WATER RESOURCES ADVISORY BOARD MEETING

MEETING DATE: Monday, 18 May 2015

MEETING TIME: 7:00 p.m.

MEETING LOCATION: Municipal Services Center, 5050 Pearl St., Boulder, CO 80301

Agenda Highlights:

1. Call to Order (7:00 p.m.)

2. Approval of 27 April Meeting Minutes (7:01 p.m.)

3. *Public comment (7:05 p.m.)

4. *Public Hearing and Consideration of a Recommendation to City Council Regarding the Skunk Creek, Bluebell Canyon Creek and King's Gulch Floodplain Mapping Update (7:15 p.m.)

5. *Public hearing and Consideration of a Recommendation to City Council Regarding the South Boulder Creek Floodplain Mitigation Plan (7:45 p.m.)

6. Information Item – Preliminary Capital Improvements Program (9:15 p.m.)

7. Matters (9:45 p.m.)

    - From Board
    - From Staff

8. Discussion of Future Schedule (9:55 p.m.)

9. Adjournment (10:00 p.m.)

Additional Information Items:

- Boulder Civic Area Update
- Boulder Creek Mitigation Plan
- GAC (Greenways) CIP

* Public Comment Item

Agenda item times are approximate.

Information:

- Please contact the WRAB Secretary email group at: WRABSecretary@bouldercolorado.gov
- Packets are available on-line at: http://www.bouldercolorado.gov – A to Z, Water Resources Advisory Board (WRAB), Next Water Resources Advisory Board Meeting

CITY OF BOULDER, COLORADO
BOARDS AND COMMISSIONS MEETING MINUTES

Name of Board / Commission: Water Resources Advisory Board

Date of Meeting: 27 April 2015

Contact Information of Person Preparing Minutes: Andrea Flanagan 303.413.7372

Board Members Present: Vicki Scharnhorst, Dan Johnson, Ed Clancy, Mark Squillace
Board Members Absent: Lesley Smith

Staff Present: Jeff Arthur, Director of Public Works for Utilities
Annie Noble, Flood and Greenways Engineering Program Coordinator
Katie Knapp, Engineering Project Manager
Kristin Dean, Utilities Planner
Ken Baird, Utilities Financial Manager
Douglas Sullivan, Acting Principal Engineer for Water, Wastewater and Stormwater
Tom Settle, Water Treatment Manager
Ward Bauscher, Engineering Project Manager
Kevin Clark, Utilities Project Manager, Sourcewater Infrastructure
Steve Buckbee, Engineering Project Manager
Christin Shepherd, Civil Engineer
Milford John-Williams, Budget Analyst
Andrea Flanagan, Board Secretary

Cooperating Agencies Present:
Alan Turner, Senior Project Manager, CH2M HILL
Shea Thomas, Urban Drainage and Flood Control District

Meeting Type: Regular

Agenda Item 1 – Call to Order **[7:00 p.m.]**

Agenda Item 2 – Approval of the 16 March 2015 Meeting Minutes **[7:00 p.m.]**
Motion to approve minutes from March 16 as presented.
Moved by: Squillace; **Seconded by:** Johnson
Vote: 4:0 (Lesley Smith absent)

Agenda Item 3 – Swearing In/ Election of Officers **[7:03 p.m.]**
Ed Clancy was sworn in for his term on the WRAB.

Motion by: Clancy; Seconded by: Squillace
Move to postpone election of officers until such a time as all five board members are present to vote. Current arrangement of officers would continue until that time.
Vote: 4:0 (Lesley Smith absent)

Agenda Item 4 – Public Participation and Comment **[7:04 p.m.]**
Public Comment:

Karl Anuta, Crif Crawford, Bruce Thompson (each speaker took a portion of the pooled time)
Karl Anuta spoke on behalf of residents of Frasier Meadows Retirement Community and presented a petition with signatures to the Board to ask for their support in the construction of a flood control facility, south of highway US 36. Citizens are concerned about the South Boulder Creek area, which the city has studied for many years. Over 300 homes of the total homes damaged by the flood event were on the west side of Foothills. This is not a flood that came up through basements, or caused by an over-taxed sewer system. This flood damage was caused strictly by surface water flowing over the turnpike and into homes, as well as the retirement community. Much of the Frasier Meadow's infrastructure was severely damaged, including several major buildings. Asking for Board support for construction of this area.

Crif Crawford:
Showed videos of flooding at: Table Mesa and US 36, Frasier Meadows (from Thunderbird), Underground Garage to illustrate the flows and seriousness of the flood waters in their community.

Bruce Thompson
Asking for Board support to further prevent water from South Boulder Creek Basin from topping over US

36 and overflowing into residential areas, west of Foothills Parkway. Highest priority is saving lives. If anyone had been in the Frasier Meadows parking garage, they might not have survived. It took less than 15 minutes to take 88 cars. Residents had to be carried across 3 feet of water to safety, which is a miracle that no one was lost. 43 residents of Frasier Meadows are present today and instead of speaking individually, they signed a sheet agreeing to these comments.

Al LeBlang
Concurs with the aforementioned statements.

Clinton Heiple
This was not a gently rising flood; this was water that came on very quickly and if anyone had been sleeping in their basement they could have died. Primary responsibility of government is to protect the lives and safety of its citizens. Hopes for Board to move forward.

Laura Tyler
Member of the South Boulder Creek Steering Committee, shared update about what the group is doing. Concerned that safety piece was not addressed at earlier study session. Group has reached out to City Council members, as well as University of Colorado (CU) staff. Reactions have been overwhelmingly positive. Council sees this as an opportunity to cooperate with CU. CU representatives are very positive and both groups clearly see the seriousness of this situation. There is a feeling of momentum. Shared a clip from Daily Camera about annexation and shared quote about the city's plans for South Boulder Creek Mitigation Project and Southeast Boulder section and wanted to include this as part of the conversation. This conversation is happening and it is very positive.

Payson Sheets
Spoke about a possible future hazard that he would like to have avoided, with regard to expansion of Eldora ski area. Family moved to Boulder in 1920's and remembers ski area working cooperatively with residents, but they are now unwilling to listen to residents. Sediment load is going into Peterson Lake and they would like to build additional trails, which would cause greater sediment issues. The ski area has been granted an expansion in both directions. EPA in Denver looked at their plans and found that the environmental impact statement was incomplete, and they were unable to assess the environmental impacts. Feels that this needs to be reassessed by the City. Nederland Advisory Board is preparing objections and he urges Board to file a firm objection to the expansion. Read from a key statement by Bret Linenfelser from April, 2014. Appreciates anything the Board can do to protect Boulder Creek.

Jim Johnson
Represents Southeast Boulder Neighborhood Association, which includes surrounding neighborhoods. Appreciates Board hearing the group's message, which is that they want to work together with the City, County and FEMA to prevent water from further flooding these neighborhoods. Held up a map to show the Board. Hopes group can plan ahead with University of Colorado and would appreciate anything the Board can do to work with these entities to help protect residents. Mitigation is needed badly.

Agenda Item 5 – [7:28 p.m.]

Public Hearing and Consideration of a Recommendation to City Council Regarding the Gregory Creek Mitigation Study
Katie Knapp and Utilities staff presented the item to the board.

Executive Summary from the Packet Materials:
The purpose of this memorandum is to present the Gregory Canyon Creek Draft Flood Mitigation Plan **(Attachment A)** for the WRAB's consideration, input and recommendation to Council.

The city has retained CH2MHill to evaluate potential alternatives to help alleviate future flooding along Gregory Canyon Creek. CH2MHill's Alternative Analysis Memorandum ("Analysis") is included as Appendix A of the Draft Flood Mitigation Plan **(Attachment A).** This Analysis contains a detailed description of the data and models used to determine the improvements which would help flood conveyance along Gregory Canyon Creek. The intent of the Analysis was to identify various types of improvements which could be constructed along the creek corridor, assess the costs and benefits associated

with each improvement, and include an engineer's recommendation.

Staff reviewed the Analysis and developed a staff recommended plan based on the engineering recommendation, input from the public and observations from the 2013 flood event. The staff recommended plan is illustrated graphically in Section 6 of the Draft Flood Mitigation Plan **(Attachment A)** which also includes additional information about the Gregory Canyon Creek watershed, the planning process and the alternatives considered. Please note that not all sections of the document have been completed. Pending consideration and input from WRAB, conceptual drawings will be developed and the mitigation plan will be finalized and presented to City Council for acceptance.

WRAB Discussion Included:

- Question about four private culverts and asked if property owners agree to dedicate easements in order for city to install
- Question if residents support installing a pedestrian bridge.
- Stated that it is likely that we will exceed a ten-year flood and questioned if infrastructure will support anything greater than a 10-year flood.
- Asked about the cost-to-benefit analysis and questioned the numbers presented because they did not match what is in the report.
- Commented that a 7% discount rate is not realistic. Concerned that if the discount rate is changed, the numbers will be skewed.
- Suggests the calculations be made under different discount rates. Numbers seem speculative.
- Stated that the culvert replacement over the ten-year event does make sense.
- Asked for further clarification on method used for property acquisition.
- Stated that it is odd that city would agree to pay for the easements and suggested further discussion of this topic.
- Asked if there is a consideration at this time for what would come first as a priority, so that larger problems are not created and requested further clarification of the overall timeline approach.
- Questioned how the benefits get assessed in this situation.
- Requested further clarification on road improvements and property acquisition and whether these aspects could not be made part of the recommendation and instead, be a part of another program?
- Stated that this project affects neighborhoods directly and recommends a more adaptive approach that allows adjustments as more information is found out and suggests adding this to recommendation.
- Requested clarification on whether there is a reason that street improvements need to be included in the recommendation.
- Stated that Board has been discussing Gregory Creek since 2008 and something needs to happen.
- Requested whether it is normal practice for landscaping to be replaced, if damaged.
- Recommended that residents be asked to grant easements without compensation, as to allow funding to be stretched.
- Stated that if property value increases, it seems odd that the city would pay for easements.

Public Comment:

Holly Pearen
Stated that staff and Board have been very open and solicitous to the neighborhood concerns. As the plan has developed, the landowners have some concerns, both on macro and micro scales. Inconsistencies lead to deep concern. Glad that benefit-cost analysis has been addressed. The value of the damages presented in the documents are inconsistent. Has to be some sort of calibration to what actually happened. Understands that the damages are estimated, but this cannot be accurate. No realistic assumptions about the value can be made based on these numbers. Open to hearing explanation as to how these numbers were arrived at from CH2M Hill. Landowners would appreciate if city and CH2M Hill could be more transparent about the cost to landowners. If in fact properties gain or lose value, tell them how much and reflect this in the budget. If easements will be given to the city for free, this may not be realistic, especially based on her experience throughout this process.

Stewart Machle
Would like to thank city for all the help given to him since the flood. Rock walls have been rebuilt.

Question about intersection of Anderson Ditch and Gregory Creek. Heard comment about an overhead culvert or culvert separate from Gregory Creek and agrees they should be separated. Asks if a decision has been made about what is going to be done with this location, as this is a critical area.

Laz Nemeth
Asked why everyone is in favor with box culverts. They are ugly. Preference is for keeping Anderson Ditch open so children can play there. Running water is aesthetically pleasing. Based on personal experience, Anderson Ditch was actually shut off during the flood. There was no more flow in Gregory Creek afterwards. Something needs to be done. Asks if there is a reason for always having two box culverts and if it is more cost-effective.

Rebecca Roser
Part of her property is Anderson Ditch, which goes to the edge of her property. Flows stopped in Anderson Ditch, because it was filled to the top with silt during the flood. Agrees that the area where Gregory Creek and Anderson Ditch come together is an issue because it's at the edge of her property. Appreciates that neighbors have been solicited and looking forward to working with city with regard to easements.

Motion by: Squillace**; Seconded:** Johnson
Vote: 4:0 (Lesley Smith absent)
Motion Passes

Staff requests Water Resources Advisory Board consideration of this matter and action in the form of the following motion:

Motion to recommend the Gregory Canyon Creek Flood Mitigation Plan be finalized based on the Staff Recommended Plan and presented to City Council for acceptance.

Agenda Item 6 – [8:40 p.m.]

Information Item – Preliminary Draft 2016 Utilities Budget (Water, Wastewater and Stormwater/ Flood Management) including the 6-year Capital Improvement Program (CIP)

Douglas Sullivan, Ken Baird, Annie Noble, Kevin Clark, Steve Buckbee, and other Utilities staff presented the information item to the board.

As part of the city's annual budget process, Utilities develops a six-year planning budget, this year for the time period of 2016 through 2021. The Water Resources Advisory Board (WRAB) role in this process is defined in the Boulder Revised Code: ". . . to review all environmental assessments and capital improvements conducted or proposed by the utilities division." Utilities staff has formulated initial revenue and expenditure projections for each of the three utility funds through the year 2021. Within the budget process, City Council approves and appropriates funds only for the first year, 2016. In addition to the six year CIP described above, Utilities staff develops a 20-yr CIP. The purpose of the 20-yr CIP is to look at long range needs for all three utilities. The 20-yr CIP is a valuable mechanism to look at upcoming regulatory requirements, asset management needs for aging facilities, and the associated debt service for existing bonds.

