

**CITY OF BOULDER  
WATER RESOURCES ADVISORY BOARD  
AGENDA ITEM**

**MEETING DATE:**

<b>AGENDA TITLE:</b> Information Item – Upper Goose and Twomile Canyon Creek; and Skunk Creek, Bluebell and King’s Gulch Flood Mitigation Plans Update
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<b>PRESENTERS:</b>
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Joe Taddeucci, Director of Utilities Douglas Sullivan, Utilities Principal Engineer Brandon Coleman, Utilities Engineering Project Manager
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**EXECUTIVE SUMMARY:**

The city’s Stormwater and Flood Management Utility uses a life-cycle approach to addressing flood risks throughout the community that includes mapping, mitigation planning, and design/construction phases. The city, in partnership with Mile High Flood District and the community, has developed draft flood mitigation plans related to the second life-cycle phase for two major interconnected drainageways; the Upper Goose Creek and Twomile Canyon Creek ([UGT](#)) located in North Boulder and the Skunk Creek, Bluebell Canyon Creek and King’s Gulch ([SBK](#)) drainageways in west-central Boulder.

Community input in 2017 and 2018 informed development and selection of the current draft mitigation recommendations for both UGT and SBK. Application of selection criteria; including, mitigation goals, community values and budget feasibility, have resulted in draft recommendations that will be presented to the community beginning in early 2021. Community engagement on UGT and SBK will be in two phases, with UGT engagement and WRAB action anticipated in Q2 or Q3 of 2021. SBK engagement will follow the UGT process with an anticipated request for a WRAB recommendation on SBK in 2022. Request for council approval of both flood mitigation plans is anticipated in 2022. The purpose of this item is to provide a review of previous engagement efforts and development of flood mitigation recommendations and provide WRAB members with an opportunity to ask questions or request additional information.

**BACKGROUND:**

The September 2013 flood event resulted in significant flood-related damage throughout the community including along the five drainageways included in UGT and SBK that represent the focus of these two flood mitigation efforts. A series of post-flood open houses was held in October 2013 to provide flood recovery information and gather public feedback on community experiences during the flood comments, which helped inform the flood mitigation effort.

The city’s [Stormwater and Flood Management Utility](#) uses a life-cycle approach to addressing flood risks throughout the community that includes mapping, mitigation planning, and design and construction phases. The first mapping phase identifies and delineates floodplains and flood risk along major drainageways. The second life cycle phase is flood mitigation planning, which involves identifying and evaluating potential flood mitigation improvements along the length of

the drainageway. Feasible projects from mitigation plans are then considered for the third lifecycle phase, design and construction. After a project is constructed, a Letter of Map Revision (LOMR) is completed and submitted to FEMA to update the floodplain mapping to reflect the improvements. Floodplain maps must then be updated periodically to reflect changes in the floodplain resulting from land development, flood mitigation improvements, new study technologies and the impacts of major floods that may have occurred.

### ***Upper Goose/Two mile***

The UGT drainageways are in North Boulder beginning in the vicinities of North Boulder Park and Linden Ave., respectively. The city began updating existing 2004 UGT floodplain mapping prior to the 2013 flood event. Mapping was approved by City Council in 2015 and by FEMA in 2016. Upon approval of the revised mapping, the city began community outreach related to the development of a flood mitigation approach to these drainageways.

Throughout 2017 to 2018, community engagement on potential flood mitigation alternatives included open houses, workshops questionnaires, tours, individual meetings with potentially impacted individuals and advisory board meetings. Through this process, city staff received over 450 emails and over 800 individual comments to a questionnaire. Many of the comments related to 100-yr flood containment - both in favor and against that level of flood protection - and concerns about private property impacts. Community feedback on initial flood mitigation alternatives helped shape the study process and resulted in revisions to alternatives being evaluated. New alternatives were added to the analysis and an initial screening process was completed to eliminate alternatives that were determined to be infeasible or would not be acceptable to the community. Community input is described in more detail in a [March 18, 2019 WRAB memo](#).

### ***Skunk/Bluebell/King's Gulch***

The Bluebell Creek and King's Gulch drainageways begin near the Chautauqua Park area and continue towards Broadway and discharge into Skunk Creek south of the Basemar shopping center. The most recent mapping update incorporates observations from 2013 flooding and was approved by city council in 2017 and FEMA in 2018. Upon council approval of the revised mapping, the city began community outreach related to the development of a flood mitigation approach to these drainageways. [Public engagement](#) in 2017 included workshops, neighborhood site walks, open houses, and advisory board meetings to discuss flood mitigation opportunities and related evaluation criteria. Property owners along King's Gulch expressed a desire to keep the upper section of the channel more natural. Community discussion also included roadway conveyance and storm drains for Bluebell Canyon Creek and King's Gulch. Community discussions for Skunk Creek included storm drain/culvert improvements at 29<sup>th</sup> Street, Arrowwood Park, Euclid Avenue and Madison Avenue.

The Water Resources Advisory Board (WRAB) provided input on the evaluation criteria used to further identify possible SBK alternatives in [Aug. 2018](#)., which included life safety, community input, and construction costs, among others. The information collected through the floodplain mapping and community outreach was used to develop draft flood mitigation studies for UGT and SBK in partnership with the Mile High Flood District.



## **ANALYSIS:**

Subsequent to the 2019 WRAB update and in response to community feedback, the following draft recommendations for UGT and SBK were selected using the scoring matrix developed through WRAB input and community feedback, which compared proposed alternatives based on primary mitigation needs, community values and budget feasibility.

### ***Upper Goose/Two mile***

#### **Two mile Canyon Creek**

- 100-Year capacity channel improvements from the western city limits to Linden Avenue; new Spring Valley Drive and Linden culverts with optional sediment capture areas;
- Less Than 100-Year channel capacity improvements from Linden to Broadway including, culvert crossings at Kalmia Avenue, Juniper Avenue, and Broadway;
- 100-Year capacity storm drain outfall system with partial open channel from Broadway to 19<sup>th</sup> Street; and,
- 100-Year capacity storm drain outfall system from 19<sup>th</sup> Street to the confluence with Goose Creek.

#### **Upper Goose Creek**

- Roadway collection to deliver flows to Alpine-Balsam site;
- 100-Year capacity open channel through Alpine-Balsam site;
- 100-Year capacity storm drain system from Broadway to 13<sup>th</sup> Street;
- 100-Year capacity open channel 13<sup>th</sup> Street to 17<sup>th</sup> Street;
- 100-Year capacity storm drain system from Alpine Avenue and 17<sup>th</sup> Street to 20<sup>th</sup> Street; and,
- 100-Year capacity open channel from 19<sup>th</sup> Street to 24<sup>th</sup> Street.

The recommended UGT mitigation improvements are estimated at a combined construction cost of approximately \$43M with a benefit of \$163M based on reduction in property damage. Details of the draft recommendations are further discussed in **Attachment A**.

### ***Skunk/Bluebell/King's Gulch***

The following draft recommendations were selected using the above-described criteria, including community values developed from the public engagement.

#### **Skunk Creek**

- 100-Year open channel and culvert improvements;
- Sediment capture facility;
- 100-Year culvert under 28<sup>th</sup> Street; and,
- Canal siphon at intersection of Wellman Canal and Skunk Creek.

#### **Bluebell Canyon Creek**

- 100-Year capacity open channel and removal of existing debris and dead trees; and,
- 100-Year capacity storm drain system.

### King's Gulch

- Sediment capture facility, 5th Street culvert and roadway improvements; and,
- Channel entrance and storm drain inlet improvements including 100-Year storm drain system.

The recommended Bluebell Canyon Creek, King's Gulch and Skunk Creek flood mitigation improvements are estimated at a construction cost of \$46M with a benefit of \$600M based on reduction in property damage. Details of the draft recommendations are further discussed in **Attachment B**.

