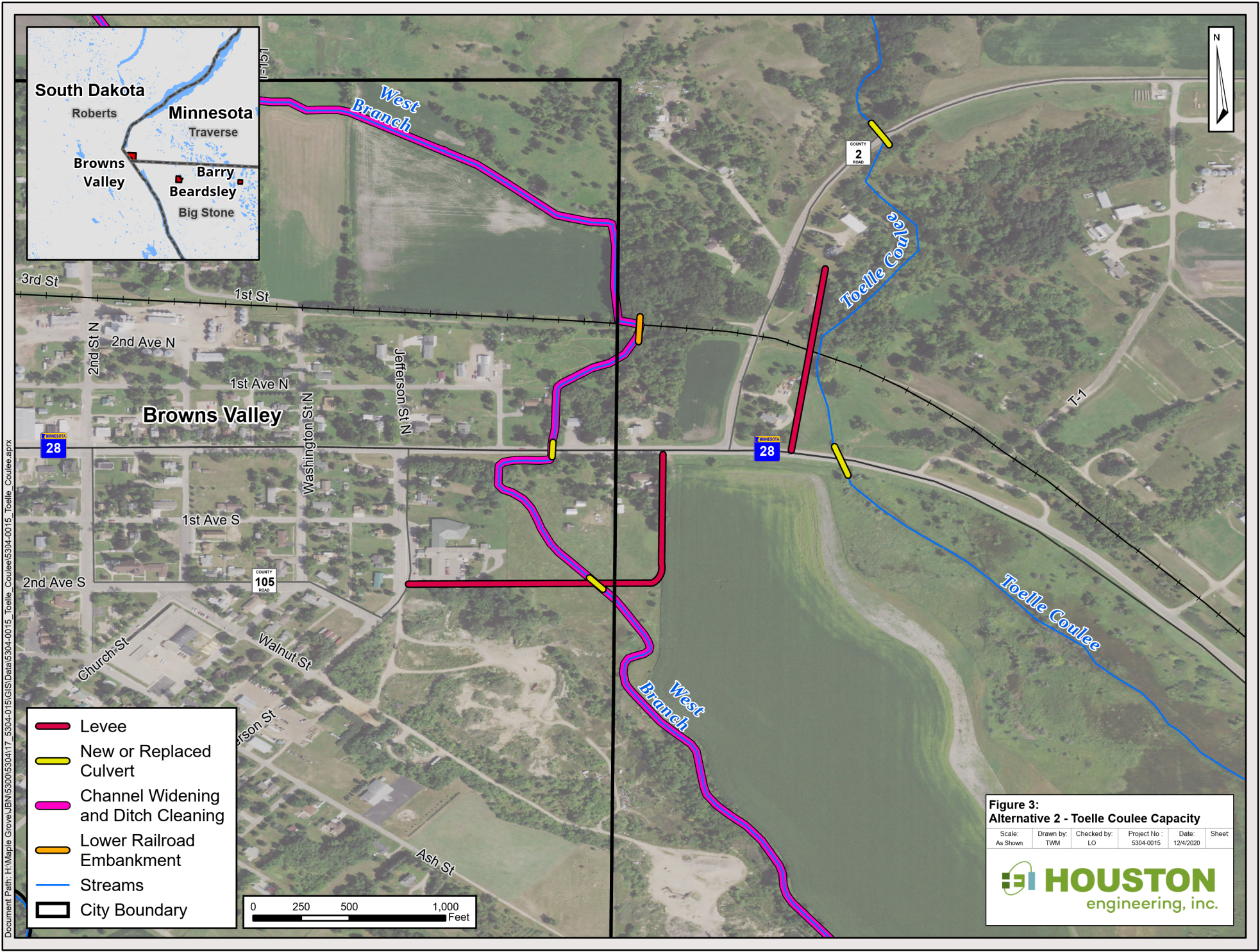


**Figure 2:**  
**Alternative 1 - Overflow Capacity West of CSAH 2**

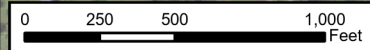
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- Levee
- ▬ New or Replaced Culvert
- ▬ Channel Widening and Ditch Cleaning
- ▬ Lower Railroad Embankment
- Streams
- City Boundary