This agenda item provides an opportunity for the WRAB to discuss a "preliminary draft" of the CIP. Input from WRAB will guide staff in preparation of a draft CIP for discussion by WRAB at the May meeting. WRAB will be asked to make a recommendation to City Council regarding the 2016-2021 CIP at its June meeting. The Planning Board will review the complete city CIP, including utilities, in July. City Council generally plans for two study sessions in September, prior to adopting the 2016 budget.

WRAB Discussion Included:

- Stated that there is some concern that the rate increases may be a bit heavy, considering they have been flat for so long. Concerned that rate increases won't stop. This could largely impact commercial users.
- Stated that perhaps we should exercise more thoughtfulness on how we conserve water and consider the possibility of selling our product (water) while we have it. If we continue to conserve, what are we losing in revenue?

- Stated that the issue is complicated, because if we don't conserve, then we need to acquire new water supplies.
- Stated that these changes could be more significant than the public may even understand.
- Expressed concern that we may be on a track that is not aligned with inflation.
- Stated that what some local communities want that is in the best interest of protecting their properties, may not actually be what's best for the community at large.
- Commented that we do need to play catch-up on sewage updates, as we saw what happened during the flood event in 2013.
- Stated that CII was never completed and suggest revisiting.
- Asked whether there is any potential to sell any of our resources to generate additional revenue.
- Questioned whether our plant investment fee is high enough and whether or not it is fair for people who buy in later.
- Questioned if there was any conclusion that came from the inspection of sewer lines that were inspected by a pipeline 'submarine.'

Agenda Item 7 – Matters from the Board: **[10:12 p.m.]**

Board Member Clancy brought up the below matter(s):

- Requested clarification on dates for future open houses.
- Requested to find out if PowerPoint presentations will be posted following meetings.

Board Member Johnson brought up the below matter(s):

- Requested more information on Eldora expansion, with regard to public comment.

Agenda Item 8 – Matters from Staff: **[10:15p.m.]**

- Kim Hutton provided an update on water supply for 2015. There is no need to implement water restrictions at this time, based on current snow pack conditions.
- Department of Health and Human Services has recently released a fluoride recommendation. City is determining next steps and will follow up at future meeting.

Agenda Item 9 – Future Schedule **[10:24p.m.]**

May:

- South Boulder Creek Mitigation
- Skunk Creek Mapping Update
- Update on Wastewater and Stormwater Collection System Master Plans
- Preliminary Capital Improvements Program update
- Boulder Civic Area Update
- Boulder Creek Mitigation Plan Update

Adjournment **[10:31 p.m.]**

There being no further business to come before the Board at this time, by motion regularly adopted, the meeting was adjourned at **10:31**p.m.

Motion to adjourn by: Johnson**; Seconded by:** Squillace

Motion Passes 4:0 (Lesley Smith absent)

Date, Time, and Location of Next Meeting:

The next WRAB meeting will be **Monday, 18 May 2015** at **7:00 p.m.,** at the **City's Municipal Services Center, 5050 Pearl St., Boulder, CO 80301**

APPROVED BY:

_____

Board Chair

_____

Date

ATTESTED BY:

_____

Board Secretary

_____

Date

An audio recording of the full meeting for which these minutes are a summary, is available on the Water Resources Advisory Board web page.

https://bouldercolorado.gov/boards-commissions/water-resources-advisory-board-next-meeting-agenda-and-packet

C I T Y OF B O U L D E R
WATER RESOURCES ADVISORY BOARD
AGENDA ITEM

MEETING DATE: May 18, 2015

AGENDA TITLE: Public hearing and consideration of a recommendation to City Council regarding the Skunk Creek, Bluebell Canyon Creek and King's Gulch Floodplain Mapping Update

PRESENTER/S:
Jeff Arthur, Director of Public Works for Utilities
Annie Noble, Acting Principal Engineer for Flood and Greenways
Katie Knapp, Engineering Project Manager

EXECUTIVE SUMMARY

Floodplain mapping provides the basis for flood management by identifying the areas at the highest risk of flooding. This information is essential for determining areas where life safety is threatened and property damage is likely and is the basis for floodplain regulations and the National Flood Insurance Program (NFIP). The city's floodplain maps need to be periodically updated to reflect changes in the floodplain resulting from land development, flood mitigation improvements, new topographic mapping information and new mapping study technologies.

The Skunk Creek Floodplain Mapping Update includes the King's Gulch, Skunk and Bluebell Canyon Creek floodplains between the city limits to east of Foothills Parkway where Skunk Creek confluences into Bear Canyon Creek as shown in red below.

Engineering consultants provided hydraulic modeling to update the existing Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) and City of Boulder floodplains, water surface elevations, conveyance and high hazard zones.

The proposed mapping of the Skunk Creek Floodplain would result in a net:

- Increase of 38 structures identified in the 100-year floodplain;
- Decrease of 22 structures identified in the conveyance zone and;
- Decrease of 19 structures identified in the high hazard zone.

STAFF RECOMMENDATION:

Staff requests Water Resources Advisory Board consideration of this matter and action in the form of the following motion:

Motion to recommend that City Council adopt the Skunk Creek, Bluebell Canyon Creek and King's Gulch floodplain mapping update.

COUNCIL FILTER 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 2014 was $760 (3,830 policies), including "preferred risk" policies for structures outside of the 100-year floodplain. Flood protection land use regulations also create costs for 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. Updated flood mapping more accurately identifies the areas with the greatest flooding risks and potential mitigation opportunities.
- **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

The Skunk Creek, Bluebell Canyon Creek and King's Gulch floodplain mapping was first presented to the WRAB as an information item on August 18, 2014. The board requested that staff continue to work with the public to inform them about the proposed floodplain mapping and address comments and concerns. It was also requested that information about FEMA's Letter of Map Amendment (LOMA) process be made available on the city's website. In response to the WRAB's feedback, staff worked with the public and will continue to send out notification letters and postcards. Information about FEMA's LOMA process has also been included on the project website and on the city's general website about floodplain mapping.

The floodplain mapping was then presented to the WRAB on September 15, 2014. At the time of the WRAB meeting, additional refinements were being done to the mapping. The WRAB passed the following motion with a vote of 3-2 (Clancy, Squillace opposed):

> Motion to recommend that City Council adopt the Skunk Creek floodplain mapping update including potential additional refinements made prior to Council's consideration and with the understanding that should such additional refinements result in substantial modifications to affected properties, that WRAB would have the opportunity to review the results prior to Council's review.

The opposition expressed a concern that an additional peer review should be conducted for the work completed by Icon Engineering.

Icon Engineering had completed an initial peer review for the project in 2013 when the mapping study was being done by Belt Collins. To address the boards concerns, a second peer review was completed in January, 2015 by a third party consultant, Anderson Consulting Engineers, Inc. The peer review comments are included as **Attachment A**. In response to the peer review comments, additional clarifications and minor revisions were made to the study as described in **Attachment B**.

After WRAB considers the mapping update, it will be provided to the Planning Board as an informational item and presented to City Council for their consideration.

PUBLIC FEEDBACK

Public notification post cards about the mapping update have been sent to all property owners in the study area and a project web site has been developed to provide information (https://bouldercolorado.gov/water/skunk-creek-floodplain-mapping-update).

An open house was held on August 18, 2014 immediately prior to the WRAB meeting to inform the public about the mapping update and hear comments and concerns about the study. Staff has also met with residents in person and responded to phone calls and emails. In general, most of the comments and questions have been about impacts to specific properties and requests for more detailed information such as proposed base

flood water elevations. There were also concerns about the high hazard zone delineations and the distribution of the Bluebell Canyon Creek split flow paths downstream of 15th St. In response to the public feedback, the high hazard zone delineations have been re-evaluated and refined. The flow distribution at 15th Street has also been reviewed. A summary of the public feedback is provided in **Attachment C**.

BACKGROUND

The risk of flash flooding is an important issue for the City of Boulder 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. Additional information about the city's floodplain management program, floodplain regulations and flood insurance can be found at: **Floodplain Management Overview.**

The city delineates four flood zones as described below:

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 defined as the areas in the floodplain that are reserved for the main passage of the entire 100-year flood flow when the 100-year floodplain is artificially narrowed until a maximum six-inch increase in flood water depth is created. This zone is delineated to allow development to occur up to the narrowed floodplain and still provide 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.

Skunk Creek, Bluebell Canyon Creek, and Kings Gulch were first studied in 1987 by the consulting firm Greenhorne & O'Mara and the resulting Flood Hazard Area Delineation (FHAD) report included the delineation of the 100-year floodplain along these creeks. The Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) approved for these creeks were originally based on the 1987 FHAD and included a federally-regulated one-foot rise floodway. Since that time, both the City of Boulder and the State of Colorado have adopted a ½ foot rise floodway, which the City refers to as the Conveyance Zone.

In 1989, Love and Associates delineated the High Hazard Zone and City of Boulder Conveyance Zone (½ foot rise floodway). The delineations were based on the hydraulic models used in the 1987 FHAD.

On May 6, 1991, FEMA issued a Letter of Map Revision (LOMR) for Skunk Creek to incorporate the results of a channel improvement project. The limit of the LOMR was in the University of Colorado's Research Park, downstream of Colorado Avenue to just upstream of the confluence of Boulder Creek.

Several road-crossing structures for Skunk Creek have been improved since the regulatory floodplain was adopted in 1991. Culverts at Broadway and at 27th Way, crossings at Anderson Ditch and the cemetery maintenance road, and the low water crossing upstream of 27th Way were not included in the 1991 regulatory model, but were incorporated into the current mapping study.

The City initially contracted with Belt Collins to develop the updated floodplain maps but they closed their Boulder office in 2013. ICON Engineering provided a peer review of Belt Collin's 2011 initial study and was selected to complete the project.

In 2013, the city acquired state-of-the-art Light Detection and Ranging (LiDAR) technology to produce high-resolution topographic mapping. The new LiDAR mapping was compared to the 2003 topographic base mapping and areas showing substantial differences were updated in the hydraulic models.

In December, 2014, Anderson Consulting Engineers was selected to complete a peer review of the floodplain mapping study completed by ICON Engineering. The peer review comments are included as **Attachment A**. In response to the peer review comments, additional clarifications and minor revisions were made to the study as described in **Attachment B**.

ANALYSIS

This mapping study updates the hydraulic models and flood hazard mapping for the 100-year floodplain, Conveyance and High Hazard Zones for the entire reach of Skunk Creek, including the King's Gulch, and Bluebell Canyon Creek tributaries.

A 2-dimensional hydraulic model was developed for the creek system to determine primary flow paths and split flow areas. Information from the 2-dimensional model was used as a "roadmap" to develop the conventional 1-dimensional hydraulic model used for the analysis.

The existing 100-year floodplain for Skunk Creek, King's Gulch and Bluebell Canyon Creek is primarily along the creek corridors and roadway areas with some spillage into surrounding properties. The proposed 100-year floodplain is more extensive than the existing mapping in most areas and bears resemblance to the September 2013 flood extents. The September 2013 flood extents were not used to delineate the floodplains but were used to check assumptions on flow paths. For Skunk Creek, King's Gulch and Bluebell Canyon Creek, the September 2013 flood extents are similar to the proposed floodplain mapping.

The existing Conveyance and High Hazard Zone mapping for Bluebell Canyon Creek and King's Gulch did not include a significant neighborhood area that has a history of flooding east of 15th Street. The proposed mapping extends the Conveyance and High Hazard Zones through this residential area to their confluence with Skunk Creek along Broadway. The proposed mapping also extends the Conveyance and High Hazard Zones for Skunk Creek north of Broadway to include more roadways, split flows and other areas not previously mapped.

The revised mapping indicates a greater flood risk area in the Skunk Creek Drainage Basin than was shown in the previous mapping. A majority of the structures newly identified as being at risk are located within the bounds of 15th Street to the east, Broadway to the west, Baseline to the north and King Avenue to the south.

The High Hazard Zone (HHZ) was initially delineated based solely on the 1-dimensional model results, which was the standard approach used in previous studies. Similar to the new approach taken for the Upper Goose Creek and Two-Mile Canyon Creek floodplain mapping study, the HHZ areas were re-evaluated by reviewing the 2-dimensional model results. The proposed mapping was revised to delineate HHZ only in areas where results from both the 2-dimensional and 1-dimensional models indicate HHZ areas. As a result, several of the HHZ areas were modified and some isolated pockets were eliminated.

Attachment D includes figures showing a comparison between existing and proposed floodplain mapping and how the mapping impacts existing structures.

