



**CITY OF BOULDER
CITY COUNCIL AGENDA ITEM**

MEETING DATE: November 18, 2014

AGENDA TITLE

Consideration of a motion to accept the Lower Bear Canyon Creek Floodplain Mapping Study update, submit the study to FEMA and direct staff to consider and use the study results in the regulation of all annexations and development proposals during the interim period in which FEMA is reviewing the study results.

PRESENTERS

Jane S. Brautigam, City Manager
Maureen Rait, Executive Director of Public Works
Jeff Arthur, Director of Public Works for Utilities
Bob Harberg, Principal Engineer - Utilities
Annie Noble, Flood and Greenways Engineering Coordinator
Katie Knapp, Engineering Project Manager
Kristin Dean, Utilities Planner

EXECUTIVE SUMMARY

The city has a comprehensive floodplain management program designed to identify flood risks, mitigate the risks of flooding, minimize loss of life and property damage and support recovery following a major flood event. Floodplain mapping provides the basis for the city's floodplain management program by identifying the areas at the highest risk for flooding. Changes in land use, updated topographic mapping and upgrades to hydrologic and hydraulic models warrant periodic mapping updates. This memorandum presents the proposed floodplain mapping revision for Lower Bear Canyon Creek.

The Lower Bear Canyon Creek study area extends from the confluence of Bear Canyon Creek and Boulder Creek (downstream) to Foothills Parkway (upstream).

The study includes the data and documentation required for accreditation of the Harrison Levee. The Harrison Levee is provisionally accredited on the current Flood Insurance Rate Maps. This study also incorporates the updated hydraulic model for Boulder Creek at the downstream tie-in location and the additional culverts below Arapahoe Avenue that were installed in 2007 to increase the conveyance of Bear Canyon Creek. Once adopted by the city and FEMA, this flood mapping study will provide the regulatory basis for land use applications, building permit applications and flood insurance requirements for properties impacted by the 100-year floodplain.

STAFF RECOMMENDATION

Staff requests council consideration of this matter and action in the form of the following motion:

Motion to accept the Lower Bear Canyon Creek Floodplain Mapping Study update, submit the study to FEMA and direct staff to consider and use the study results in the regulation of all annexations and development proposals during the interim period in which FEMA is reviewing the study results.

COMMUNITY SUSTAINABILITY ASSESSMENTS AND IMPACTS

- **Economic:** Flood insurance is required for properties located in the 100-year floodplain if they are financed by a federally-backed mortgage. Flood insurance rates are set by FEMA based on the flood risk as shown on the flood insurance rate maps. Accurate floodplain mapping helps facilitate accurate flood insurance rates. The average annual rate for flood insurance within the city in 2013 was \$760 (3,830 policies). Flood protection land use regulations also create costs for the property owners in the form of permit fees, increased costs of remodeling and restrictions on development. Flood insurance and land use regulations do, however, provide protection from potentially catastrophic losses due to floods.
- **Environmental:** Flood events can result in damage or destruction to buildings and corresponding release of man-made contaminants. Flood waters can also cause erosion and damage to areas of the natural environment that are not capable of conveying high-velocity stormwater. The updated mapping will more accurately identify the areas with the greatest flooding risks.
- **Social:** Floodplain mapping provides the basis for flood management by identifying the areas subject to flooding. This information is essential for determining areas where life safety is threatened and property damage is likely. Land use regulations help reduce risks to people and property in these high flood-risk areas. Accurate mapping of flood risks also helps implement effective flood preparedness and response programs, thereby increasing the safety of people living, working or visiting the City of Boulder.

OTHER IMPACTS

- **Fiscal:** Funding for this study is included in the Department of Public Works Utilities Division budget.
- **Staff Time:** Time for completing the study is included in existing work plans.

BOARD AND COMMISSION FEEDBACK

An open house was held on July 1, 2014 with floodplain maps on display for public review. The Water Resources Advisory Board (WRAB) considered the floodplain mapping update on July 21, 2014. The WRAB unanimously recommended that City Council adopt the floodplain mapping update.