These flood mitigation recommendations are planned to be used in conjunction with other Stormwater and Flood Utility mitigation measures that are not location specific. These include greenways preservation and habitat improvements, property acquisition and non-structural methods (*i.e., early warning systems, flood education and outreach, evacuation plans, flood insurance, floodproofing, and code enforcement*).

### **NEXT STEPS:**

Next steps include informing and consulting with the community on the draft recommendations and seeking additional feedback on whether the recommendations addresses previous input prior to requesting WRAB recommendations to council. Outreach will be phased, with UGT preceding SBK. Staff anticipates returning to WRAB for recommendation on UGT in the summer of 2021 and will begin the community outreach for the SBK mitigation plan shortly thereafter. City staff will seek council approval of the flood mitigation plans following WRAB's recommendation.

### **ATTACHMENTS:**

**Attachment A:** Upper Goose Creek and Twomile Canyon Creek Flood Mitigation Plan Alternatives Report – DRAFT

**Attachment B:** Skunk Creek, Bluebell Canyon Creek and King's Gulch Flood Mitigation Plan Alternatives Report - DRAFT

TO: City of Boulder Public Works, Brandon Coleman, P.E.  
FROM: ICON Engineering, Brian LeDoux, PE, CFM  
DATE: August 21<sup>st</sup>, 2020  
RE: **Upper Goose Creek and Twomile Canyon Creek – Flood Mitigation Plan – Recommended Plan Memorandum**

### **Background and Purpose**

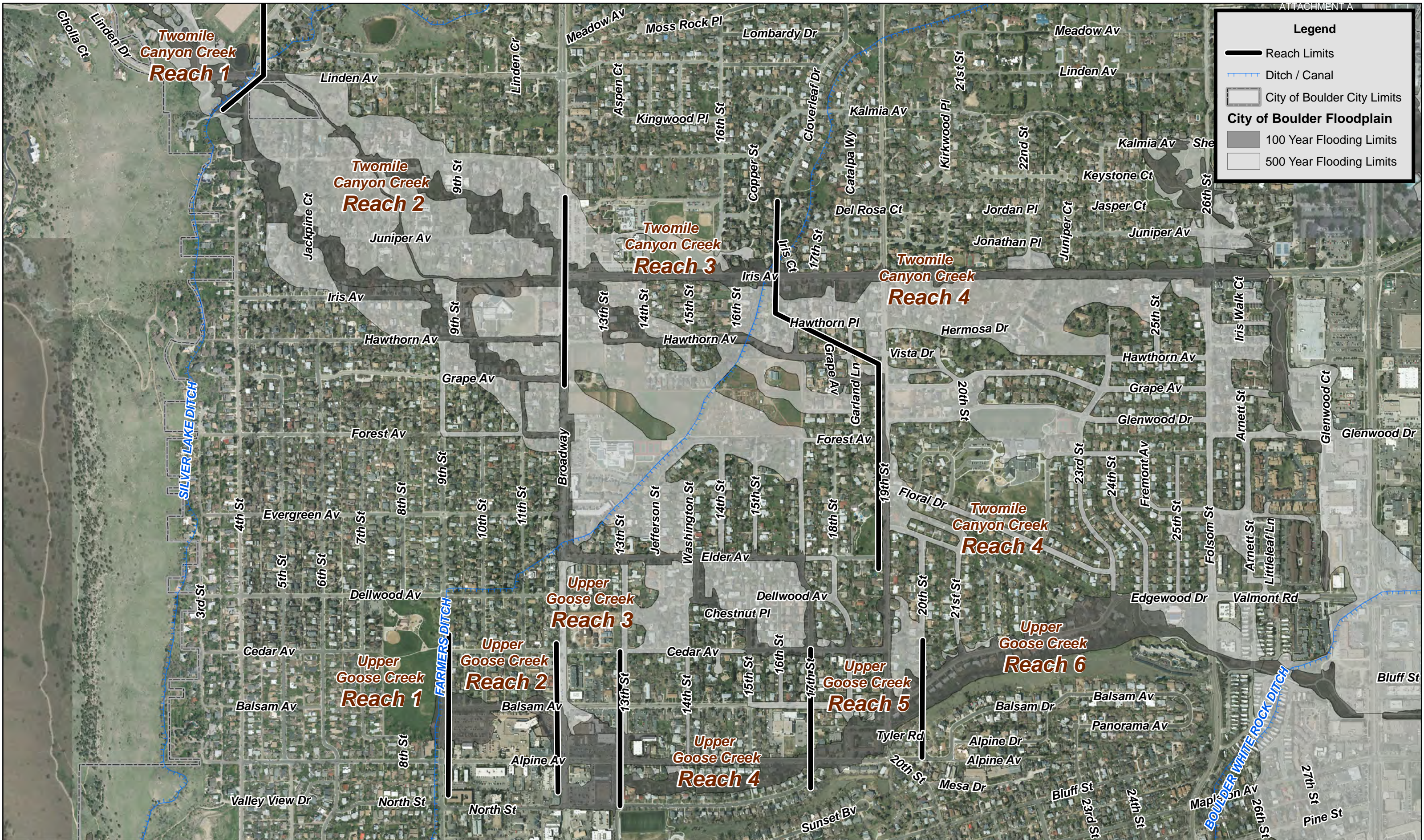
ICON Engineering Inc. (ICON) has been placed under contract by the City of Boulder to develop, select, analyze, and recommend flood mitigation alternatives for Upper Goose Creek and Twomile Canyon Creek. This effort follows the previously completed Letter of Map Revision (LOMR) for Upper Goose Creek and Twomile Canyon Creek (Case No. 16-08-0026P) that became effective on August 18, 2016. The LOMR provided updated hydrologic and hydraulic analysis for flooding from Upper Goose Creek and Twomile Canyon Creek. This memorandum also follows the February 22<sup>nd</sup>, 2019 Alternative Selection Memorandum, the November 1<sup>st</sup>, 2019 Benefit Cost Analysis Memorandum, and the August 4<sup>th</sup>, 2020 Alternative Scoring Memorandum for the Upper Goose Creek and Twomile Canyon Creek Flood Mitigation Plan.

This memorandum summarizes the recommended flood mitigation alternatives based on the results of the preceding memorandums. The recommended mitigation approach will then undergo conceptual design and inclusion into the final Upper Goose Creek and Twomile Canyon Creek Flood Mitigation Plan.

### **Study Area Description**

The study area extends from the upper reaches of Twomile Canyon Creek near Pine Brook Hills, downstream where flows split and one reach heads east along Iris past 26<sup>th</sup> before entering the Elmer's Twomile Creek drainage, and the other reach flows to the southeast ultimately flowing into Upper Goose Creek. Upper Goose Creek begins near North Boulder Park and continues east along Balsam and Alpine towards the confluence with Twomile Canyon Creek at the southwest corner of Folsom Street and Edgewood Drive. These two basins generally drain from west to east and Goose Creek eventually discharges into Boulder Creek. The study is located in Sections 13, 14, 24 and 25, Township 1 North, Range 71 West, and Sections 19, 20, 29 and 30, Township 1 South, Range 70 West. See **Figure 1** below.







## Recommended Plan

Based on the Alternative Scoring memorandum, the top scoring alternatives for each reach were generally selected for the recommended plan. The total score for each alternative and the relative ranking of each alternative within the reach, drainage and watershed are provided in the attached table. The recommended plan is also summarized below and illustrated in the attached maps.