NEXT STEPS:

Following a recommendation of approval from the WRAB, the floodplain mapping study will be provided to the Planning Board as an informational item so that it can be considered for planning purposes. The study will also be considered by City Council for adoption. If City Council approves the study, the city will submit a request to FEMA for review. During the 2-4 year FEMA review and approval process, it is recommended that the new mapping be used for regulatory purposes by regulating to the more restrictive of the existing and proposed mapping. This would mean that development within the newly identified flood zones would be subject to the city floodplain regulations. In accordance with FEMA requirements, development within areas being removed from the floodplain are 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. Peer Review Memo dated Feb. 5, 2015
B. Response to Peer Review Apr. 27, 2015
C. Public Comments
D. Existing and Proposed Floodplain Maps

MEMORANDUM

Anderson Consulting Engineers, Inc.
Civil • Water Resources • Environmental

DATE: February 5, 2015 **ACE PROJECT NO.:** COBLDR16

TO: Katie Knapp, City of Boulder Planning and Development Department

FROM: Brian Van Zanten, Anderson Consulting Engineers, Inc. BLV
Greg Koch, Anderson Consulting Engineers, Inc. GTK

SUBJECT: Peer Review – Skunk Creek, Bluebell Canyon Creek, and King's Gulch Request for Physical Map Revision Report, Boulder, Colorado

Report/Peer Review Summary

Anderson Consulting Engineers, Inc. (ACE) has completed our peer review of the report entitled "Skunk Creek, Bluebell Canyon Creek, and King's Gulch, Request for Physical Map Revision (PMR)," ICON Engineering, Inc., draft, August 1, 2014. The City of Boulder (COB) contracted with ACE to perform the current peer review which focuses on minor hydrologic adjustments, hydraulic modeling and techniques, and flood hazard delineations, including 100-year, 500-year, conveyance zone (CZ), and high hazard zone (HHZ) limits. This report is requesting a Physical Map Revision (PMR) for Skunk Creek, Bluebell Canyon Creek, and King's Gulch.

ICON provided ACE with the PMR report, along with all associated hydraulic models and flood hazard mapping in GIS format. Effective FHAD hydrology for Bluebell Canyon Creek and King's Gulch as well as effective FEMA hydrology for Skunk Creek were compiled as part of ICON's study. ICON interpolated 25-year discharge values for all three drainages and extrapolated the 500-year discharges for Bluebell Canyon Creek and King's Gulch. Additional flow change locations were added along each stream in order to further refine existing discharge profiles.

Effective hydraulics on Skunk Creek (downstream study limit to downstream side of King Avenue) were also compiled. Skunk Creek upstream of this location as well as Bluebell Canyon Creek and King's Gulch are currently approximate studies. Information related to current hydraulic modeling, including the use of boundary conditions, roughness coefficients, hydraulic structures (including assumed and updated blockage percentages for the current study), blocked obstructions, split flow modeling, and conveyance zone modeling were also included.

Due to the complexity of the hydraulic modeling, including the use of junctions, lateral structures, and the two-dimensional hydraulic model FLO-2D, numerous flow and convergence instabilities were encountered. As a result multiple geometry files were created, with each file specific to a specified discharge profile. In some instances hydraulic modeling software, such as HY-8, external to HEC-RAS was required in order to determine discharge/water surface elevation rating curves for select hydraulic structures.

Both a conveyance zone (CZ – aka 0.5-foot rise floodway) and high hazard zone (HHZ) mapping were also defined using HEC-RAS along all relevant flow paths for the 100-year event. The 10-, 25-, 50-, and 500-year discharges were also evaluated. Flood hazard mapping was completed on all streams including base flood elevations (BFEs), 100- and 500-year floodplain boundaries, CZ boundaries, and HHZ boundaries.

MEMORANDUM

Comments and Recommendations

The following comments and recommendations are offered below, related to the report, hydraulic models, and flood hazard mapping.

Report Text

(1) On Page 6, Table 1, please change the location of Flow Change ID from 20th Street to 16th Street. Also, the 500-year discharge value appears to be incorrect at the upstream study limit (the table indicates a discharge of 50 cfs, which is lower than the 100-year discharge at this location). Please add a flow change location at Cross Section No. 4282 in order to account for the inflow from Node B_2 from the FLO-2D analysis as well as providing some explanation as to how this value was determined.

(2) On Page 8, the FHAD Design Point on the Skunk Creek outfall should be labeled "306" instead of "302".

(3) On Page 9, Table 2 please change the River Station ID at Flow Change ID No. 1 from 4034 to 3841.

(4) It is unclear as to why the 100-year discharge on King's Gulch is 14 cfs lower at the upstream study limit than at Bellevue Drive. It seems unlikely the discharge would change over this short distance. Consider maintaining the higher discharge at the upstream study limit for all return periods.

(5) Please explain why the peak discharges are lower (approximately 8-9%) in the last line of Table 2 on page 9 than what is listed in the FHAD. For example, the 100-year discharge in King's Gulch is stated as 340 cfs in the table; the FHAD lists the 100-year discharge equal to 373 cfs.

(6) The first paragraph on page 10 describing a hydrologic adjustment factor and the distribution of flows into the Skunk Creek model from Bluebell Canyon Creek and King's Gulch is confusing. We would recommend reviewing the effective HEC-1 model in order to ascertain the timing of the flows at confluences. For example, it appears as if the peak 100-year discharge between FHAD DP 301 and FHAD DP 302 should be between 640 and 710 cfs (based on the FHAD, the peak 100-year discharge of 640 cfs at FHAD DP 301 appears to include the King's Gulch drainage area; however, this should be verified). The model indicates the total flow coming from these two drainages to this point is approximately 900 cfs.

(7) On Page 10, Table 3 of the report please change River Station ID from 11437 to 11847. It appears that Flow Change ID No. 2 was omitted when it should be included in the table as well. Please provide justification as to how the discharges were determined at FHAD DP 302. For consistency, the values in this row should not be bolded as they are not listed as being effective discharges. River Station 1022 associated with FHAD DP is located along Baseline Road and not the main Skunk Creek flow path. Please include a cross section in the table along Skunk Creek associated with the flow change. Please change Flow Change Location from "Upstream of 29th Street" to "Downstream of 29th Street". Please change the River Station ID from 5277 to 4497 and Flow Change Location from "Upstream of Euclid Avenue" to "Upstream of 34th Street".

Also, to be consistent, the Flow Change ID No. 7 row should be bold and include all applicable 500-year discharges as they were included in the FIS.

(8) On Page 16 in the first paragraph, the second to last sentence is not clear. Please revise this discussion to provide additional clarity.

(9) On Page 18 in the first paragraph at the top of the page, revise "27th Street" to "27th Way".

(10) On Page 18, please consider revising the downstream boundary condition on the King's Gulch reaches to normal depth to be consistent with the other flow paths. It is standard for FEMA to require using normal depth. The use of tailwater from receiving streams normally requires justification (which can simply be previous precedent).

(11) On Page 28, the description of the hydraulic model from its upstream limit to 20th Street along Bluebell Canyon Creek does not describe how flows are able to split out to the east along the Mariposa-US-16th flow path. Also, the 500-year spill is mentioned upstream of 15th Street to the south along Mariposa Avenue, but not the 100-year spill. Junctions are mentioned at 16th and 17th Streets that distribute the flow; however, they do not appear to be present in the HEC-RAS model. Also, a majority of the flow is said to go north and east along Columbine; however, it appears a majority of flow heads east down Mariposa Avenue. Please revise the text as necessary.

(12) On Page 28 under the "Baseline Spills" section, it states that flows are lost to the north along Baseline Road but return at the US-36 interchange in the Skunk Creek model. It does not appear that local topography would support this assumption. Please justify. Also, this 100-year spill appears to be approximately 90 cfs; a split flow path or shallow flooding zone may need to be defined for this spill.

(13) On Page 29 under the "Broadway to Skunk Creek" section, the discussion regarding the adding in of flows to satisfy the hydrology of DP 212 is confusing. Please revise as necessary.

(14) On Page 29 under the "Kings Gulch from the upstream limit to 20th Street" section, it mentions that the 500-year floodplain upstream of 15th Street includes Bellevue Drive from 15th Street to the Bellevue Drive culvert pipe. The 500-year floodplain mapping appears to be confined to the main channel in this reach. Please revise as necessary.

(15) On Page 30 change any references from "22nd Avenue" to "22nd Street".

(16) On Page 31, the final paragraph describes how flow splits were determined for the 25-, 50-, and 500-year events into the NIST reach by pro-rating the 100-year spill along the right bank lateral structures. Please provide additional explanation for this assumption. Also, it states that the discharges were pro-rated down to Bluebell Avenue which is downstream of the NIST reach. Please provide clarification.

(17) Page 34 indicates the 100-year discharge was increased by 10 percent at Cross Section No. 7407 (increases from 1,350 cfs to 1,525 cfs, an increase of 175 cfs). Please provide justification for this increase. It is noted the FHAD hydrology indicates that not until Madison Avenue and 35th Street does the 100-year discharge increase by 520 cfs (1,350 cfs to 1,870 cfs).

(18) On Page 35 under the "Wellman Canal" section at the bottom of the page, the second sentence is lengthy and confusing. Please revise to provide additional clarity.

Skunk Creek HEC-RAS Model

(1) The HEC-RAS model indicates the downstream boundary condition along the main flow path is normal depth. It appears that the culverts immediately downstream at Foothills Parkway could create backwater. Please consider moving the downstream cross section for the Skunk Creek model downstream of Foothills Parkway.

(2) The lateral structures modeled along the left overbank immediately upstream of Foothills Parkway (12 total) are modeled using a weir coefficient of 2.4. The report states in Section 3.5.2 (page 36) that "weirs were coded…using a weir coefficient of 2.4 to reflect high backwater in the left overbank (Boulder Creek floodplain)." This assumes concurrent flood peaks. Please verify that these weir coefficients are reasonable.

(3) Cross Section No. 1635 is being exceeded along the left overbank during the 100-year event. Consider placing a lateral structure(s) upstream and downstream of this cross section.

(4) It appears that Lateral Structure No. 12535 (Reach 1.020-Innova, located along the left overbank between Cross Section Nos. 12550 and 12500) spills across the flow path into Reach 1.010-Inova, which is located along the right overbank. Please confirm this model configuration is appropriate. Please consider eliminating the lateral structure as the spill appears to be minimal and mapping the floodplain as a backwater area.

(5) Both ends of Cross Section No. 12000 are being exceeded during the 100-year event. Please extend the endpoints of this cross section to contain the flow.

(6) The cross sections along Innovation Drive between Discovery Drive and Colorado Avenue show 100-year water surface elevations exceeding the left overbank ground elevations. Please extend the left ends of the cross sections in order to contain the water surface elevation.

(7) Cross sections between Euclid Avenue and Colorado Avenue along Skunk Creek do not appear to be perpendicular to flow streamlines; it appears as if two flow paths could be modeled through this area. Please review and revise if necessary.

(8) There appear to be a number of areas that have limited or no use of blocked obstructions and/or ineffective flow areas. Rather, higher assumed n-values appear to have been used to represent the presence of flow obstructions. This is not consistent with other areas in the model and may influence the definition of the CZ and HHZ. Please review, along all flow paths, including Bluebell Canyon Creek and King's Gulch, and explain or revise as necessary.

(9) The report (Table 3) indicates the total 100-year discharge at Cross Section No. 6517 should be 1,780 cfs; the model indicates a total flow coming to this point (before splits) of approximately 1,529 cfs. Also, the report (Table 3) indicates the 100-year discharge should be 2,230 cfs at Cross Section No. 4886; however, the FHAD indicates that this is the discharge at the outfall. Please revise as necessary.

(10) The cross sections immediately upstream of 29th Street are very tightly spaced (within approximately five feet in the overbank). Please consider eliminating some of these cross sections, unless the spacing is necessary for modeling accuracy.

(11) The flow path along Baseline Road crosses over the Skunk Creek hydraulic baseline, and the lateral spill along the right overbank spills back underneath Baseline Road. Please clarify the flow splits in this area.

(12) Flows that split from Skunk Creek (334 cfs) south along U.S. Highway 36 are assumed to return to the creek north of Baseline Road. It appears that the local topography might preclude this from happening. Please review and revise as necessary. If this is justified, an additional flow path may be required to define this split.

(13) The total 100-year discharge passing beneath Broadway on Skunk Creek is approximately 1,090 cfs. Was the timing of the hydrographs from FHAD Design Points 212 and 302 investigated in order to define this peak discharge? It appears the discharge at this point could be roughly between 1,200 and 1,300 cfs. Please explain or revise as necessary.

(14) There are a number of lateral structures in the model that are not optimized. Please provide justification as to why these structures were not optimized (notes in the model are also recommended) and justification for the split flows that are represented.

(15) There are a number of locations where discharges change across crossing structures. Please verify modeling results in these cases are appropriate. It is recommended that discharges remain constant through each crossing.

Bluebell Canyon Creek/King's Gulch HEC-RAS Model

(1) Lateral Structure No. 2450 (King's Gulch – Kings-US-17th Reach) should have the tailwater set at Cross Section No. 15814 instead of Cross Section No. 15731. Please revise as necessary.

(2) It appears that split flow paths should be considered off of King Avenue along 18th and 19th Streets. Please review and add flow paths as required.

(3) It appears that several cross sections along Bluebell Avenue east of 20th Street are angled downstream farther than would be consistent with lines of constant water surface elevation. Please re-orient these cross sections to be more perpendicular to the flow (this would apply to BFEs as well).