PUBLIC FEEDBACK

Postcard notifications were sent to all property owners and residents in the project area and letters were mailed to all affected property owners to inform them about the mapping study, upcoming public meetings and where to find information about the study on the city website. An open house meeting was held in early July 2014 to inform the public about the mapping revisions. Most questions and concerns were about flood insurance requirements and plans for future drainageway improvements.

BACKGROUND

The risk of flash flooding is an important issue city, primarily due to its location at the mouth of Boulder Canyon and other canyon creeks. Approximately 13 percent of the city is located within the 100-year floodplains of Boulder Creek and its 14 tributaries. Nearly 2,600 individual structures are located within this flood zone. Additional information about the city's floodplain management program, floodplain regulations and flood insurance can be found at the [Flood Management Program Overview](#) web page.

Floodplain mapping provides the basis for the city's floodplain management program by identifying the areas at the greatest risk for flooding. Changes in land use, updated topographic mapping and upgrades to hydrologic and hydraulic models warrant periodic mapping updates.

The city delineates four flood zones:

- 500-year floodplain: The 500-year floodplain delineates the flood limits resulting from a storm that has a 0.2 percent chance of occurring in any given year.
- 100-year floodplain: The 100-year floodplain delineates the flood limits resulting from a storm that has a one percent chance of occurring in any given year (26 percent chance over a 30-year mortgage).
- Conveyance zone: The conveyance zone is the area of the floodplain that is specifically reserved for the passage of floodwaters. This zone is delineated to allow development to occur in some areas of the floodplain while still accommodating the passage of 100-year storm flows.
- High hazard zone: The high hazard zone defines the area of the floodplain where water depth and velocity pose a threat to life and safety. This area is delineated for areas in the floodplain where water depths are four feet or greater or where the water velocity multiplied by water depth equals or exceeds the number four.

The city has recently updated or is in the process of updating all of the floodplain mapping for the major drainageways. Current mapping studies include Upper Goose and

Twomile Canyon Creeks, Skunk Creek, Kings Gulch, Bluebell Canyon Creek, and Boulder Slough.