- **Goose-01:** Detention facility within North Boulder Park, new 9<sup>th</sup> Street culvert.
- **Goose-02:** 100-Year open channel through Alpine Balsam site.
- **Goose-03:** 100-Year storm drain system
- **Goose-04:** 100-Year open channel
- **Goose-05:** 100-Year storm drain system from Alpine/17<sup>th</sup> through 19<sup>th</sup>
- **Goose-06:** 100-Year open channel
  
- **Twomile-01:** 100-Year open channel with optional sediment capture areas
- **Twomile-02:** <100-Year open channel to Broadway and Iris
- **Twomile-03:** 100-Year storm drain system with partial open channel
- **Twomile-04:** 100-Year storm drain system

Two of the recommended alternatives were the #2 scoring alternatives for the designated project reach but were selected for the recommended plan in place of the top scoring alternative. For the **Twomile-03** reach, the storm drain outfall system with partial open channel is recommended in place of the 100-Year open channel that connected to Iris Avenue. The driving reason for this recommendation is to avoid the alignment that routes flood flows to Iris Avenue roadway and ultimately Elmer's Twomile a much lower scoring alternative. For the **Twomile-04** reach, the storm drain outfall system is recommended in place of the 100-Year open channel. The project team determined that despite the high score of the open channel, the introduction of a flooding channel and the associated flood hazard into an area that currently does not have a regulatory floodplain or high hazard areas is not a preferred approach.

Both **Twomile-03** and **Twomile-04** have alternative alignments available for the recommended storm drain systems. These alternative alignments are illustrated on the attached **Figures 4** and **5**. The final recommended alignment will be determined during conceptual design efforts.

## Conclusion

The recommended mitigation plan reflects the top scoring alternatives with minor adjustments to reflect compatibility with downstream selections. The recommended plan is illustrated in the attached figures.

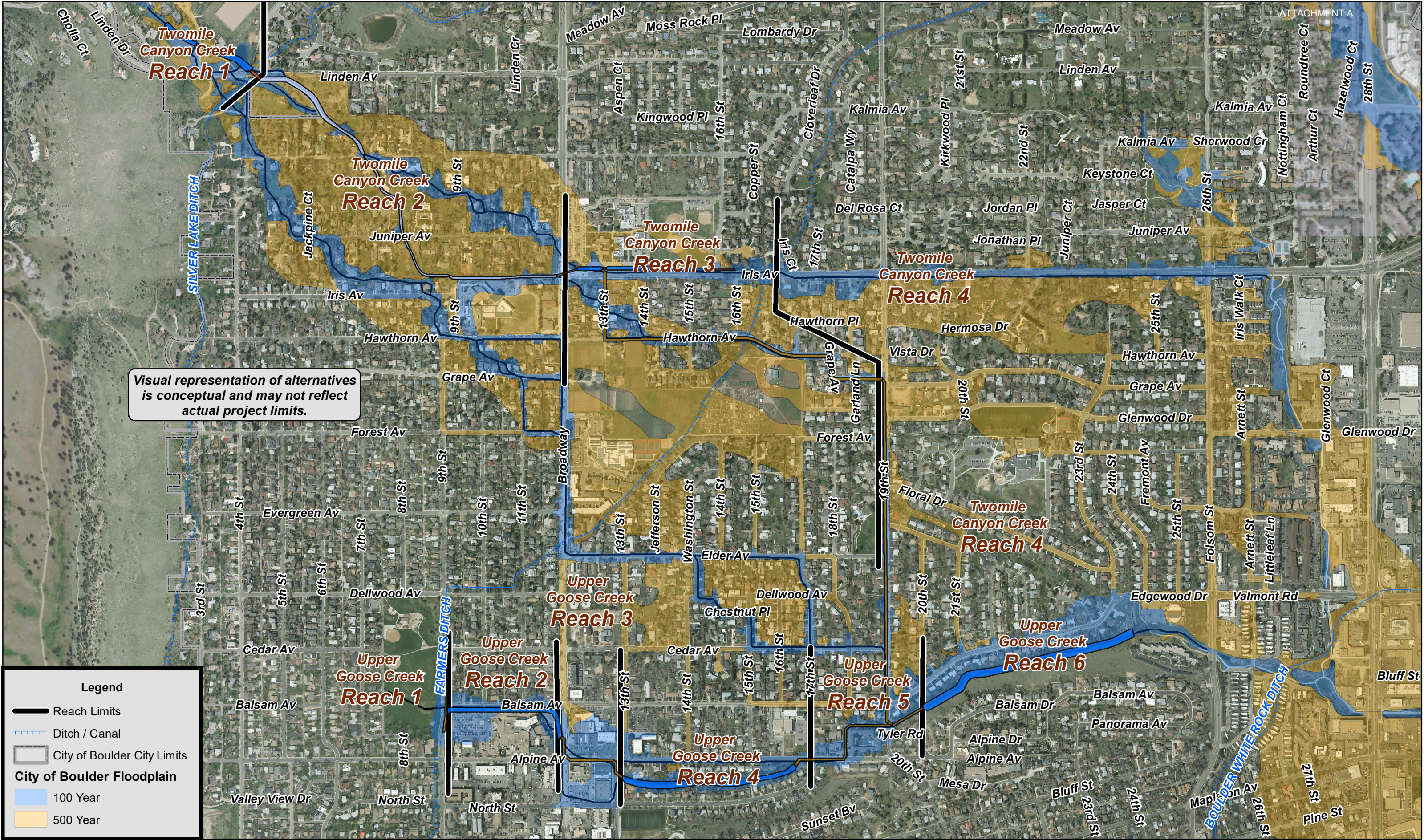
			Total Value and Rankings				
Reach	ID	Project Description	Total Value (100 Points)	Reach Rank	Drainage Rank	Watershed / Overall Rank	
Goose-01	A	Detention facility within North Boulder Park; new 9th Street culvert	56	1	11	18	<<< Recommended Alternative
Goose-01	B	No detention; Roadway collection to deliver flows to Alpine-Balsam site	40	2	17	34	
Goose-02	A	100-Year open channel through Alpine-Balsam site	76	1	1	1	<<< Recommended Alternative
Goose-02	B	<100-Year open channel through Alpine-Balsam site	63	2	3	6	
Goose-02	C	100-Year storm drain through Alpine-Balsam site (detained flow)	58	4	8	14	
Goose-02	D	100-Year storm drain through Alpine-Balsam site (full flow)	59	3	6	9	
Goose-02	E	<100-Year storm drain through Alpine-Balsam site (full flow)	48	5	14	29	
Goose-03	A	100-Year storm drain system	62	1	4	7	<<< Recommended Alternative
Goose-03	B	<100-Year storm drain system	49	2	12	24	
Goose-04	A	100-Year open channel	73	1	2	2	<<< Recommended Alternative
Goose-04	B	<100-Year open channel	59	2	6	9	
Goose-04	C	100-Year storm drain system	57	3	10	17	
Goose-04	D	<100-Year storm drain system	49	4	12	24	
Goose-05	A	100-Year storm drain system from Alpine/17th through 20th	60	1	5	8	<<< Recommended Alternative
Goose-05	B	<100-Year storm drain system from Alpine/17th through 19th	47	2	15	30	
Goose-06	A	100-Year Open channel	58	1	8	14	<<< Recommended Alternative
Goose-06	B	Open channel (sizing per previous study recommending a "5-Year" improvement; exceeds 5-Year with detained flow and/or Twomile improvements)	46	2	16	31	
Twomile-01	A	100-Year channel improvements; new Spring Valley Drive and Linden Avenue culverts	70	1	1	3	<<< Recommended Alternative
Twomile-01	B	<100-Year channel improvements; new Spring Valley Drive and Linden Avenue culverts	59	2	4	9	
Twomile-01	C	Enlarge existing sediment capture facility	50	3	12	23	<<< Recommended additional option to Alternative A
Twomile-02	A	<100-Year channel improvements; new Kalmia Avenue, Juniper Avenue, and Broadway culverts; channel to Broadway and Iris	59	1	4	9	
Twomile-02	B	<100-Year channel improvements; new Kalmia Avenue, Juniper Avenue, and Broadway/Hawthorn Avenue culverts; channel to Broadway and Hawthorn	54	2	8	19	<<< Recommended Alternative
Twomile-02	C	Roadway conveyance	49	3	13	24	
Twomile-03	A	100-Year channel improvements; new 13th Street, 14th Street culverts, culvert from 16th Street through Farmer's Ditch; Iris Avenue Roadway Improvements for surface flow	64	1	3	5	
Twomile-03	B	<100-Year channel improvements; new 13th Street, 14th Street culverts, culvert from 16th Street through Farmer's Ditch; Iris Avenue Roadway Improvements for surface flow	52	3	9	20	<<< Recommended Alternative
Twomile-03	C	100-Year storm drain outfall system	58	2	7	14	
Twomile-03	D	<100-Year storm drain outfall system	43	5	16	32	
Twomile-03	E	Detention facility within the Boulder County Complex at Broadway and Iris (ballfields only)	51	4	10	21	<<< Recommended Alternative
Twomile-04	A	Iris Avenue Roadway Improvements for surface flow	49	4	13	24	
Twomile-04	B	<100-Year Iris Avenue Roadway Improvements for surface flow	43	6	16	32	
Twomile-04	C	100-Year storm drain outfall system	59	2	4	9	
Twomile-04	D	<100-Year storm drain outfall system	49	4	13	24	
Twomile-04	E	100-Year channel improvements; new 21st Street and Edgewood Drive culverts	66	1	2	4	
Twomile-04	F	<100-Year channel improvements; new 21st Street and Edgewood Drive culverts	51	3	10	21	