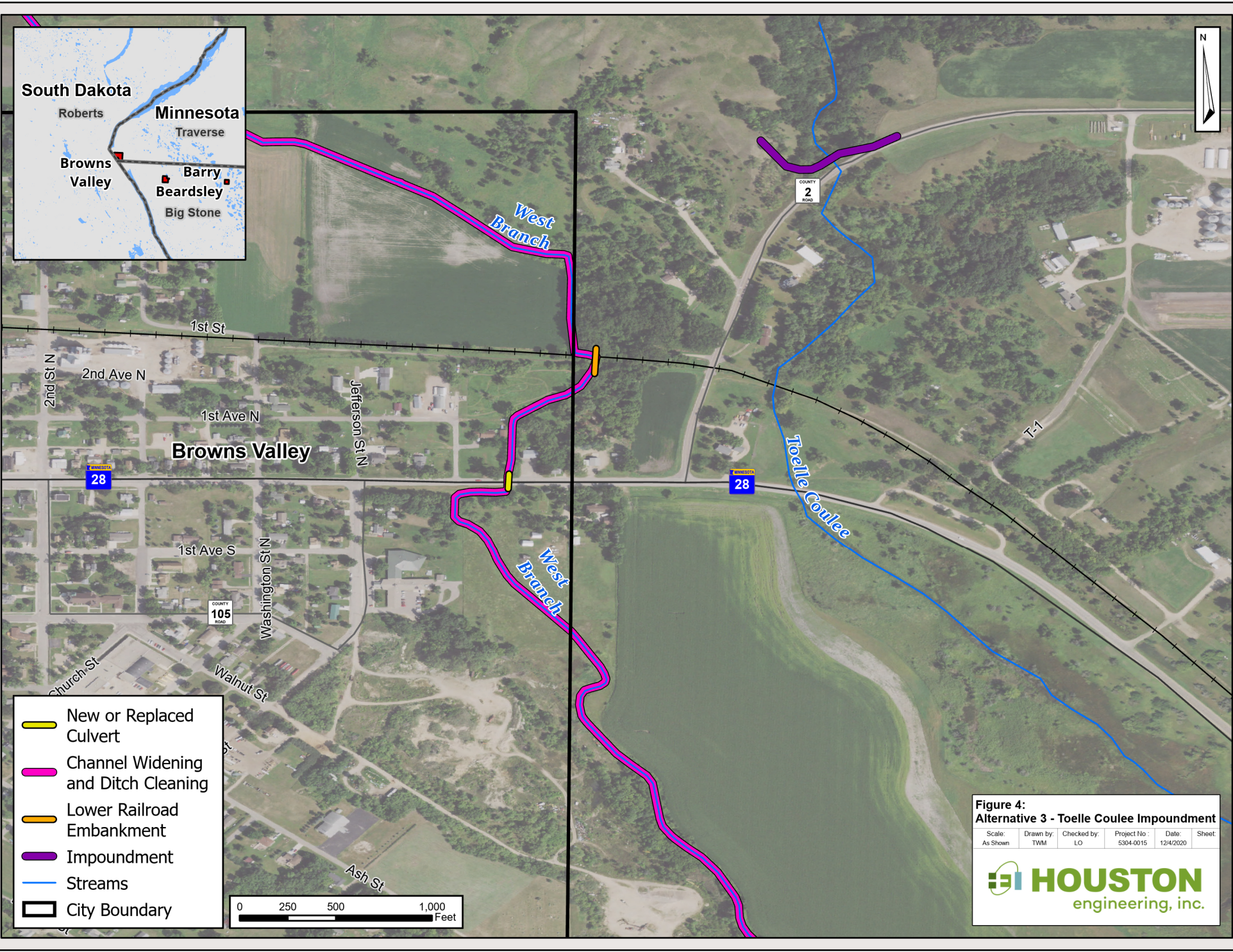








**Figure 3:**  
**Alternative 2 - Toelle Coulee Capacity**

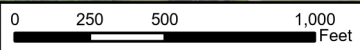
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**HOUSTON**  
 engineering, inc.

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-  New or Replaced Culvert
-  Channel Widening and Ditch Cleaning
-  Lower Railroad Embankment
-  Impoundment
-  Streams
-  City Boundary



**Figure 4:**  
**Alternative 3 - Toelle Coulee Impoundment**

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### Alternative 1: Overflow Capacity West of CSAH 2

#### Project Components

- a. Concrete flume leading to earthen levees running along the west side of CSAH 2 to convey overflow from the coulee to the south.
- b. Additional culvert crossing for overflow at TH 28
- c. West Levees along the CSAH 2 overflow to protect homes
- d. Levees south of TH 28 to protect homes
- e. Channel widening and cleaning along West Branch
- f. Lowering of railroad embankment at West Branch
- g. Culvert replacement at West Branch crossing TH 28

#### Advantages

- Avoids construction of large crossing at CSAH 2
- Technically feasible

#### Disadvantages

- Establishes new infrastructure (channel) to be maintained
- Development occurring since 2008 has complicated this alternative, likely rendering it impractical
- Would require new permit submittals to the MnDNR and USACE