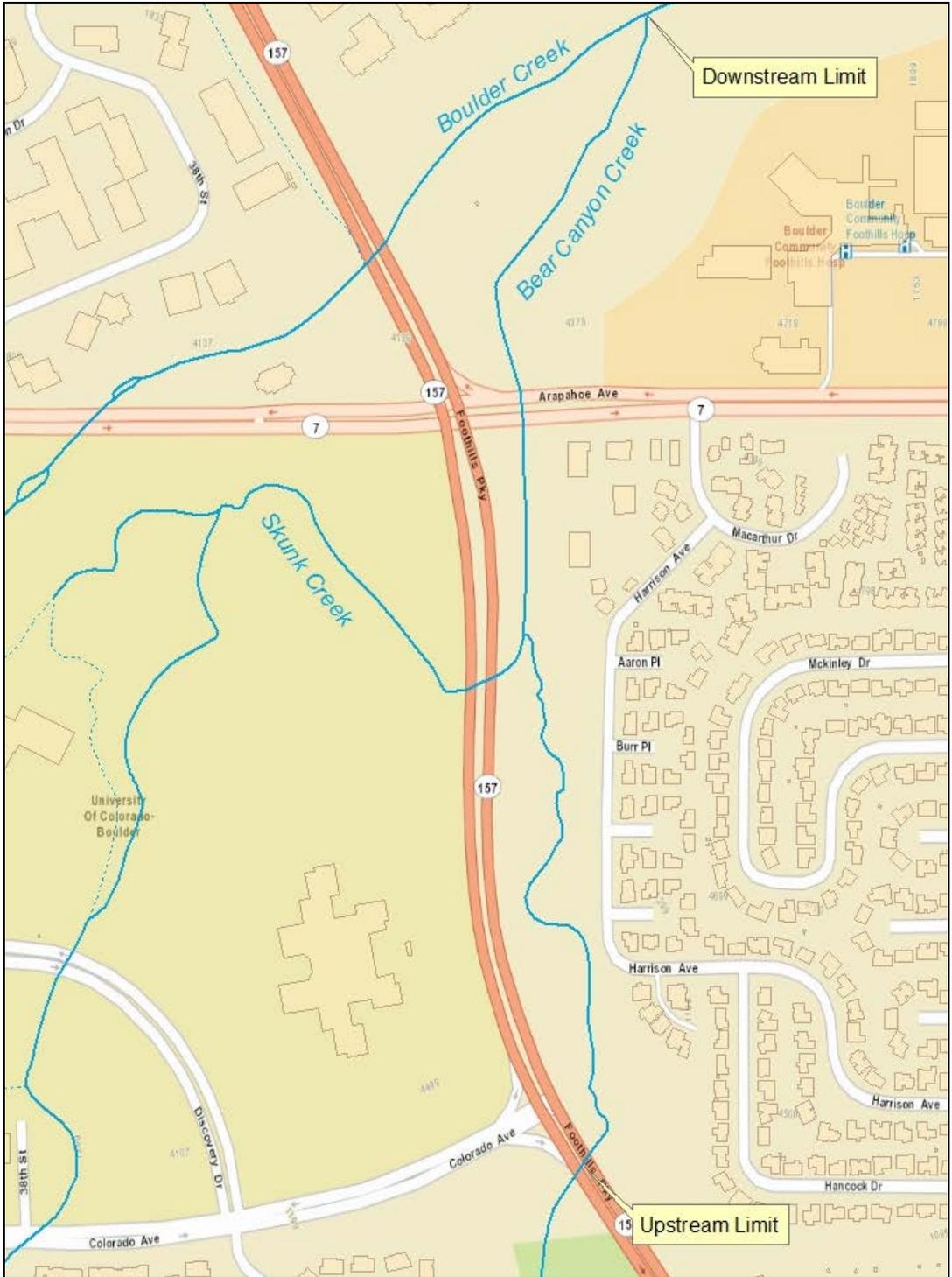
On Sept. 30, 2014, a [Flood Study Session](#) was held with council. Staff communicated that studies are currently under review and are scheduled to be brought to council. Council members supported the mapping studies being reviewed as consent items provided there are no significant issues of concern. This mapping study for Lower Bear Canyon Creek is the first to be scheduled for the council's consent agenda and will be reviewed concurrently with the summary for the Sept. 30 Flood Study Session.

ANALYSIS

A Letter of Map Revision (LOMR) updates floodplain mapping and hydraulic models. The Lower Bear Canyon Creek LOMR request is being made to update a short reach of the Bear Canyon Creek floodplain. A LOMR is required to formalize flood mitigation improvements and to update hydraulic models. The hydrology used in the mapping update is from the 2012 FEMA Flood Insurance Study and is based on a 1-hour storm event.

The city previously submitted a LOMR for Bear Canyon Creek from Foothills Parkway (downstream) to the city limits (upstream) to reflect changes authorized by city floodplain permits and update hydraulic models based on better, more detailed topographic information. This LOMR was submitted to FEMA in 2002 and approved on February 27, 2003.

The study area for the current LOMR addresses the remainder of Bear Canyon Creek within the city limits, extending from the confluence of Bear Canyon Creek and Boulder Creek (downstream) to Foothills Parkway (upstream). See the map below.



This study includes the data and documentation required for accreditation of the Harrison Levee. The Harrison Levee is provisionally accredited on the current Flood Insurance Rate Maps. The LOMR will also incorporate the updated hydraulic model for Boulder Creek at the downstream tie-in location and incorporate the additional culverts below Arapahoe Avenue that were installed to increase the conveyance of Bear Canyon Creek. A summary of the number of structures affected by this remapping is provided below.

Summary of Proposed Changes

Lower Bear Canyon Creek			
Number of Structures	100-Year Floodplain	Conveyance Zone	High Hazard Zone
Existing Floodplain	64	0	0
Proposed Floodplain	39	0	0
Change	-25	0	0
No Longer Affected	37		
Newly Affected	12		
No Change	27		

Although the proposed floodplain mapping results in fewer structures designated within the 100-year floodplain, the proposed mapping includes slight modifications to the outer boundaries for the 100-year floodplain and the boundaries of a higher elevation or “island” areas within the 100-year floodplain, resulting in some newly identified structures. All structures within the 100-year floodplain with federally backed financing are required to purchase flood insurance. The city’s floodplain regulations also apply to all properties within the 100-year floodplain, although existing structures that were constructed without a 100-year floodplain designation are grandfathered and can remain in their current configuration.