(4) Cross Section Nos. 1885, 1936, and 2055 along King's Gulch have Manning's n-values of 0.45. Please provide justification as to the use of such conservatively high values. Also, please refer to Comment No. 8 in the Skunk Creek HEC-RAS model comments section concerning the use of flow obstructions and physically representative n-values.

(5) It appears as if there is a flow split occurring along the right overbank between Cross Section Nos. 5696 and 5828 (37 cfs toward Bellevue Drive) on Bluebell Canyon Creek; however, the discharge profile along Bluebell Canyon Creek does not reflect this reduction in flow. Please revise or explain as necessary.

(6) Based on the flow split occurring between Cross Section Nos. 4282 and 4258 on the Bluebell Canyon Creek flow path, it appears to be reasonable that the flow change along Mariposa Avenue should occur at Cross Section No. 3141 (adjacent to Cross Section No. 4258) instead of at Cross Section No. 3081 (i.e., upstream of 15th Street). Please revise as necessary.

(7) Cross sections in the vicinity of 20th Street and Columbine Avenue do not appear to be oriented perpendicular to the flow and, in some cases, cross over one another, or are nearly concurrent with one another. The 5440 BFE also crosses Cross Section No. 11998 on 20th Street. Please revise.

(8) It does not appear that the discharge profile in the HEC-RAS model along Bluebell Canyon Creek matches the profile provided in the report. For example, the 100-year discharge along Mariposa Avenue just east of 19th Street is 273 cfs, and the discharge one block north along Columbine Avenue just east of 19th Street is 121 cfs. The total discharge at this point is 394 cfs, and according to the table, the discharge at Flow Change ID No. 3 should be 590 cfs. Please revise or explain as necessary.

(9) The lateral structures along Baseline Road between 21st Street and Broadway are not optimized. Please explain how these splits are determined. Also, adding notes within the model is highly recommended.

(10) The 100-year flow splits to the north from the main Bluebell Canyon Creek flow path to the upstream end of Columbine Avenue do not match. It appears as if there is 70 cfs splitting to the north (121 cfs to 51 cfs), while the Columbine flow path has 65 cfs. Please revise as necessary.

(11) The flow is reduced from approximately 80 cfs to 20 cfs during the 100-year event between Cross Section Nos. 11100 and 11030 along Baseline Road. Is there a flow split occurring to the north? If so, please explain how the split was determined.

(12) The 100-year flows at the intersection of Baseline Road and Broadway do not seem to maintain continuity. The model indicates there is approximately 20 cfs along Baseline Road both upstream and downstream of Broadway, whereas the upstream end of Broadway has 150 cfs, directly downstream of Baseline Road. The 100-year WSEL at Cross Section No. 14900 is also nearly 0.3 feet higher than at Cross Section No. 10725 immediately upstream. Please revise as necessary.

(13) The source of an additional 70 cfs along Broadway between Baseline Road and Columbine Avenue during the 100-year event is not apparent. Please explain.

(14) According to the 100-year discharges in each reach, the total flow that could potentially reach Broadway (assuming no splits north off of Baseline Road and no splits south off of Mariposa Avenue toward Bluebell Avenue) is 616 cfs (Bluebell Canyon Creek only). Assuming that the split of 37 cfs off of Bluebell Canyon Creek onto Bellevue Drive should be accounted for, the total discharge would drop to 579 cfs. Table 1 indicates the total discharge should be 740 cfs. Please revise accordingly.

(15) The residual 100-year discharge along Baseline Road is approximately 20 cfs, and the flows in front of the Basemar Shopping Center are approximately 41 cfs. The discharge east of this intersection is approximately 10 cfs rather than what would appear to be 61 cfs. Please explain or revise as necessary. Further downstream, the flows tie into the Skunk Creek model, and the flow at the upstream end of this reach (Cross Section No. 1548) is 225 cfs. It appears continuity may be an issue at this location. Please review and revise.

(16) Cross Section Nos. 1570 and 1520 along Columbine Avenue have n-values for the street portion of the cross section of 0.1. Please provide justification for this roughness value or revise as necessary.

(17) Cross Section No. 2793 has a negative surcharge (-0.2 ft) in the conveyance zone plan. Please revise as necessary.

Floodplain Workmaps

(1) According to the HEC-RAS model, 100-year flows begin spilling over the left overbank on the main Skunk Creek flow path downstream of Cross Section 1437. Figure 4.9 depicts the 100-year floodplain boundary extending past this point to Cross Section 1237. Please revise as necessary.

(2) The 100- and 500-year floodplain mapping limits along the split flow path 1.020-Innova, in particular between Discovery Drive and Colorado Avenue, are mapped against adjacent structures. Please use the bare earth topography to map the floodplain limits.

(3) General mapping note: BFEs need to be coincident with the 100-year floodplain limits as well as the associated contour elevation unless being tied to the DEM. As an example, BFE 5255 on Skunk Creek, immediately upstream of Cross Section No. 1968, extends past the 100-year floodplain limit (as well as the 5255 contour). Other examples include the 5590 BFE (King's Gulch; ties to the 5591 contour on one side) and the 5595 BFE (King's Gulch; extends past the 5595 contour on one side and doesn't reach it on the other).

(4) The 5490 BFEs along Bluebell Avenue and King Avenue should tie to the floodplain limits and not extend into the shallow flooding area.

(5) It appears that Shaded Zone X should be mapped between 19th Street and 22nd Street and Mariposa Avenue and Bluebell Avenue. Please review and revise as needed.

(6) There are a number of locations where cross section alignments intersect one another on differing flow paths, in particular at the intersection of King Avenue and Skunk Creek. Please orient the cross sections to not intersect.

(7) The BFEs along and south of Columbine Avenue between 18th and 19th Streets are generally not parallel to the adjacent cross sections and some cross between flow paths. Also, as an example, the 5470 BFE is shown crossing the 5472 contour elevation. Please adjust as necessary.

(8) A detailed floodplain with BFEs is mapped along Columbine Avenue between 20th Street and 22nd Street at a 100-year discharge of 13 cfs; however, a detailed floodplain is not mapped along Bellevue Drive and Mariposa Avenue upstream of 15th Street for a 100-year discharge of 37 cfs (mapped as Shaded Zone X). Please explain or revise as necessary.

(9) The 100- and 500-year floodplain limits do not extend upstream through Cross Section No. 20270 on the Skunk Creek – 7.122 NIST S flow path. It appears as if there is a split occurring along the main Skunk Creek flow path into this flow path. Also, please add a gutter line between the Skunk 7.121 NIST N and 7.122 NIST S flow paths.

(10) Please indicate that minor flows would leave the system east of the intersection of 29th Street and Baseline Road. One option would be to use dashed floodplain boundaries with a flow arrow heading east.

(11) BFE 5335 at the intersection of 29th Street and Skunk Creek crosses two separate flow paths, crosses Cross Section 7489, and runs parallel to the flow split going north down 29th Street. BFEs 5300 and 5305 have similar orientation issues. Please revise as necessary.

(12) Please show the 500-year floodplain boundary on the south side of Mariposa Avenue west of 19th Street.

(13) Please add flow path identification on the work maps.

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Planning
Design
Management

April 27, 2015

Ms. Katie Knapp, P.E.
Engineering Project Manager
Department of Public Works / Utilities Division
1739 Broadway, 2nd Floor
Boulder, Colorado 80302

RE: Skunk Creek, Bluebell Canyon Creek, and King's Gulch Request for Physical Map Revision

Dear Ms. Knapp,

This letter provides responses to the comments provided by Anderson Consulting Engineers as part of their peer review regarding the Skunk Creek, Bluebell Canyon Creek, and King's Gulch Request for Physical Map Revision – Hydraulic Report, dated August 1, 2014. A revised Hydraulic report will be provided under separate cover.

Report Text

1. **On Page 6, Table 1, please change the location of Flow Change ID from 20th Street to 16th Street. Also, the 500-year discharge value appears to be incorrect at the upstream study limit (the table indicates a discharge of 50 cfs, which is lower than the 100-year discharge at this location). Please add a flow change location at Cross Section No. 4282 in order to account for the inflow from Node B_2 from the FLO-2D analysis as well as providing some explanation as to how this value was determined.**

   Table 1 has been updated. The 500-year discharge has been revised. A flow change occurs at cross section 4258 in order to account for the inflow from Node B_2. Please note that the flow distribution between the Bluebell Canyon Creek and Mariposa Avenue has been determined by the 2D model. The B_2 inflow value was determined by its relative contributing size within the full drainage basin (flows to design point 212 in the effective information).

2. **On Page 8, the FHAD Design Point on the Skunk Creek outfall should be labeled "306" instead of "302".**

   The label has been revised.

3. **On Page 9, Table 2, please change the River Station ID at Flow Change ID No. 1 from 4034 to 3841.**

   The table has been revised.

4. **It is unclear as to why the 100-year discharge on King's Gulch is 14 cfs lower at the upstream study limit than at Bellevue Drive. It seems unlikely that discharge would change over this short distance. Consider maintaining the higher discharge at the upstream study limit for all return periods.**

   This was done to reflect reduced contributing area at the upstream limit of the study. Discharges have not been revised.

5. **Please explain why the peak discharges are lower (approximately 8-9%) in the last line of Table 2 on page 9 than what is listed in the FHAD. For example, the 100-year discharge in King's Gulch is stated as 340 cfs in the table; the FHAD lists the 100-year discharge equal to 373 cfs.**

   This was done as part of the original project approach in order to address slight changes in contributing area between this study and the FHAD.

6. **The first paragraph on page 10 describing a hydrologic adjustment factor and the distribution of flows into the Skunk Creek model from Bluebell Canyon Creek and King's Gulch is confusing. We would recommend reviewing the effective HEC-1 model in order to ascertain the timing of the flows at confluences. For example, it appears as if the peak 100-year discharge between FHAD DP 301 and FHAD DP 302 should be between 640 and 710 cfs (based on the FHAD, the peak 100-year discharge of 640 cfs at FHAD DP 301 appears to include the King's Gulch drainage area; however, this should be verified). The model indicates the total flow coming from these two drainages to this point is approximately 900 cfs.**

   The revised models have approximately 1098 cfs flowing into Skunk Creek from Bluebell Canyon Creek and King's Gulch. The total increase in discharge along Skunk Creek is 630 cfs as a result Bluebell Canyon Creek and King's Gulch. In order for the discharge along Skunk Creek to not exceed the effective hydrology, the flow increases along Skunk Creek were reduced in order to match the effective hydrology total discharges. This was done as described in the first paragraph on page10.

7. **On Page 10, Table 3 of the report please change River Station ID from 11437 to 11847. It appears that Flow Change ID No. 2 was omitted when it should be included in the table as well. Please provide justification as to how the discharges were determined at FHAD DP 302. For consistency, the values in this row should not be bolded as they are not listed as being effective discharges. River Station 1022 associated with FHAD DP is located along Baseline Road and not the main Skunk Creek flow path. Please include a cross section in the table along Skunk Creek associated with the flow change. Please change Flow Change Location from "Upstream of 29th Street" to "Downstream of 29th Street". Please change the River Station ID from 5277 to 4497 and Flow Change Location from "Upstream of Euclid Avenue" to "Upstream of 34th Street". Also, to be consistent, the Flow Change ID No. 7 row should be bold and include all applicable 500-year discharges as they were included in the FIS.**

   The table has been revised.

8. **On Page 16 in the first paragraph, the second to last sentence is not clear. Please revise this discussion to provide additional clarity.**

   The text has been revised.

9. **On Page 18 in the first paragraph at the top of the page, revise "27th Street" to "27th Way".**

   The text has been revised.

10. **On Page 18, please consider revising the downstream boundary condition on the King's Gulch reaches to normal depth to be consistent with the other flow paths. It is standard for FEMA to require using normal depth. The use of tailwater from receiving streams normally requires justification (which can simply be previous precedent).**

    The starting water surface elevations for King's Gulch have been revised to normal depth.

11. **On Page 28, the description of the hydraulic model from its upstream limit to 20th Street along Bluebell Canyon Creek does not describe how flows are able to split out to the east along the Mariposa-US-16th flow path. Also, the 500-year spill is mentioned upstream of 15th Street to the south along Mariposa Avenue, but not the 100-year spill. Junctions are mentioned at 16th and 17th Streets that distribute the flow; however, they do not appear to be present in the HEC-RAS model. Also, a majority of the flow is said to go north and east along Columbine; however, it appears a majority of flow heads east down Mariposa Avenue. Please revise the text as necessary.**

    Report text has been revised.

12. **On Page 28 under the "Baseline Spills" section, it states that flows are lost to the north along Baseline Road but return at the US-36 interchange in the Skunk Creek model. It does not appear that local topography would support this assumption. Please justify. Also, this 100-year spill appears to be approximately 90 cfs; a split flow path or shallow flooding zone may need to be defined for this spill.**

    The watershed boundary and spill flows north of Baseline Road were discussed with the City of Boulder and Belt Collins West, who initiated the mapping update. It was agreed that these flows would predominately return to Skunk Creek further downstream, closer to Aurora Avenue. However, the flows were requested by the City to be added back to Skunk Creek at the US-36 interchange to remain consistent with the current effective FEMA discharges at that location. This decision was believed to be consistent with past

input provided by both the City of Boulder and UDFCD. No additional revisions have been completed.