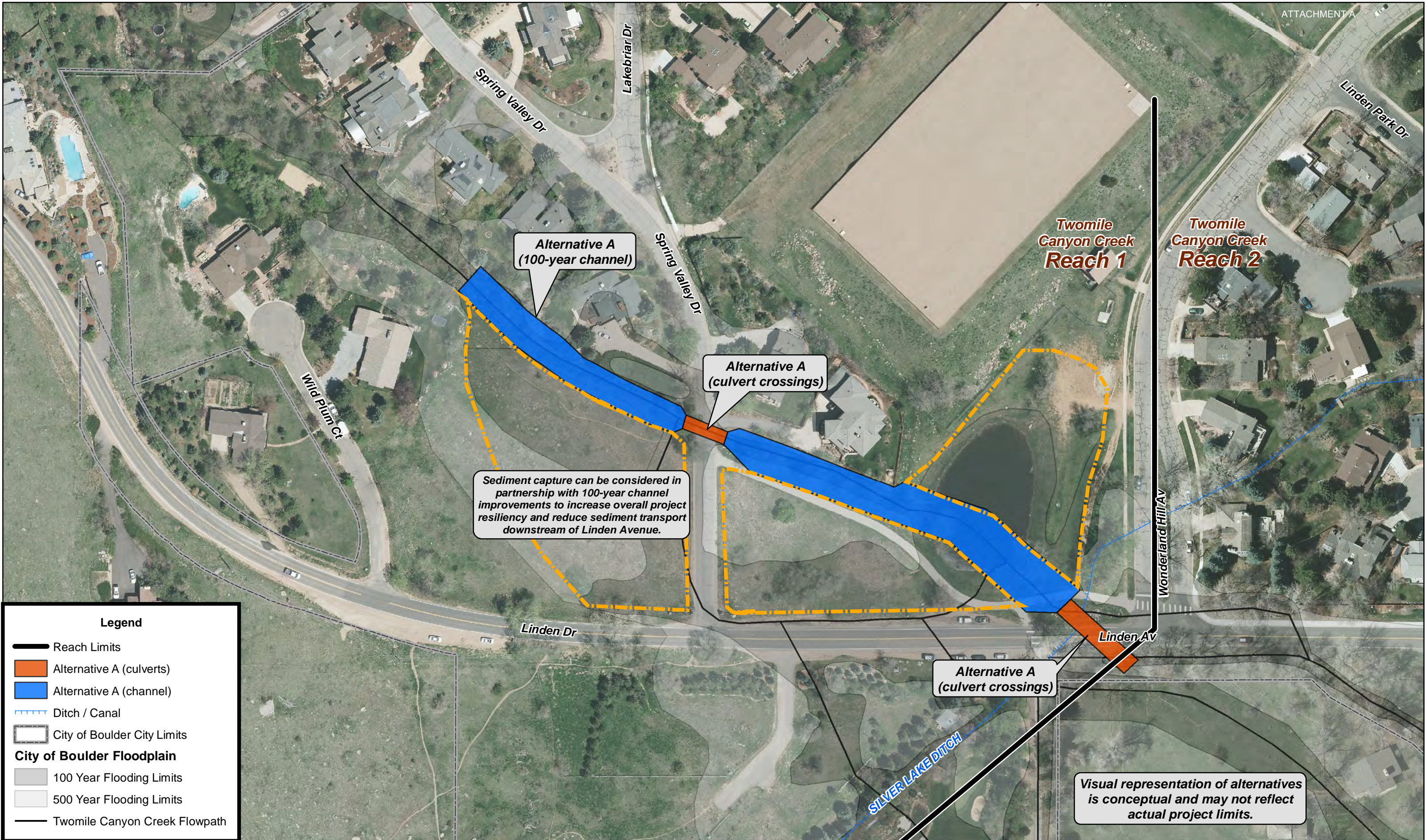
**Attachments:**

- *Figure 1: Reach Overview*
- Recommended Plan Maps
  - *Figure 2: Twomile Canyon Creek Reach 1*
  - *Figure 3: Twomile Canyon Creek Reach 2*
  - *Figure 4: Twomile Canyon Creek Reach 3*
  - *Figure 5: Twomile Canyon Creek Reach 4*
  - *Figure 6: Upper Goose Creek Reach 1*
  - *Figure 7: Upper Goose Creek Reach 2*
  - *Figure 8: Upper Goose Creek Reach 3*
  - *Figure 9: Upper Goose Creek Reach 4*
  - *Figure 10: Upper Goose Creek Reach 5*
  - *Figure 11: Upper Goose Creek Reach 6*