Results

Attachments A through D present figures showing a comparison between existing and proposed floodplain mapping.

MATRIX OF OPTIONS:

City Council options for review and consideration include:

- Accept the updated flood study, which will then be submitted to FEMA. Staff will consider and use the results in the regulation of all annexations and development proposals during the interim period while FEMA reviews the study results. (Staff Recommendation)
- Accept the updated flood study with changes or conditions that require additional public involvement, information or evaluation of the flood hazard situation before submittal to FEMA or use by city staff.
- Do not accept the updated flood study and continue use of the current floodplain maps for city regulatory purposes.

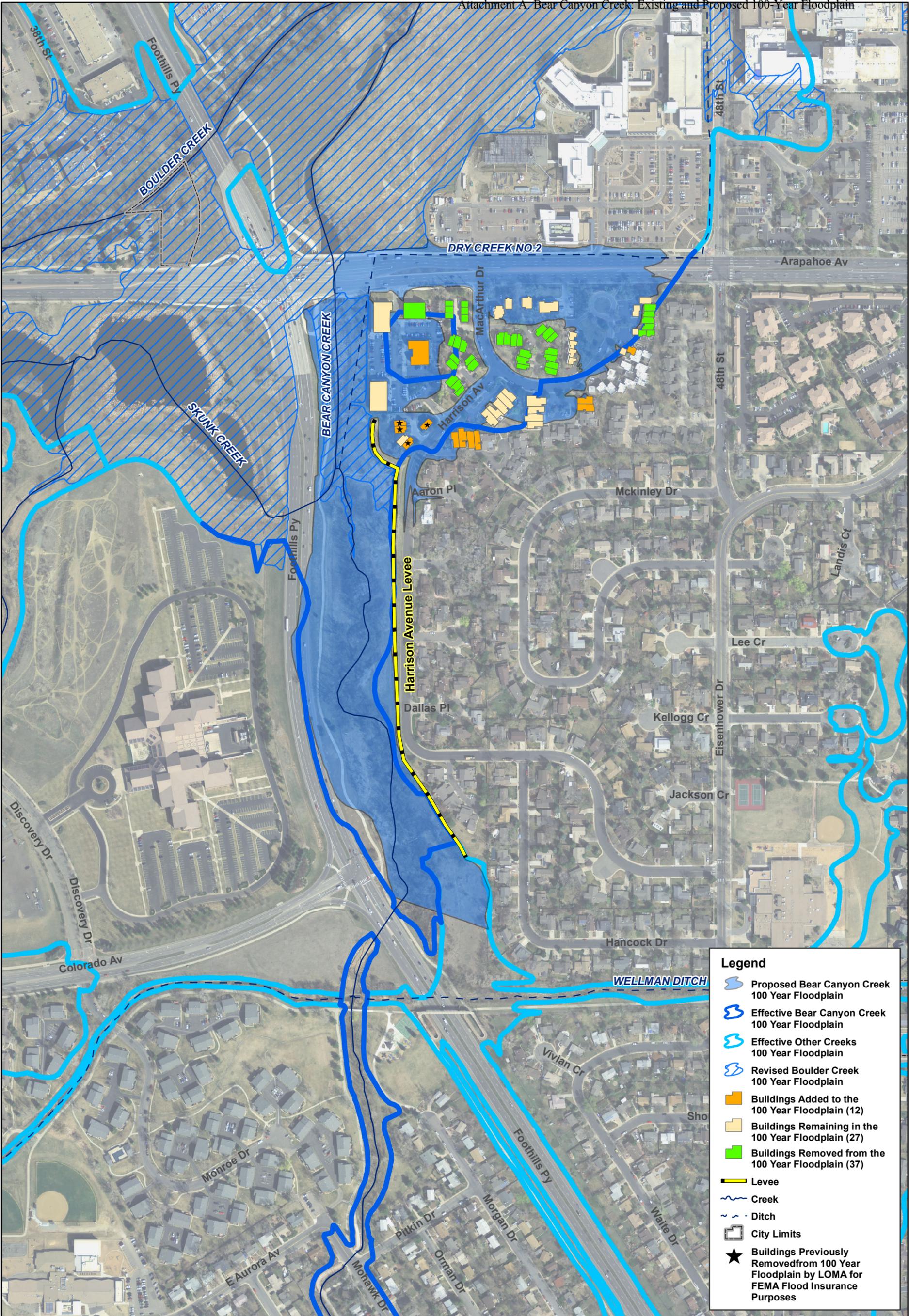
NEXT STEPS:

If City Council approves the map revisions, the city will submit the LOMR requests to FEMA for review. During the FEMA review and approval process (estimated to be six to 12 months) it is recommended that the new mapping be used for regulatory purposes by regulating to the more restrictive of the existing and new mapping. This would mean that

development within the newly identified flood zones would be subject to the city floodplain regulations. In order to comply with FEMA requirements, development within the areas that are being removed from the floodplain would still be subject to the city's floodplain regulations until FEMA officially adopts the new floodplain mapping. Following formal adoption by FEMA, the city would regulate solely based on the new mapping.

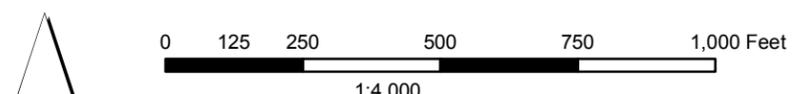
ATTACHMENTS:

- A. Bear Canyon Creek: Existing and Proposed 100-Year Floodplain
- B. Bear Canyon Creek: Existing and Proposed Conveyance Zone
- C. Bear Canyon Creek: Existing and Proposed High Hazard Zone
- D. Bear Canyon Creek: Existing and Proposed 500-Year Floodplain



Legend

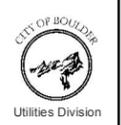
- Proposed Bear Canyon Creek 100 Year Floodplain
- Effective Bear Canyon Creek 100 Year Floodplain
- Effective Other Creeks 100 Year Floodplain
- Revised Boulder Creek 100 Year Floodplain
- Buildings Added to the 100 Year Floodplain (12)
- Buildings Remaining in the 100 Year Floodplain (27)
- Buildings Removed from the 100 Year Floodplain (37)
- Levee
- Creek
- Ditch
- City Limits
- Buildings Previously Removed from 100 Year Floodplain by LOMA for FEMA Flood Insurance Purposes