13. **On Page 29 under the "Broadway to Skunk Creek" section, the discussion regarding the adding in of flows to satisfy the hydrology of DP 212 is confusing. Please revise as necessary.**

    Report text has been revised.

14. **On Page 29 under the "Kings Gulch from the upstream limit to 20th Street" section, it mentions that the 500-year floodplain upstream of 15th Street includes Bellevue Drive from 15th Street to the Bellevue Drive culvert pipe. The 500-year floodplain mapping appears to be confined to the main channel in this reach. Please revise as necessary.**

    Report text has been revised.

15. **On Page 30 change any references from "22nd Avenue" to "22nd Street".**

    Report text has been revised.

16. **On Page 31, the final paragraph describes how flow splits were determined for the 25-, 50-, and 500-year events into the NIST reach by pro-rating the 100-year spill along the right bank lateral structures. Please provide additional explanation for this assumption. Also, it states that the discharges were pro-rated down to Bluebell Avenue which is downstream of the NIST reach. Please provide clarification.**

    Based on the original modeling approach and discussions with the City, this method of split flow determination is considered reasonable. The text has been reviewed and revised to provide additional clarification.

17. **Page 34 indicates the 100-year discharge was increased by 10 percent at Cross Section No. 7407 (increases from 1,350 cfs to 1,525 cfs, an increase of 175 cfs). Please provide justification for this increase. It is noted the FHAD hydrology indicates that not until Madison Avenue and 35th Street does the 100-year discharge increase by 520 cfs (1,350 cfs to 1,870 cfs).**

    This reflects the previous modeling approach and provides a more gradual increase in discharge. No revisions have been made.

18. **On Page 35 under the "Wellman Canal" section at the bottom of the page, the second sentence is lengthy and confusing. Please revise to provide additional clarity.**

    Report text has been revised.

Skunk Creek HEC-RAS Model

19. **The HEC-RAS model indicates the downstream boundary condition along the main flow path is normal depth. It appears that the culverts immediately downstream at Foothills Parkway could create backwater. Please consider moving the downstream cross section for the Skunk Creek model downstream of Foothills Parkway.**

    The downstream tie-in area with both Bear Creek and Boulder Creek has been revised. The HEC-RAS model now extends downstream of Foothills and ultimately to Boulder Creek using modeling taken from the pending Boulder Creek and Bear Creek studies.

20. **The lateral structures modeled along the left overbank immediately upstream of Foothills Parkway (12 total) are modeled using a weir coefficient of 2.4. The report states in Section 3.5.2 (page 36) that "weirs were coded…using a weir coefficient of 2.4 to reflect high backwater in the left overbank (Boulder Creek floodplain)." This assumes concurrent flood peaks. Please verify that these weir coefficients are reasonable.**

    The weir coefficients have not been revised as they consider the backwater (from spill out of Skunk Creek – not from concurrent flood peaks) in the Boulder Creek overbank.

21. **Cross Section No. 1635 is being exceeded along the left overbank during the 100-year event. Consider placing a lateral structure(s) upstream and downstream of this cross section.**

    Cross section 1635 has been revised to reflect the ground elevations at the top of the embankment. The cross section is now contained.

22. **It appears that Lateral Structure No. 12535 (Reach 1.020-Innova, located along the left overbank between Cross Section Nos. 12550 and 12500) spills across the flow path into Reach 1.010-Inova, which is located along the right overbank. Please confirm this model configuration is appropriate. Please consider eliminating the lateral structure as the spill appears to be minimal and mapping the floodplain as a backwater area.**

    This configuration reflects the storm sewer system that collects discharges in the left overbank and then outfalls into the open channel on the east side of Innovation Drive. No revisions to the model have been made.

23. **Both ends of Cross Section No. 12000 are being exceeded during the 100-year event. Please extend the endpoints of this cross section to contain the flow.**

    Cross section 12000 has been revised and is now contained.

24. **The cross sections along Innovation Drive between Discovery Drive and Colorado Avenue show 100-year water surface elevations exceeding the left overbank ground elevations. Please extend the left ends of the cross sections in order to contain the water surface elevation.**

    This reach of innovation drive is bounded by large buildings on the left overbank. It is not necessary to extend the sections as the flow will be adequately contained by the structures.

25. **Cross sections between Euclid Avenue and Colorado Avenue along Skunk Creek do not appear to be perpendicular to flow streamlines; it appears as if two flow paths could be modeled through this area. Please review and revise if necessary.**

    This approach reflects the original modeling efforts. This area has also undergone a 2D confirmation of split flows that confirmed the original modeling approach.

26. **There appear to be a number of areas that have limited or no use of blocked obstructions and/or ineffective flow areas. Rather, higher assumed n-values appear to have been used to represent the presence of flow obstructions. This is not consistent with other areas in the model and may influence the definition of the CZ and HHZ. Please review, along all flow paths, including Bluebell Canyon Creek and King's Gulch, and explain or revise as necessary.**

    This approach was discussed with the City. With exception to areas where new modeling was developed, the original modeling approach was maintained.

27. **The report (Table 3) indicates the total 100-year discharge at Cross Section No. 6517 should be 1,780 cfs; the model indicates a total flow coming to this point (before splits) of approximately 1,529 cfs. Also, the report (Table 3) indicates the 100-year discharge should be 2,230 cfs at Cross Section No. 4886; however, the FHAD indicates that this is the discharge at the outfall. Please revise as necessary.**

    These discharge issues were reviewed and the application of the flow was not changed. The 2233 cfs total occurs somewhere between Madison Avenue and the confluence with Bear Creek. Given the presence of multiple split flow paths and the tributary basin partially located both north and south of Colorado Avenue, the total discharge values were considered reasonable.

28. **The cross sections immediately upstream of 29th Street are very tightly spaced (within approximately five feet in the overbank). Please consider eliminating some of these cross sections, unless the spacing is necessary for modeling accuracy.**

    This was done per the original modeling approach and will not be revised.

29. **The flow path along Baseline Road crosses over the Skunk Creek hydraulic baseline, and the lateral spill along the right overbank spills back underneath Baseline Road. Please clarify the flow splits in this area.**

    The right overbank spill will enter a multi-use trail underpass and flow north underneath Baseline Road.

30. **Flows that split from Skunk Creek (334 cfs) south along U.S. Highway 36 are assumed to return to the creek north of Baseline Road. It appears that the local topography might preclude this from happening. Please review and revise as necessary. If this is justified, an additional flow path may be required to define this split.**

    This reflects original project approach and is based on previous direction provided by the City of Boulder. This area was reviewed with the City, who elected to not add the additional flow path.

31. **The total 100-year discharge passing beneath Broadway on Skunk Creek is approximately 1,090 cfs. Was the timing of the hydrographs from FHAD Design Points 212 and 302 investigated in order to define this peak discharge? It appears the discharge at this point could be roughly between 1,200 and 1,300 cfs. Please explain or revise as necessary.**

    As a result of revisions to drainage basin B-2, there is a portion of that basin that contributes discharge to Skunk Creek downstream of Broadway. This contribution of approximately 293 cfs accounts for the noted discrepancy.

32. **There are a number of lateral structures in the model that are not optimized. Please provide justification as to why these structures were not optimized (notes in the model are also recommended) and justification for the split flows that are represented.**

    Some lateral structures were not optimized in order to get the model(s) to converge. Split flows that are represented are based on vertically extended cross sections and topography that indicates that the split flow would not immediately return to the main flow path.

33. **There are a number of locations where discharges change across crossing structures. Please verify modeling results in these cases are appropriate. It is recommended that discharges remain constant through each crossing.**

    In these areas it has been assumed that surface discharge will flow from the roadways and enter the channel on the downstream side of the crossing structure. For this reason it was common for discharges to change across crossing structures.

Bluebell Canyon Creek & King's Gulch HEC-RAS Model

34. **Lateral Structure No. 2450 (King's Gulch – Kings-US-17th Reach) should have the tailwater set at Cross Section No. 15814 instead of Cross Section No. 15731. Please revise as necessary.**

    Discharge that flows through lateral structure no. 2450 will flow into cross section no. 15731. The model has not been revised.

35. **It appears that split flow paths should be considered off of King Avenue along 18th and 19th Streets. Please review and add flow paths as required.**

    The depth of flow that would travel north along 18th and 19th Streets is estimated to be less than 0.5 feet, which is consistent with the Zone X shaded designation that has been used in these areas. Additionally, these two flow paths were not identified during flooding in September 2013.

36. **It appears that several cross sections along Bluebell Avenue east of 20th Street are angled downstream farther than would be consistent with lines of constant water surface elevation. Please re-orient these cross sections to be more perpendicular to the flow (this would apply to BFEs as well).**

    Due to the split flows in this area and the ditch influence, the cross sections are aligned as best possible to facilitate reasonable floodplain delineation. The cross sections have not been revised.

37. **Cross Section Nos. 1885, 1936, and 2055 along King's Gulch have Manning's n-values of 0.45. Please provide justification as to the use of such conservatively high values. Also, please refer to Comment No. 8 in the Skunk Creek HEC-RAS model comments section concerning the use of flow obstructions and physically representative n-values.**

    Manning's n values at cross sections 1885, 1936, 2055, and 2208 have been reduced to a value of 0.06. Please note that this change affects the flow over the adjacent lateral weir and downstream flow distributions which have been revised accordingly.

38. **It appears as if there is a flow split occurring along the right overbank between Cross Section Nos. 5696 and 5828 (37 cfs toward Bellevue Drive) on Bluebell Canyon Creek; however, the discharge profile along Bluebell Canyon Creek does not reflect this reduction in flow. Please revise or explain as necessary.**

    This flow split was identified by the 2D model but is not evident by the 1D model. In an effort to remain conservative with the main channel of Bluebell Canyon Creek, yet show the identified flow split, the minor reduction in discharge for flows leaving the main channel has not been accounted for along the main channel.

39. **Based on the flow split occurring between Cross Section Nos. 4282 and 4258 on the Bluebell Canyon Creek flow path, it appears to be reasonable that the flow change along Mariposa Avenue should occur at Cross Section No. 3141 (adjacent to Cross Section No. 4258) instead of at Cross Section No. 3081 (i.e., upstream of 15th Street). Please revise as necessary.**

    The discharge increase for Mariposa Avenue has been moved upstream from cross section 3081 to 3141.

40. **Cross sections in the vicinity of 20th Street and Columbine Avenue do not appear to be oriented perpendicular to the flow and, in some cases, cross over one another, or are nearly concurrent with one another. The 5440 BFE also crosses Cross Section No. 11998 on 20th Street. Please revise.**

    The cross section layout in this area is complicated by the Anderson Ditch, junction of a split flow reach, and the start of another split flow reach. As a result, the cross sections were aligned as best possible given the modeling and topographic constraints.

41. **It does not appear that the discharge profile in the HEC-RAS model along Bluebell Canyon Creek matches the profile provided in the report. For example, the 100-year discharge along Mariposa Avenue just east of 19th Street is 273 cfs, and the discharge one block north along Columbine Avenue just east of 19th Street is 121 cfs. The total discharge at this point is 394 cfs, and according to the table, the discharge at Flow Change ID No. 3 should be 590 cfs. Please revise or explain as necessary.**

    Upon further review of the hydrology for drainage basin B-2 (draining to FHAD design point 212) it was determined that the area north of Baseline Road does not contribute to Bluebell Canyon Creek upstream of US Highway 36. As a result, B_2 inflow node has been adjusted and the B_3 inflow node has been removed. The 394 cfs value is valid from 15th street east to Broadway.

42. The lateral structures along Baseline Road between 21st Street and Broadway are not optimized. Please explain how these splits are determined. Also, adding notes within the model is highly recommended.

All lateral structures along Baseline Road between 21st Street and Broadway are now optimized and reflect the split flows that occur in this area.

43. The 100-year flow splits to the north from the main Bluebell Canyon Creek flow path to the upstream end of Columbine Avenue do not match. It appears as if there is 70 cfs splitting to the north (121 cfs to 51 cfs), while the Columbine flow path has 65 cfs. Please revise as necessary.

At this location, the discharge values have been based on a 2D model and compare within 5 cfs (4% of total flow). This difference was not further refined.

44. The flow is reduced from approximately 80 cfs to 20 cfs during the 100-year event between Cross Section Nos. 11100 and 11030 along Baseline Road. Is there a flow split occurring to the north? If so, please explain how the split was determined.

Yes, a flow split occurs at this location. Discharge values are now based on lateral weir spills that are now optimized accordingly.

45. The 100-year flows at the intersection of Baseline Road and Broadway do not seem to maintain continuity. The model indicates there is approximately 20 cfs along Baseline Road both upstream and downstream of Broadway, whereas the upstream end of Broadway has 150 cfs, directly downstream of Baseline Road. The 100-year WSEL at Cross Section No. 14900 is also nearly 0.3 feet higher than at Cross Section No. 10725 immediately upstream. Please revise as necessary.