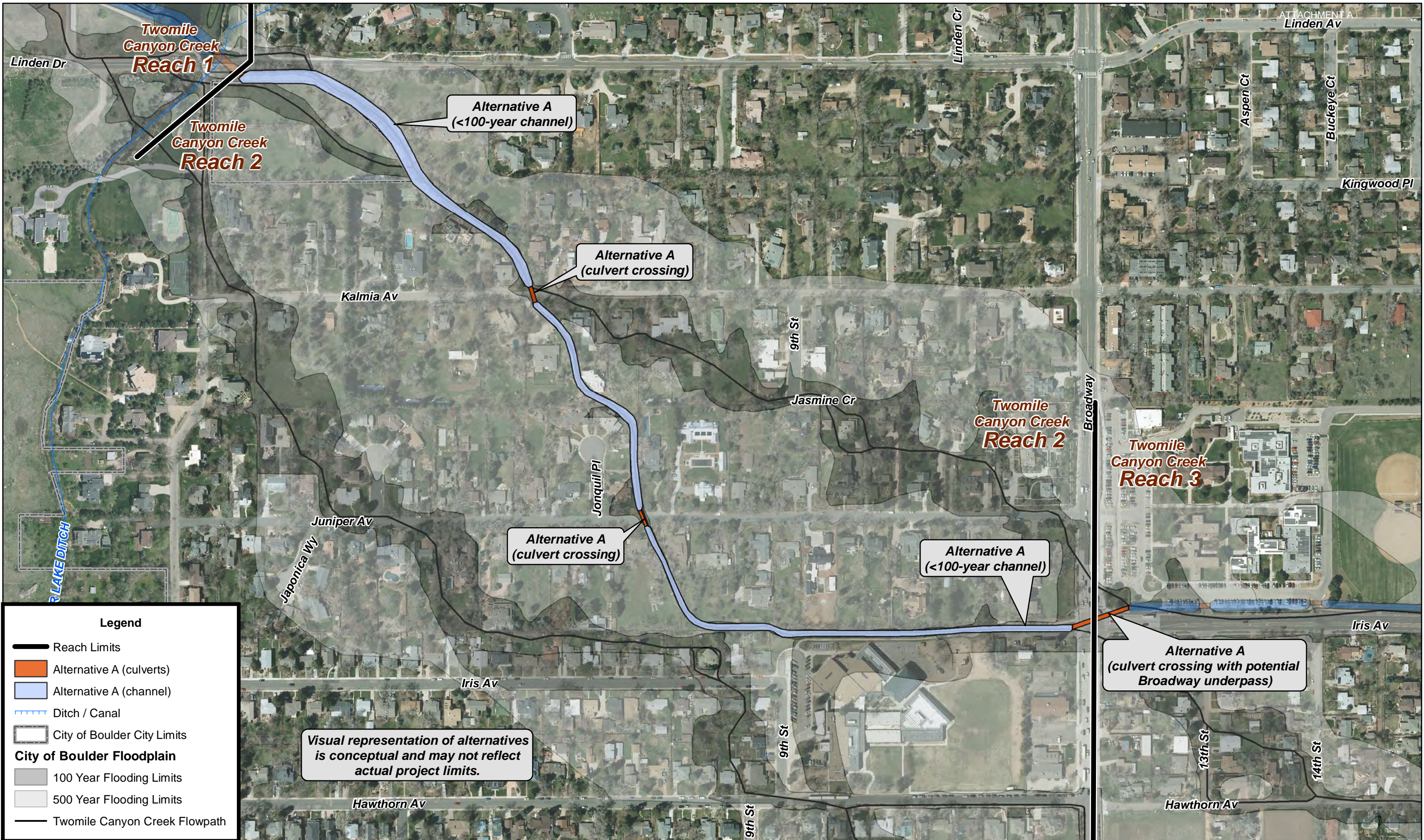




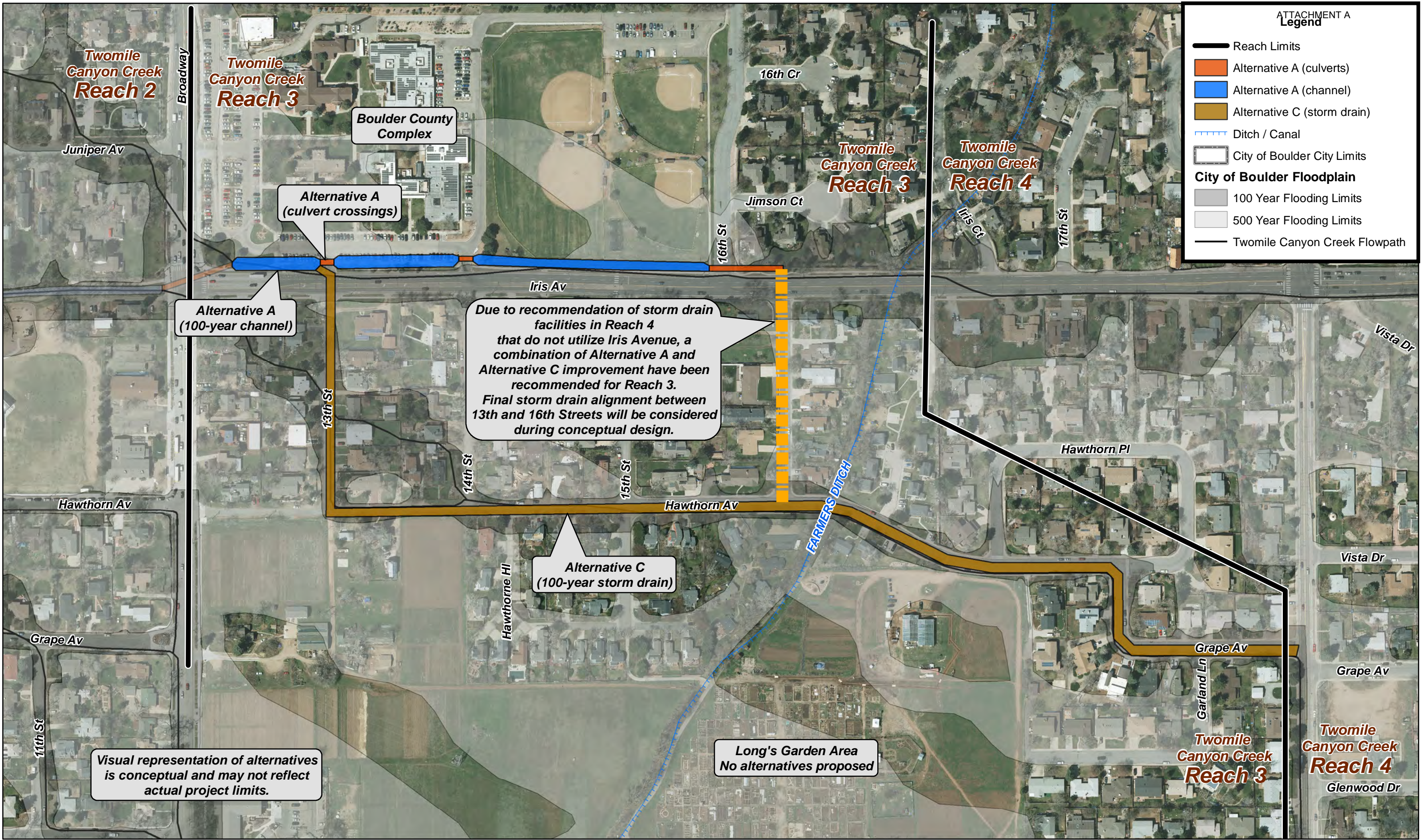










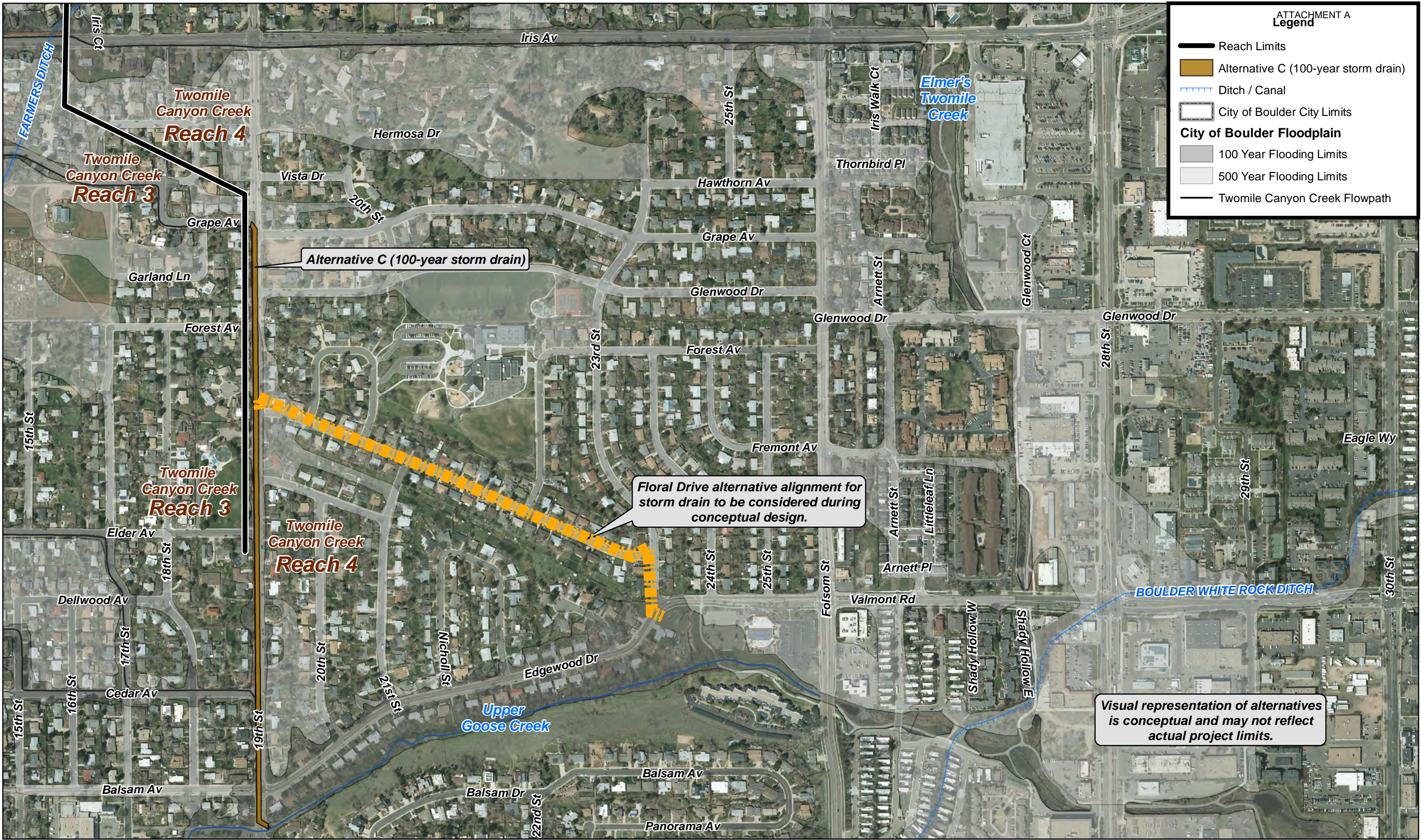


ATTACHMENT A  
**Legend**

- Reach Limits
- Alternative A (culverts)
- Alternative A (channel)
- Alternative C (storm drain)
- Ditch / Canal
- City of Boulder City Limits
- City of Boulder Floodplain**
- 100 Year Flooding Limits
- 500 Year Flooding Limits
- Twomile Canyon Creek Flowpath







ATTACHMENT A  
**Legend**

- Reach Limits
- Alternative C (100-year storm drain)
- Ditch / Canal