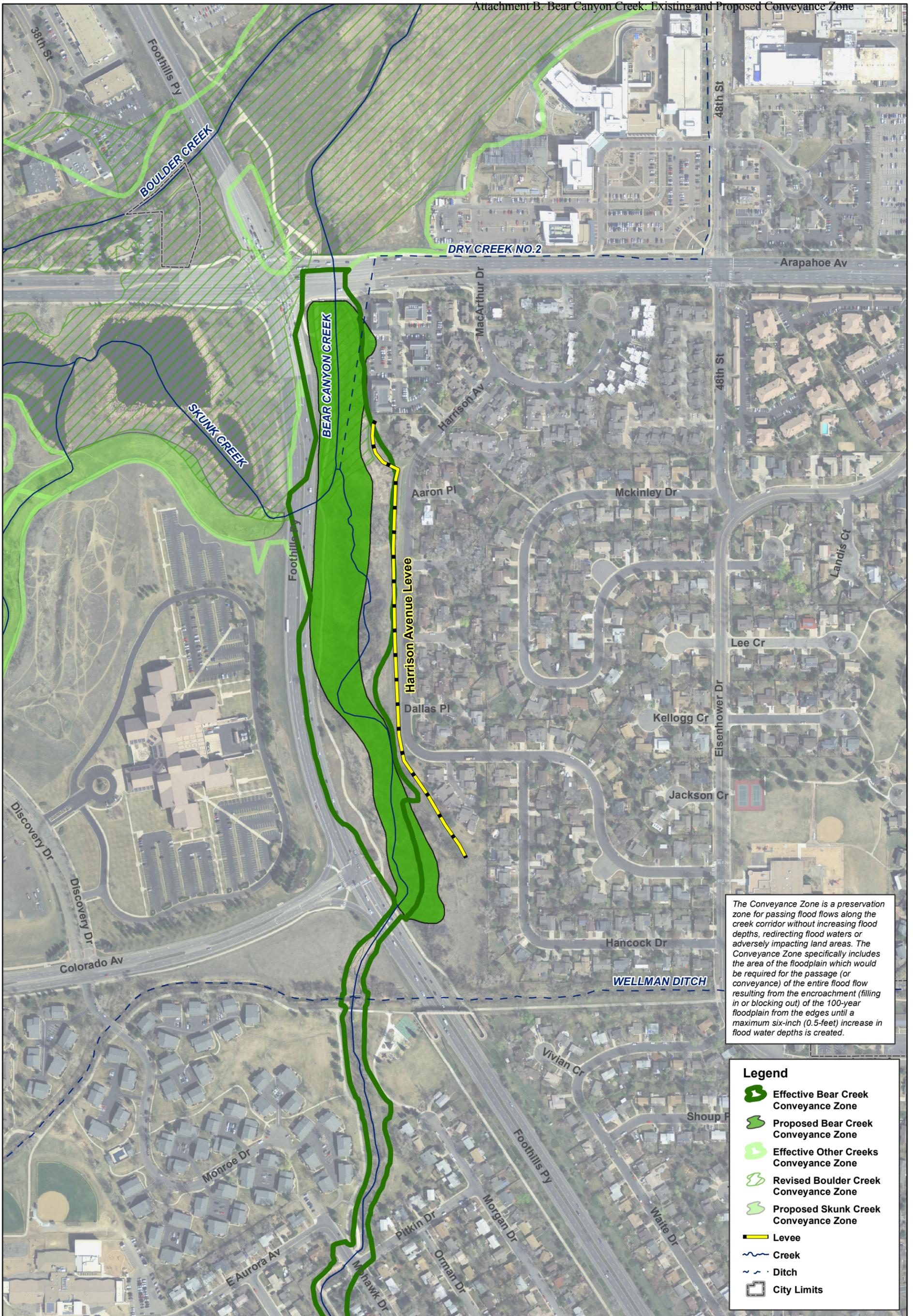


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Bear Canyon Creek

Proposed 100-Yr Floodplain
Compared to FEMA Effective





The Conveyance Zone is a preservation zone for passing flood flows along the creek corridor without increasing flood depths, redirecting flood waters or adversely impacting land areas. The Conveyance Zone specifically includes the area of the floodplain which would be required for the passage (or conveyance) of the entire flood flow resulting from the encroachment (filling in or blocking out) of the 100-year floodplain from the edges until a maximum six-inch (0.5-foot) increase in flood water depths is created.

- Legend**
- Effective Bear Creek Conveyance Zone
 - Proposed Bear Creek Conveyance Zone
 - Effective Other Creeks Conveyance Zone
 - Revised Boulder Creek Conveyance Zone
 - Proposed Skunk Creek Conveyance Zone
 - Levee
 - Creek
 - Ditch
 - City Limits