This is a result of the B_4 inflow location. No model revisions were completed.

46. The source of an additional 70 cfs along Broadway between Baseline Road and Columbine Avenue during the 100-year event is not apparent. Please explain.

This errant addition of 70 cfs along Broadway between Baseline Road and Columbine Avenue has been fixed. The B_4 inflow is the only discharge increase in this general vicinity.

47. **According to the 100-year discharges in each reach, the total flow that could potentially reach Broadway (assuming no splits north off of Baseline Road and no splits south off of Mariposa Avenue toward Bluebell Avenue) is 616 cfs (Bluebell Canyon Creek only). Assuming that the split of 37 cfs off of Bluebell Canyon Creek onto Bellevue Drive should be accounted for, the total discharge would drop to 579 cfs. Table 1 indicates the total discharge should be 740 cfs. Please revise accordingly.**

    This discrepancy is the result of recent changes to Basin B-2 in order to more accurately account for the portion of the basin north of Baseline Road that will not be accounted for until downstream of US Highway 36. Table 1 has been revised and Figures 3.1 and 3.2 have been created to provide a map showing the flow increases and discharges along the various split flow reaches of Bluebell Canyon Creek. Please note that the flow profiles reflect total flow and may not necessary accurately reflect discharge within a given split flow reach.

48. **The residual 100-year discharge along Baseline Road is approximately 20 cfs, and the flows in front of the Basemar Shopping Center are approximately 41 cfs. The discharge east of this intersection is approximately 10 cfs rather than what would appear to be 61 cfs. Please explain or revise as necessary. Further downstream, the flows tie into the Skunk Creek model, and the flow at the upstream end of this reach (Cross Section No. 1548) is 225 cfs. It appears continuity may be an issue at this location. Please review and revise.**

    Due to minor changes the residual discharge along Baseline Road is now approximately 23 cfs and the flows in front of the Basemar Shopping Center are approximately 29 cfs. The discharge east of the intersection of these two split flows has been revised to 52 cfs. Further downstream the discharge increase to 225 cfs is a result of an increase in discharge as a result of flows that originate or spill into the drainage basin on the north side of Baseline Road. In order to match the FEMA flows along Bluebell Canyon Creek and ultimately Skunk Creek, the full discharge has been returned to the model at US Highway 36, as discussed previously.

49. **Cross Section Nos. 1570 and 1520 along Columbine Avenue have n-values for the street portion of the cross section of 0.1. Please provide justification for this roughness value or revise as necessary.**

    The Manning's n values have been revised to reflect a value of 0.03 within the roadway sections in similar fashion to sections upstream and downstream.

50. **Cross Section No. 2793 has a negative surcharge (-0.2 ft) in the conveyance zone plan. Please revise as necessary.**

    This section does not have floodway encroachment into the effective conveyance area. Also note that the change in energy grade is +0.49 feet.

Floodplain Workmaps

51. **According to the HEC-RAS model, 100-year flows begin spilling over the left overbank on the main Skunk Creek flow path downstream of Cross Section 1437. Figure 4.9 depicts the 100-year floodplain boundary extending past this point to Cross Section 1237. Please revise as necessary.**

    This area has been revised to reflect the spill downstream of cross section 1437.

52. **The 100- and 500-year floodplain mapping limits along the split flow path 1.020-Innova, in particular between Discovery Drive and Colorado Avenue, are mapped against adjacent structures. Please use the bare earth topography to map the floodplain limits.**

    Given the size of these structures and the mapping source (LiDAR) there is not reasonable bear earth topography available for use. Additionally, the size of structures is such that they will provide significant containment of the floodplain. In order to remove any ambiguity, the floodplain mapping limits were adjusted in order to clearly show buildings that are impacted by the adjacent floodplain boundary.

53. **General mapping note: BFEs need to be coincident with the 100-year floodplain limits as well as the associated contour elevation unless being tied to the DEM. As an example, BFE 5255 on Skunk Creek, immediately upstream of Cross Section No. 1968, extends past the 100-year floodplain limit (as well as the 5255 contour). Other examples include the 5590 BFE (King's Gulch; ties to the 5591 contour on one side) and the 5595 BFE (King's Gulch; extends past the 5595 contour on one side and doesn't reach it on the other).**

    This issue (generally less than 2 feet in size) appears to result from the use of survey data in place of mapping.

54. **The 5490 BFEs along Bluebell Avenue and King Avenue should tie to the floodplain limits and not extend into the shallow flooding area.**

    These BFEs have been revised.

55. **It appears that Shaded Zone X should be mapped between 19th Street and 22nd Street and Mariposa Avenue and Bluebell Avenue. Please review and revise as needed.**

    This area has been revised to reflect a Zone X shaded designation.

56. There are a number of locations where cross section alignments intersect one another on differing flow paths, in particular at the intersection of King Avenue and Skunk Creek. Please orient the cross sections to not intersect.

The cross sections were aligned as best possible given the modeling and topographic constraints. This issue is generally a result of the alignment of multiple flow paths where there is not a reasonable approach to alternative orientation.

57. The BFEs along and south of Columbine Avenue between 18th and 19th Streets are generally not parallel to the adjacent cross sections and some cross between flow paths. Also, as an example, the 5470 BFE is shown crossing the 5472 contour elevation. Please adjust as necessary.

The orientation of the BFEs reflect the condition of discharges transferring form the south to the north. The 5470 BFE is shown as crossing the 5472 contour in order to avoid showing a small island in the middle of the floodplain.

58. A detailed floodplain with BFEs is mapped along Columbine Avenue between 20th Street and 22nd Street at a 100-year discharge of 13 cfs; however, a detailed floodplain is not mapped along Bellevue Drive and Mariposa Avenue upstream of 15th Street for a 100-year discharge of 37 cfs (mapped as Shaded Zone X). Please explain or revise as necessary.

The 13 cfs along Columbine has been shown as detailed study as it eventually receives additional discharges for a total flow of 58 cfs. The 37 cfs along Mariposa Avenue has been mapped as Shaded Zone X as a result of continuously shallow flooding and a lack of discharge increase.

59. The 100- and 500-year floodplain limits do not extend upstream through Cross Section No. 20270 on the Skunk Creek – 7.122 NIST S flow path. It appears as if there is a split occurring along the main Skunk Creek flow path into this flow path. Also, please add a gutter line between the Skunk 7.121 NIST N and 7.122 NIST S flow paths.

The delineation for 20270 reflects the original modeling approach and has not been revised. Similarly, the gutter line has not been added as the floodplains are joined.

60. Please indicate that minor flows would leave the system east of the intersection of 29th Street and Baseline Road. One option would be to use dashed floodplain boundaries with a flow arrow heading east.

The flows leaving have been determined to be insignificant and shallow enough to not warrant additional designation. Likewise, the full discharge has been accounted for within Skunk Creek to remain conservative. No revisions have been completed.

61. **BFE 5335 at the intersection of 29th Street and Skunk Creek crosses two separate flow paths, crosses Cross Section 7489, and runs parallel to the flow split going north down 29th Street. BFEs 5300 and 5305 have similar orientation issues. Please revise as necessary.**

    Given the urban shallow flooding condition, this has been a challenge to depict. The BFEs have been drawn to best illustrate the respective flood risk and also to reflect the major flow directions. In an effort to keep the mapping simple, extensive use of gutter lines has not been used.

62. **Please show the 500-year floodplain boundary on the south side of Mariposa Avenue west of 19th Street.**

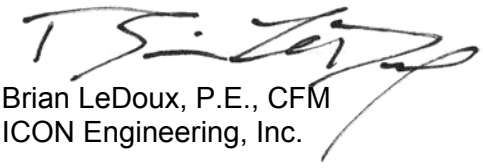
    This area has been designated as Zone X shaded.

63. **Please add flow path identification on the work maps.**

    Separate flow path identification work maps have been prepared. Please see figures 4 and 5.

Please let me know if there is any additional information needed to clarify our responses to the above review comments.

Sincerely,



Brian LeDoux, P.E., CFM
ICON Engineering, Inc.

ICON ENGINEERING, INC.

Skunk Creek, Bluebell Canyon Creek, King's Gulch

Request for Physical Map Revision (PMR)

Figure 3.1: HEC-RAS 100-Year Discharges Upstream of Highway 36

N

500 Feet

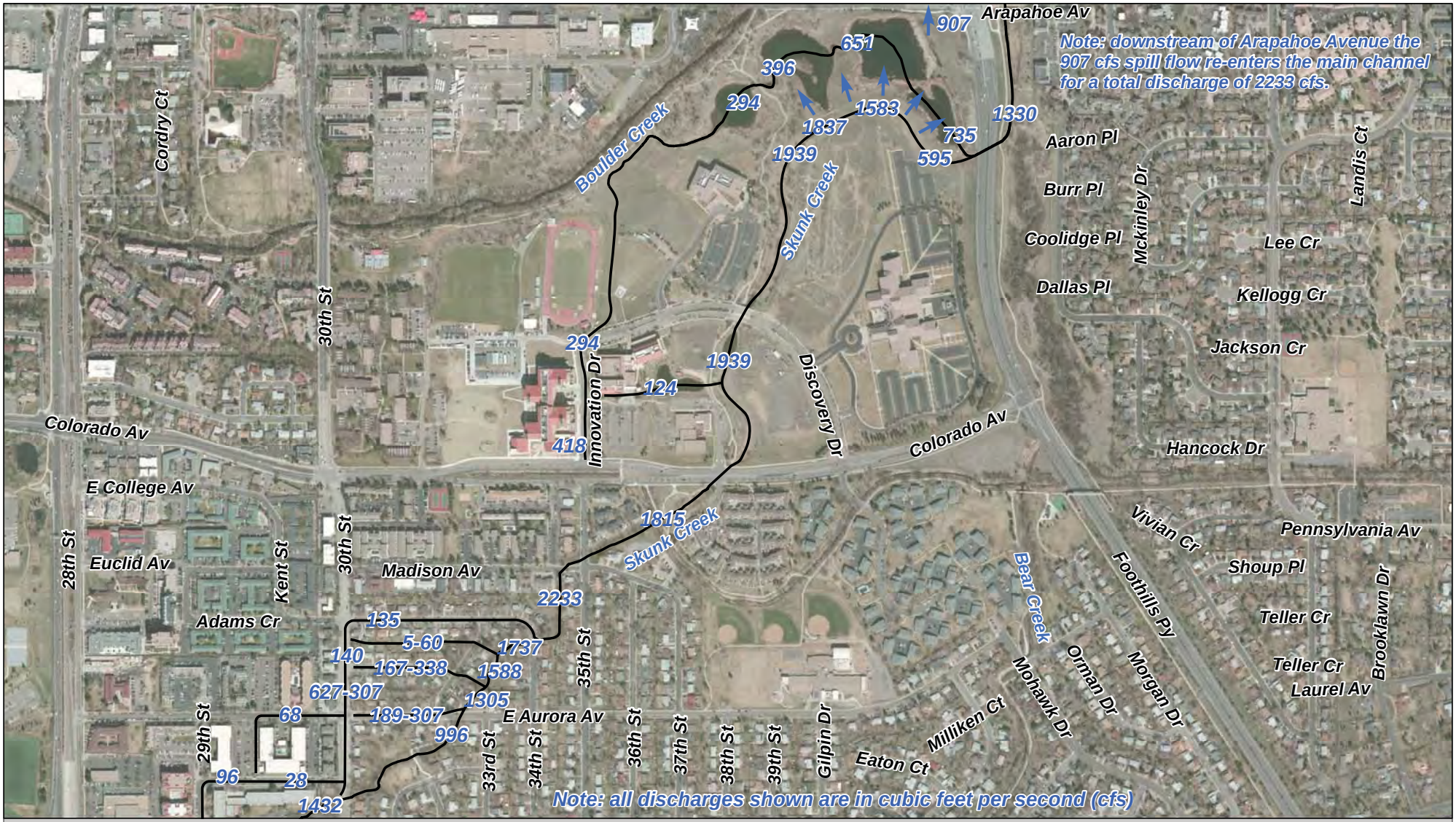


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Figure 3.2: HEC-RAS 100-year Discharges Downstream of Highway 36

N

500 Feet

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Figure 4: HEC-RAS Reach Names Upstream of Highway 36