### Alternative 2: Toelle Coulee Capacity

#### Project Components

- a. Installation of an additional box culvert through CSAH 2 along Toelle Coulee
- b. Levee on the west side of Toelle Coulee
- c. Increase capacity of TH 28 crossing.
- d. Levees south of TH 28 to protect homes
- e. Channel widening and cleaning along West Branch
- f. Lowering of railroad embankment at West Branch
- g. Culvert replacement at West Branch crossing TH 28

#### Advantages

- Maintains flow in existing Toelle Coulee channel (historic path)
- Requires little new infrastructure to maintain – just an improvement of existing infrastructure
- This alternative was included in the permit applications to the MNDNR and USACE for the Toelle Phase 1 construction project and will not require additional permitting.
- Technically feasible

#### Disadvantages

- Box culvert under CSAH 2 will obligate County to complete bridge inspection

### Alternative 3: Toelle Coulee Impoundment

#### Project Components



- a. Construction of a dam upstream of CSAH 2
- b. Channel widening and cleaning along West Branch
- c. Lowering of railroad embankment at West Branch
- d. Culvert replacement at West Branch crossing TH 28

#### Advantages

- Would reduce flows downstream beyond project extents
- Technically feasible

#### Disadvantages

- Dam will be DNR “high hazard” classification which will require a substantial future maintenance obligation
- Would require new permit submittals to the MnDNR and USACE

The 2008 HEI engineer’s report recommended Alternative 2 (Toelle Coulee Capacity). We continue to recommend implementation of that alternative.

## **PROJECT FUNDING**

The cost estimate for Alternative 2 was updated in 2019 based on input from local contractors. At that time, it was estimated that land acquisition, engineering, and construction costs would total approximately 3.2 million dollars. Assuming construction in the summer of 2022 the total project cost is estimated to be 3.6 million dollars.

The 2020 Minnesota Bonding Bill included a \$2,000,000 appropriation for flood hazard mitigation for Toelle Coulee in the City of Browns Valley. This provides for just over half the cost to complete the project. Although the next phase of the project may be started, to complete this project phase additional funding will need to be secured. Potential additional funding sources may include a future bonding bill, a FEMA flood hazard mitigation grant, MnDOT, or local sources (City, Watershed District, and/or project assessment).

## **SEQUENCING OF PROJECT COMPONENTS**

Major project components of Alternative 2 include the culverts at CSAH 2, the culverts at TH 28, and levees. If the CSAH 2 culverts are constructed without the downstream TH 28 culverts and levees installed, flows to Toelle Coulee will be increased without downstream mitigation, which will place public infrastructure (TH 28) and homes at increased risk. Therefore, phasing the CSAH 2 culverts first is unlikely to be approved or desired.

The culverts crossing TH 28 and levees adjacent to Toelle Coulee can be constructed prior to the crossing at CSAH 2 without adverse impact. However, until the CSAH 2 culvert is increased in size, flood flows can continue to overflow to the west; thus, the reduction in flooding in the City will be limited. To realize the benefits to the City of Browns Valley and complete the project goal of preventing flooding through the city during the 100-year, all components of Alternative 2 must be constructed.

## **RECOMMENDATIONS**

The UMRWD should engage with project stakeholders (County Highway Department, City of Browns Valley, adjacent landowners) to reach to a consensus on project direction and components and project funding

sources. We do not recommend proceeding with further project development until project funding sources are determined for the remainder of the project.

Additionally, maintenance responsibilities of project components should be agreed upon prior to construction. Culvert crossings will likely be maintained by road authorities while the levees will likely be the responsibility of UMRWD or the City of Browns Valley.

If it is not desired to move forward with the project in its entirety, the project goal (preventing flow through the city during the 100-year event) should be reevaluated and consensus reached on a lesser goal. It may be feasible to complete projects that will lessen susceptibility to flood damages, while not removing the city from the floodplain. Such projects could be levees, flood proofing, slip lining the existing CSAH 2 culvert, tree and shrub clearing, or construction of a floodway that does not contain the 100-year discharge.

Once the project stakeholders have reached a consensus on the project components and reaffirmed the goals, UMRWD should submit a grant application to the MnDNR to receive the funds allocated within the 2020 Bonding Bill.

Additional coordination should be completed with the MnDNR to utilize all potential funding sources for project components of the Toelle Coulee Project and regarding updates to the effective FEMA floodplain maps. A letter of map revision was not completed following construction of the Little Minnesota River Diversion or Phase 1 of the Toelle Coulee project. Updated flood maps would provide the community with a more accurate risk assessment; however, if future flood mitigation projects are to be pursued, map updates should follow construction of those projects.