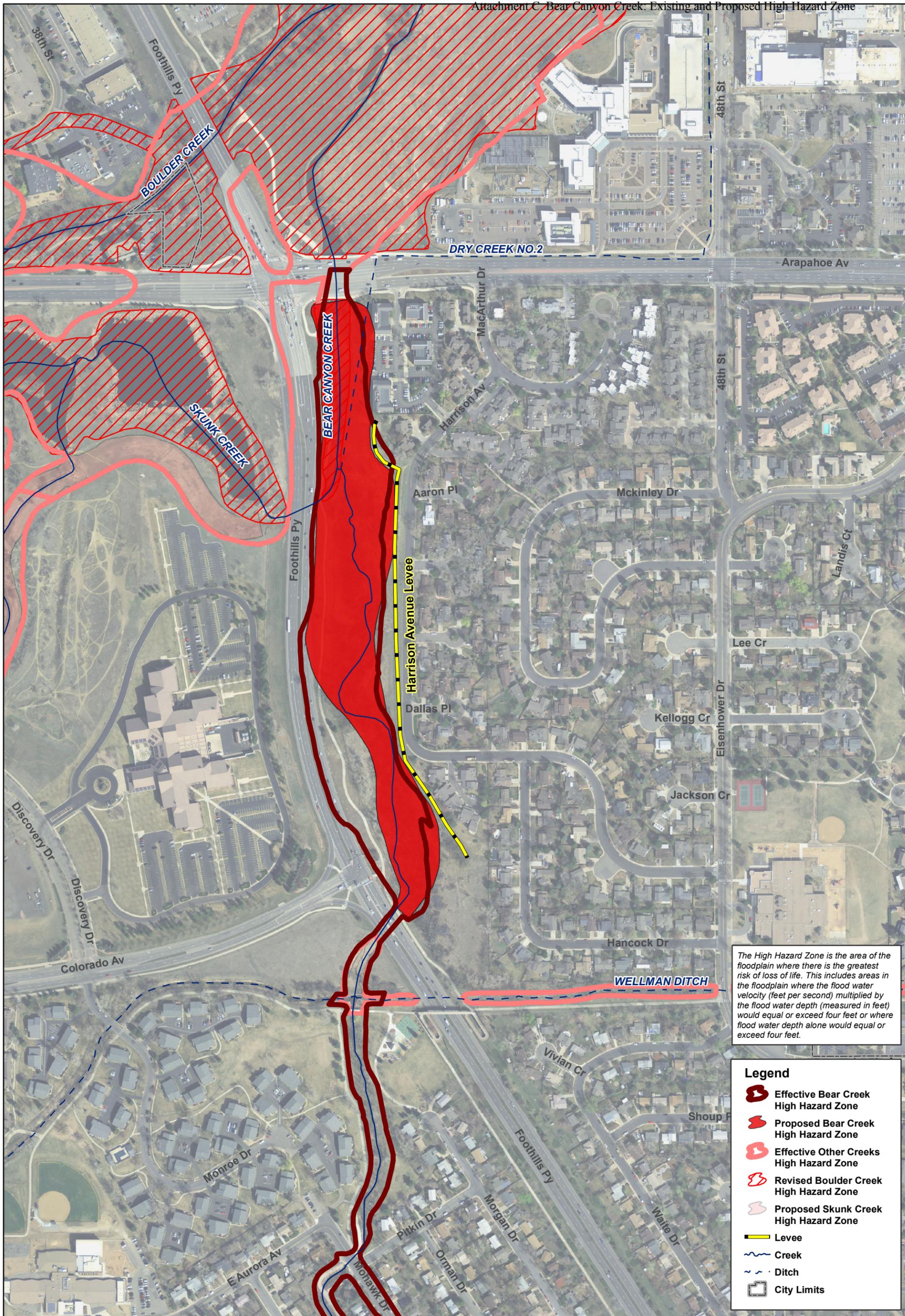


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Bear Canyon Creek

Proposed Conveyance Zone
Compared to FEMA Effective





The High Hazard Zone is the area of the floodplain where there is the greatest risk of loss of life. This includes areas in the floodplain where the flood water velocity (feet per second) multiplied by the flood water depth (measured in feet) would equal or exceed four feet or where flood water depth alone would equal or exceed four feet.