N

500 Feet

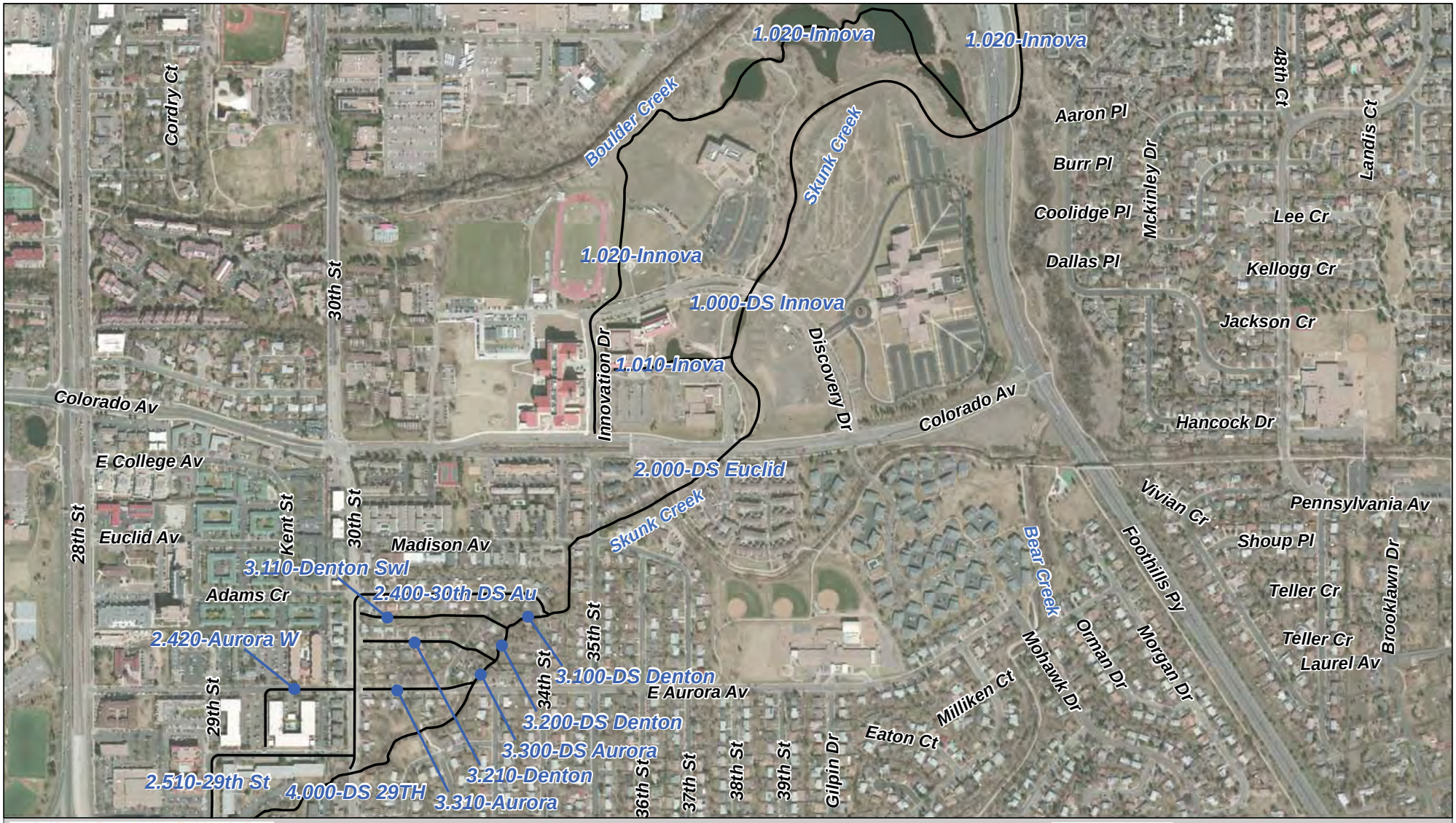

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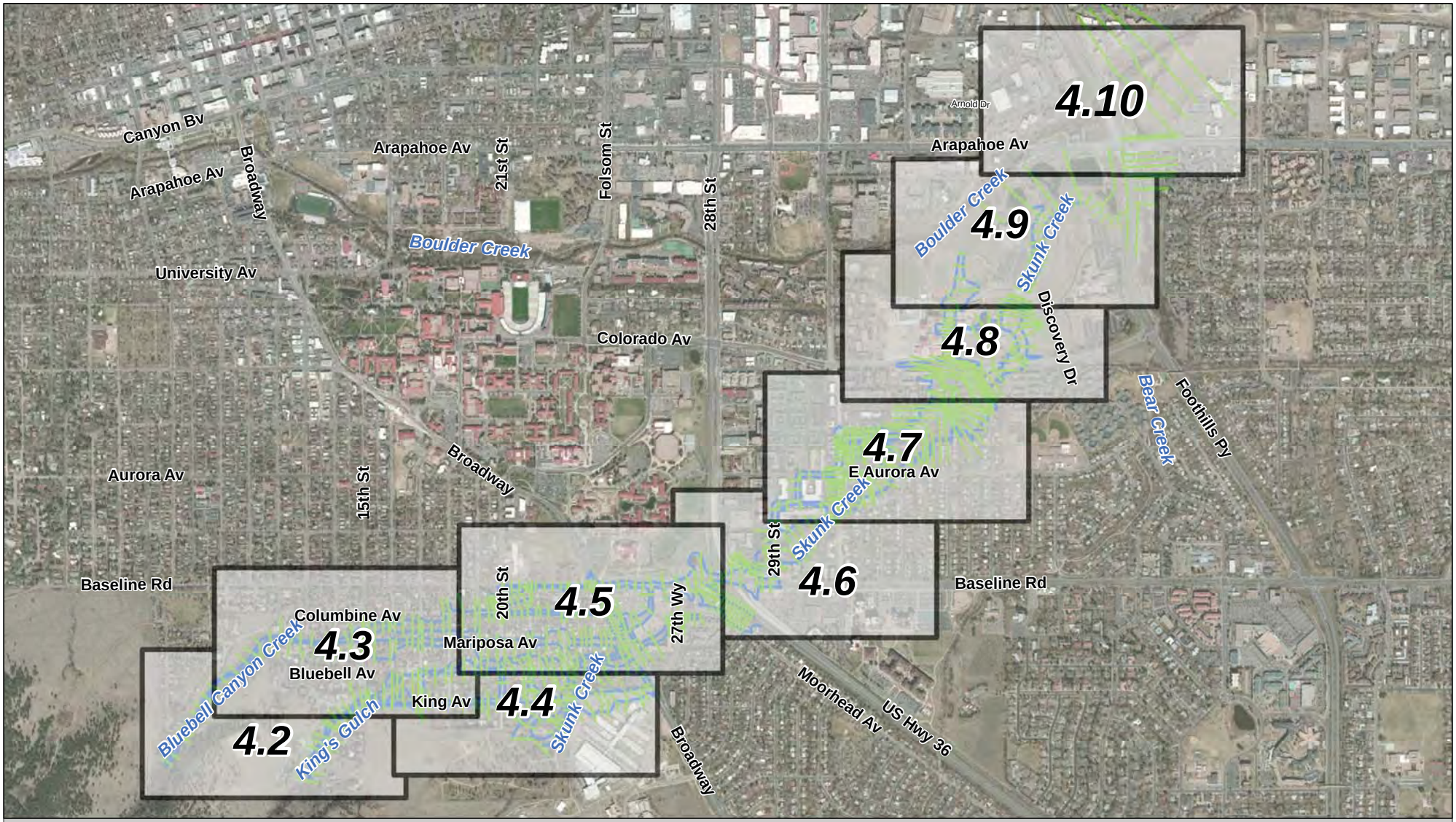
Figure 5: HEC-RAS Reach Names Downstream of Highway 36

N

500 Feet



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Skunk Creek, Bluebell Canyon Creek, King's Gulch
Request for Physical Map Revision (PMR)
Figure 4.1: Floodplain Workmap Index

N
1,100
Feet

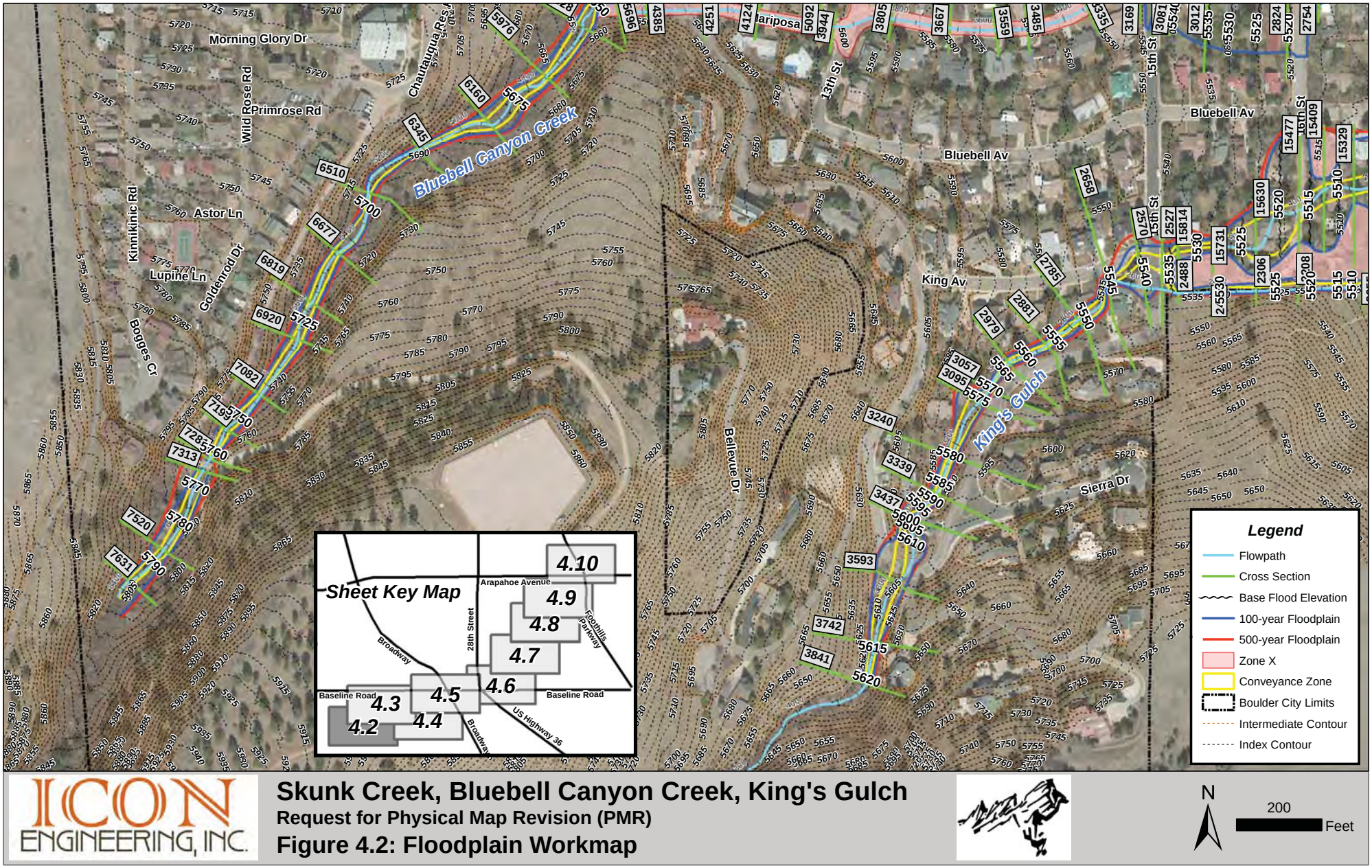

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Figure 4.2: Floodplain Workmap

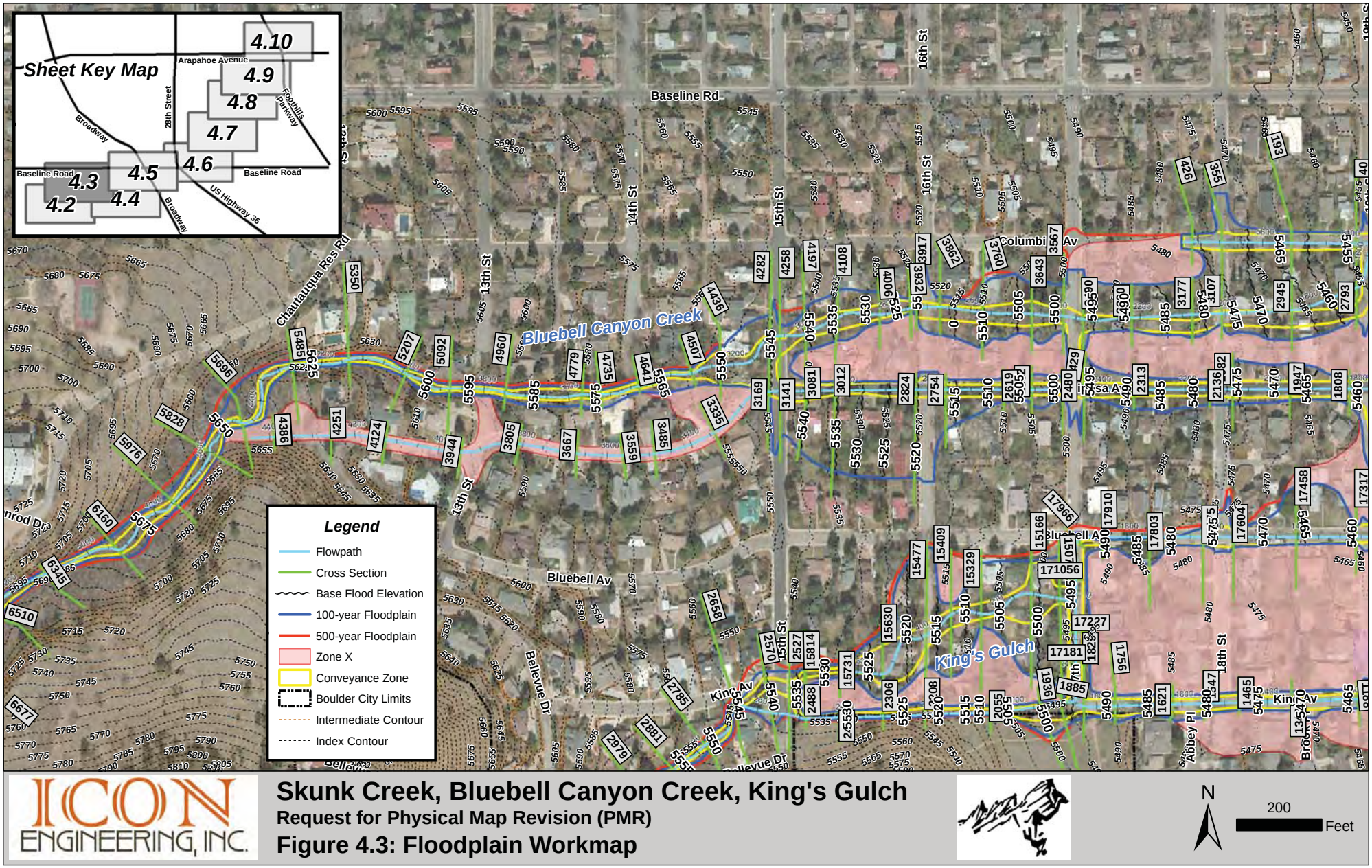

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Figure 4.3: Floodplain Workmap