- City of Boulder City Limits

**City of Boulder Floodplain**

- 100 Year Flooding Limits
- 500 Year Flooding Limits
- Twomile Canyon Creek Flowpath

Floral Drive alternative alignment for storm drain to be considered during conceptual design.

Visual representation of alternatives is conceptual and may not reflect actual project limits.

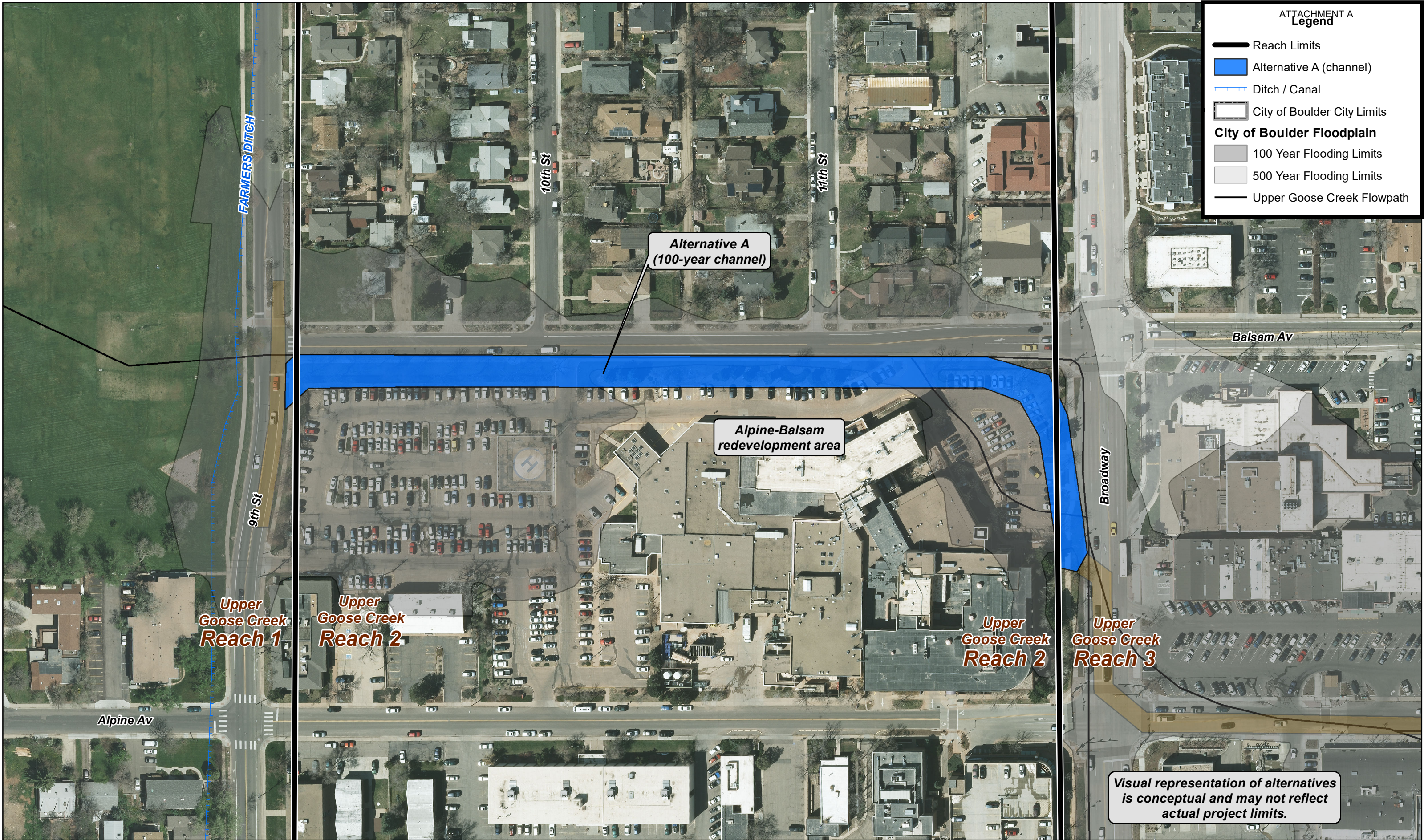


**Upper Goose Creek and Twomile Canyon Creek - Flood Mitigation Plan**  
**Recommended Plan Memorandum**  
Figure 5: Twomile Canyon Creek - Reach 4