Legend

- Effective Bear Creek High Hazard Zone
- Proposed Bear Creek High Hazard Zone
- Effective Other Creeks High Hazard Zone
- Revised Boulder Creek High Hazard Zone
- Proposed Skunk Creek High Hazard Zone
- Levee
- Creek
- Ditch
- City Limits

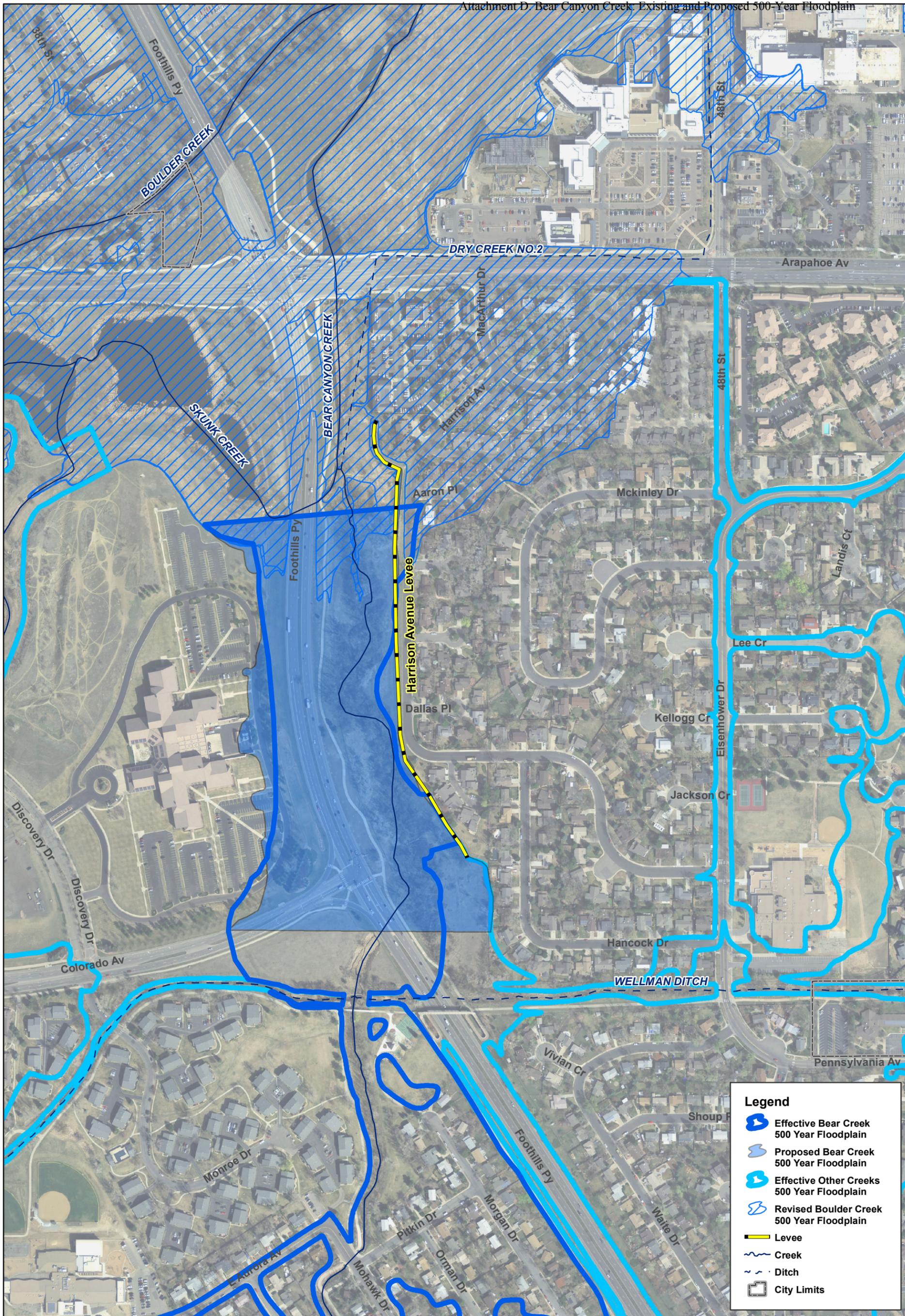


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Bear Canyon Creek

Proposed High Hazard Zone Compared to FEMA Effective





Legend

- Effective Bear Creek 500 Year Floodplain
- Proposed Bear Creek 500 Year Floodplain
- Effective Other Creeks 500 Year Floodplain
- Revised Boulder Creek 500 Year Floodplain
- Levee
- Creek
- Ditch
- City Limits



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Bear Canyon Creek

Proposed 500-Yr Floodplain
Compared to FEMA Effective