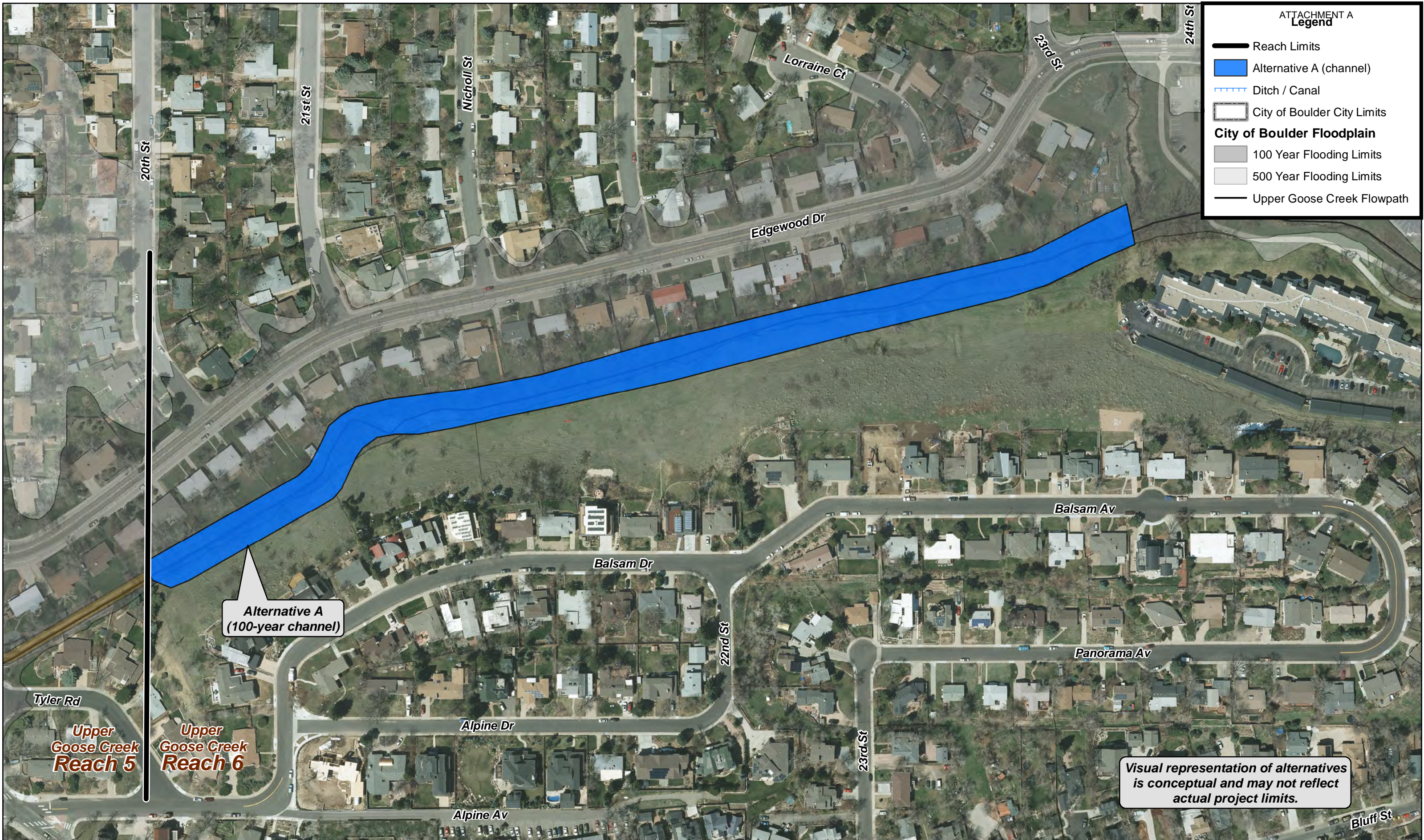












ATTACHMENT A  
**Legend**

- Reach Limits
- Alternative A (channel)
- Ditch / Canal
- City of Boulder City Limits

**City of Boulder Floodplain**

- 100 Year Flooding Limits
- 500 Year Flooding Limits
- Upper Goose Creek Flowpath



TO: City of Boulder Public Works, Sara DeGroot, P.E., CFM, ENV SP  
FROM: ICON Engineering, Brian LeDoux, PE, CFM  
DATE: August 21, 2020  
RE: **Skunk Creek, Bluebell Canyon Creek, and King's Gulch – Flood Mitigation Plan – Recommended Plan Memorandum**

### **Background and Purpose**

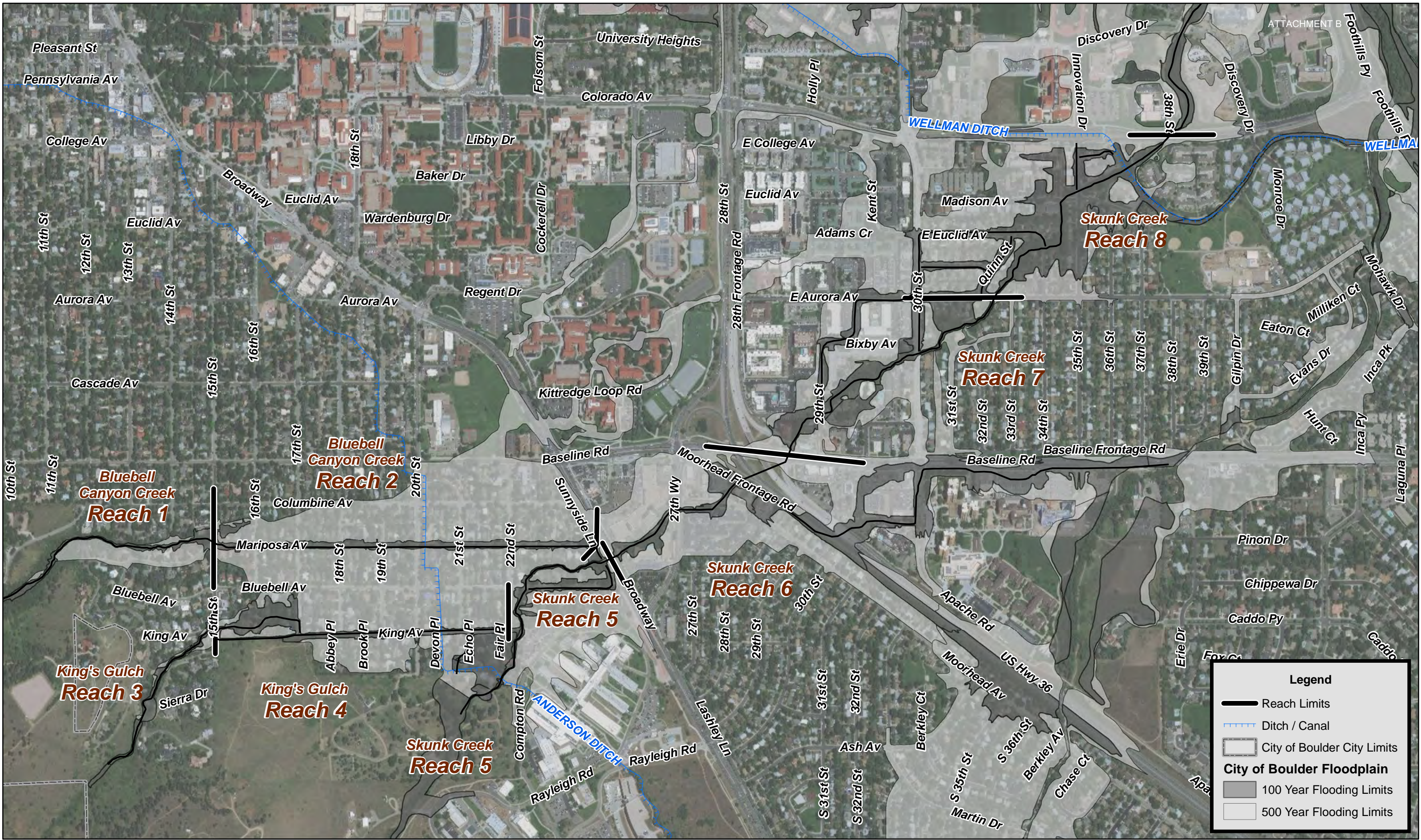
ICON Engineering Inc. (ICON) has been placed under contract by the City of Boulder to develop, select, analyze, and recommend flood mitigation alternatives for Skunk Creek, Bluebell Canyon Creek, and King's Gulch. This effort follows the previously completed Letter of Map Revision (LOMR) for Skunk Creek, Bluebell Canyon Creek and King's Gulch (Case No. 17-08-0797P) that became effective on May 31<sup>st</sup>, 2018. The LOMR provided updated hydrologic and hydraulic analysis for flooding from Skunk Creek, Bluebell Canyon Creek and King's Gulch. This memorandum also follows the April 9<sup>th</sup>, 2019 Alternative Selection Memorandum, the March 30<sup>th</sup>, 2020 Benefit Cost Analysis Memorandum, and the August 14<sup>th</sup>, 2020 Alternative Scoring Memorandum for the Skunk Creek, Bluebell Canyon Creek and King's Gulch Flood Mitigation Plan.

This memorandum summarizes the recommended flood mitigation alternatives based on the results of the preceding memorandums. The recommended mitigation approach will then undergo conceptual design and inclusion into the final Skunk Creek, Bluebell Canyon Creek, and King's Gulch Flood Mitigation Plan.

### **Study Area Description**

The study area extends from the confluence of Skunk Creek and Bear Creek upstream to the Green Mountain Memorial Park, and also includes Bluebell Canyon Creek and King's Gulch in the Chautauqua neighborhood, which are both tributary to Skunk Creek. The study is located in Sections 31, 32, and 33, Township 1 North, Range 70 West, Sections 5 and 6, Township 1 South, Range 70 West, and Section 1, Township 1 South, Range 71 West. These three basins generally drain from southwest to northeast. See **Figure 1** below.





**Skunk Creek, Bluebell Canyon Creek, and King's Gulch - Flood Mitigation Plan**  
**Recommended Plan Memorandum**  
**Figure 1: Reach Overview**



## Recommended Plan

Based on the Alternative Scoring memorandum, the top scoring alternatives for each reach were generally selected for the recommended plan. The total score for each alternative and the relative ranking of each alternative within the reach, drainage and watershed are provided in the attached table. The recommended plan is also summarized below and illustrated in the attached maps.

- **Bluebell-01:** 100-Year channel and removal of existing debris and dead trees
- **Bluebell-02:** 100-Year storm drain system
- **King-03:** Sediment capture facility, improve 15<sup>th</sup> Street culvert, and roadway improvements on 15<sup>th</sup> Street
- **King-04:** Improve channel entrance, improve storm drain inlet, 100-Year storm drain
- **Skunk-05:** 100-Year open channel improvements and sediment capture facility
- **Skunk-06:** 100-Year open channel
- **Skunk-07:** 100-Year open channel
- **Skunk-08:** 100-Year open channel with optional canal siphon to eliminate culvert

Note that three reaches include a combination of several alternatives. In the case of **Bluebell-01**, the 100-Year channel and removal of existing debris are unrelated and provide unique mitigation improvements. In **Skunk-05**, the 100-Year channel and sediment capture facility are also unrelated and provide unique mitigation improvements. The **King-04** reach includes an improved channel entrance to tie-in with the **King-03** roadway and culvert improvements, and the storm drain inlet improvements are necessary to provide a full connection to the 100-Year storm drain system in King Avenue.

The **Skunk-06** 100-Year channel improvements originally included channel work just downstream of Broadway in order to capture the 100-year floodplain that extends just beyond the channel. Based on the relatively recent channel work in this area and the limited extents of the 100-Year flooding outside of the channel, the project team determined that channel improvements would be limited to the section of channel between Moorhead and the US Highway 36 culvert (i.e. the gabion basket channel area).

## Conclusion

The recommended mitigation plan reflects the top scoring alternatives with additional alternatives to facilitate additional benefits or to provide connectivity with downstream selections. The recommended plan is illustrated in the attached figures.

			Total Value and Rankings				
Reach	ID	Project Description	Total Value (100 Points)	Reach Rank	Drainage Rank	Watershed / Overall Rank	
Bluebell-01	A	Remove existing debris and dead trees along channel	51	2	5	19	<<< Recommended Alternative
Bluebell-01	B	Debris trap	40	4	8	26	
Bluebell-01	C	100-Year channel improvements	58	1	2	10	<<< Recommended Alternative
Bluebell-01	D	<100-Year channel improvements	50	3	6	21	
Bluebell-02	A	100-Year storm drain system	60	1	1	6	<<< Recommended Alternative
Bluebell-02	B	10-Year storm drain system	52	3	4	18	
Bluebell-02	C	Roadway Conveyance (15th to Broadway)	53	2	3	16	
Bluebell-02	D	Roadway and Anderson Ditch Improvements at 20th and Mariposa Avenue	46	4	7	23	
King-03	A	Sediment capture facility	42	4	8	25	<<< Recommended Alternative
King-03	B	Improve 15th Street culvert	54	2	5	14	
King-03	C	Bellevue Drive storm drain (collect on Bellevue, deliver to channel downstream of 15th Street)	44	3	7	24	<<< Recommended Alternative
King-03	D	Roadway Improvements on 15th Street	55	1	4	13	
King-04	A	Improve channel entrance to reduce/remove split flow	60	2	2	6	<<< Recommended Alternative
King-04	B	Improve channel and storm drain inlet	57	3	3	11	
King-04	C	100-Year storm drain improvements	61	1	1	5	
King-04	D	Roadway improvements 17th to 22nd Street	54	4	5	14	
Skunk-05	A	Sediment capture facility	40	4	11	26	<<< Recommended Alternative
Skunk-05	B	100-Year channel improvements; new cemetery road, Anderson Ditch (siphon), King Avenue, 322 22nd driveway, 2200 Bluebell driveway, and Bluebell Avenue culverts	63	1	3	3	
Skunk-05	C	10-Year channel improvements; new cemetery road, Anderson Ditch (siphon), King Avenue, 322 22nd driveway, 2200 Bluebell driveway, and Bluebell Avenue culverts	59	2	6	9	<<< Recommended Alternative
Skunk-05	D	Roadway improvements 22nd to Broadway	51	3	9	19	
Skunk-06	A	100-year channel improvements; pedestrian underpass opportunity at Moorhead Ave (not included in cost); new US Highway 36 culvert	60	1	5	6	<<< Recommended Alternative
Skunk-06	B	New culvert at US Highway 36 and channel improvements for Bear Creek Split flow (Not required if A is implemented)	48	2	10	22	
Skunk-07	A	100-Year channel improvements; new 29th Street, 30th Street, and Aurora Avenue culvers; new pedestrian access, covered bridge, and Arrowwood Park bridges	69	1	1	1	<<< Recommended Alternative
Skunk-07	B	10-Year channel improvements; new 29th Street, 30th Street, and Aurora Avenue culvers; new pedestrian access, covered bridge, and Arrowwood Park bridges	62	2	4	4	
Skunk-08	A	100-Year channel improvements; new 34th Street, Madison Avenue, 35th Street, and Wellman Canal Culverts	64	1	2	2	<<< Recommended Alternative
Skunk-08	B	10-Year channel improvements; new 34th Street, Madison Avenue, 35th Street, and Wellman Canal Culverts	56	2	7	12	
Skunk-08	C	Wellman Canal siphon	53	3	8	16	<<< Recommended option to Alternative A

**Attachments:**

- *Figure 1: Reach Overview*
- Recommended Plan Maps
  - *Figure 2: Bluebell Canyon Creek – Reach 1*
  - *Figure 3: Bluebell Canyon Creek – Reach 2*
  - *Figure 4: King's Gulch – Reach 3*
  - *Figure 5: King's Gulch – Reach 4*
  - *Figure 6: Skunk Creek – Reach 5*
  - *Figure 7: Skunk Creek – Reach 6*
  - *Figure 8: Skunk Creek – Reach 7*
  - *Figure 9: Skunk Creek – Reach 8*