N

200 Feet

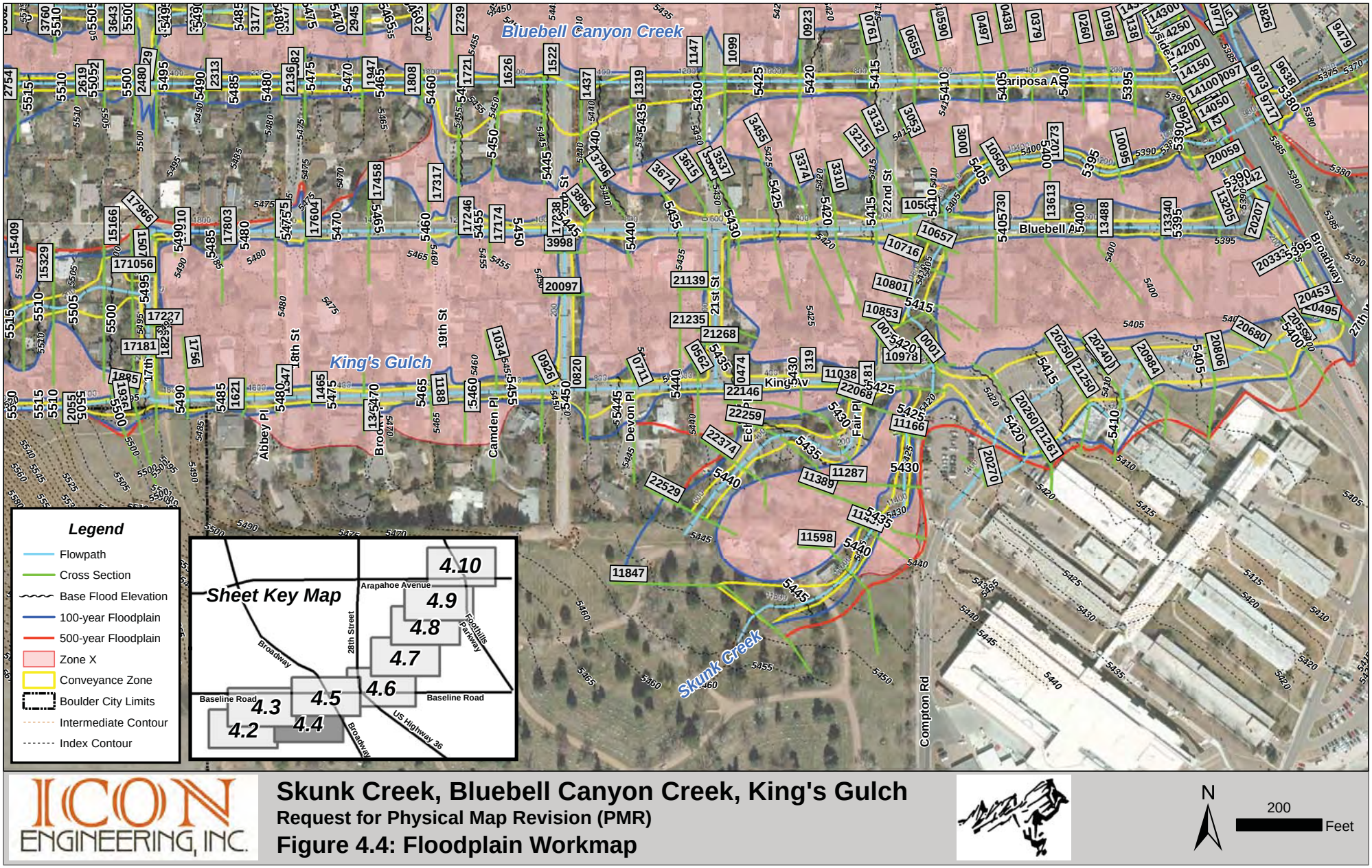

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Figure 4.4: Floodplain Workmap

N

200 Feet

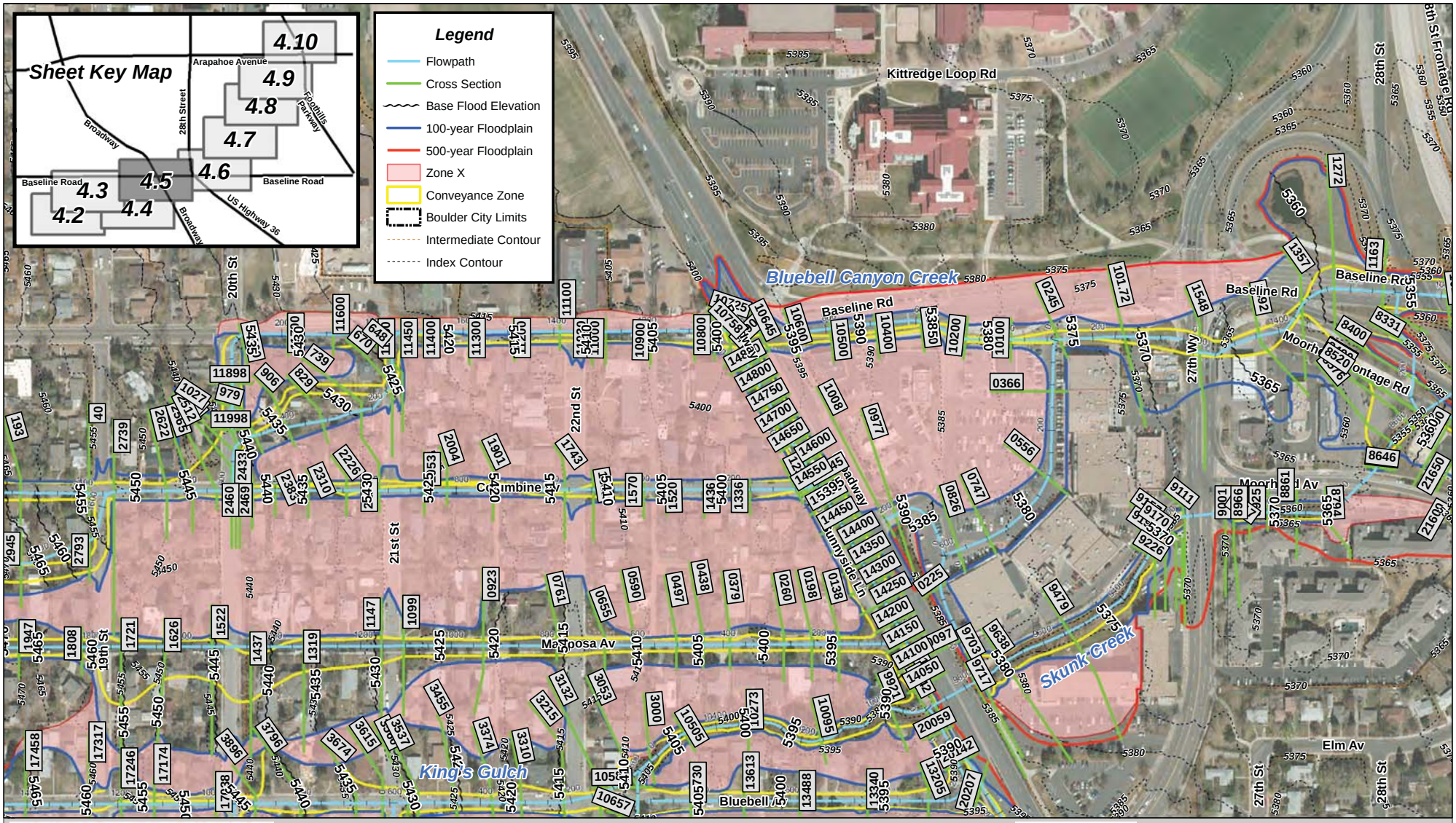

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Figure 4.5: Floodplain Workmap

N

200 Feet

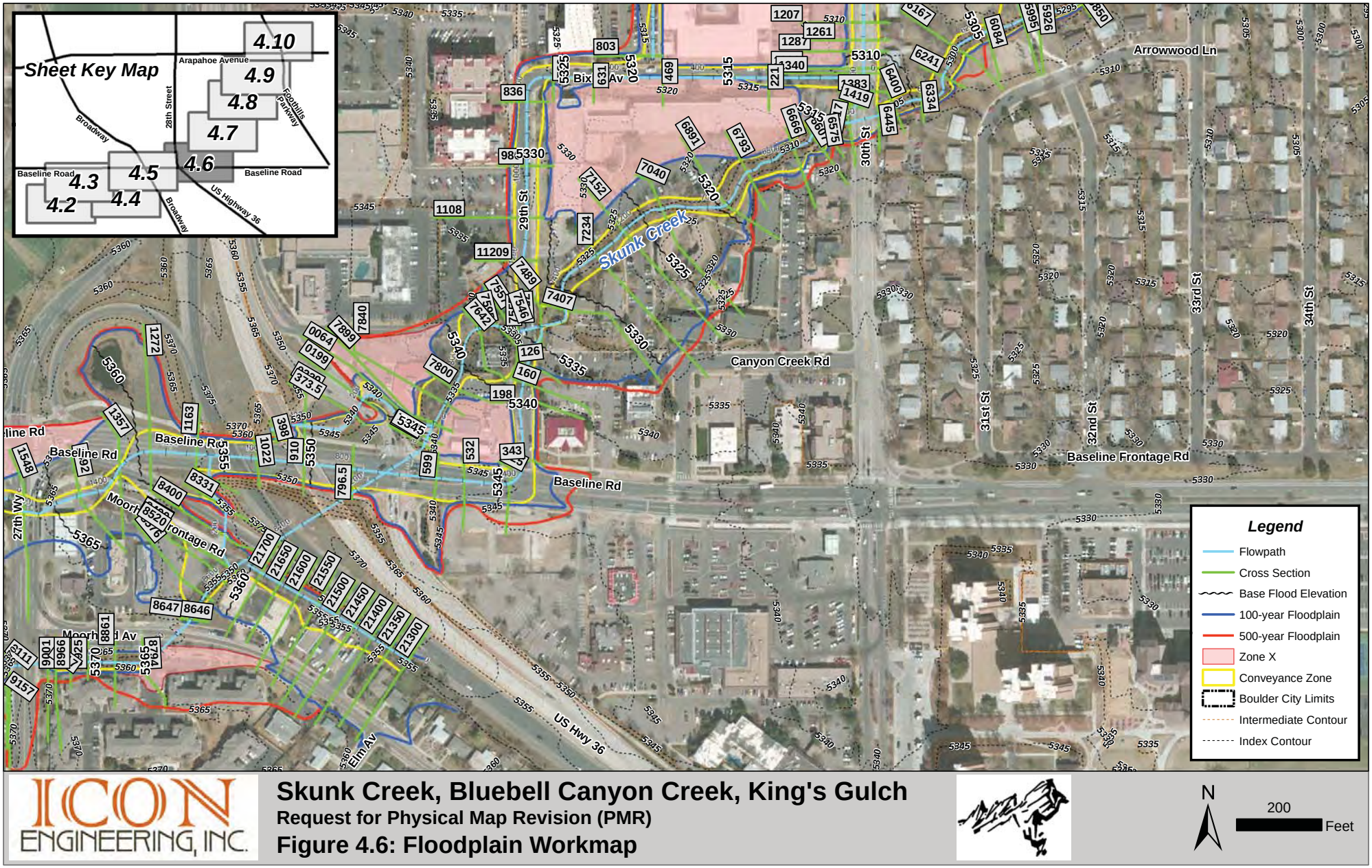

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Figure 4.6: Floodplain Workmap

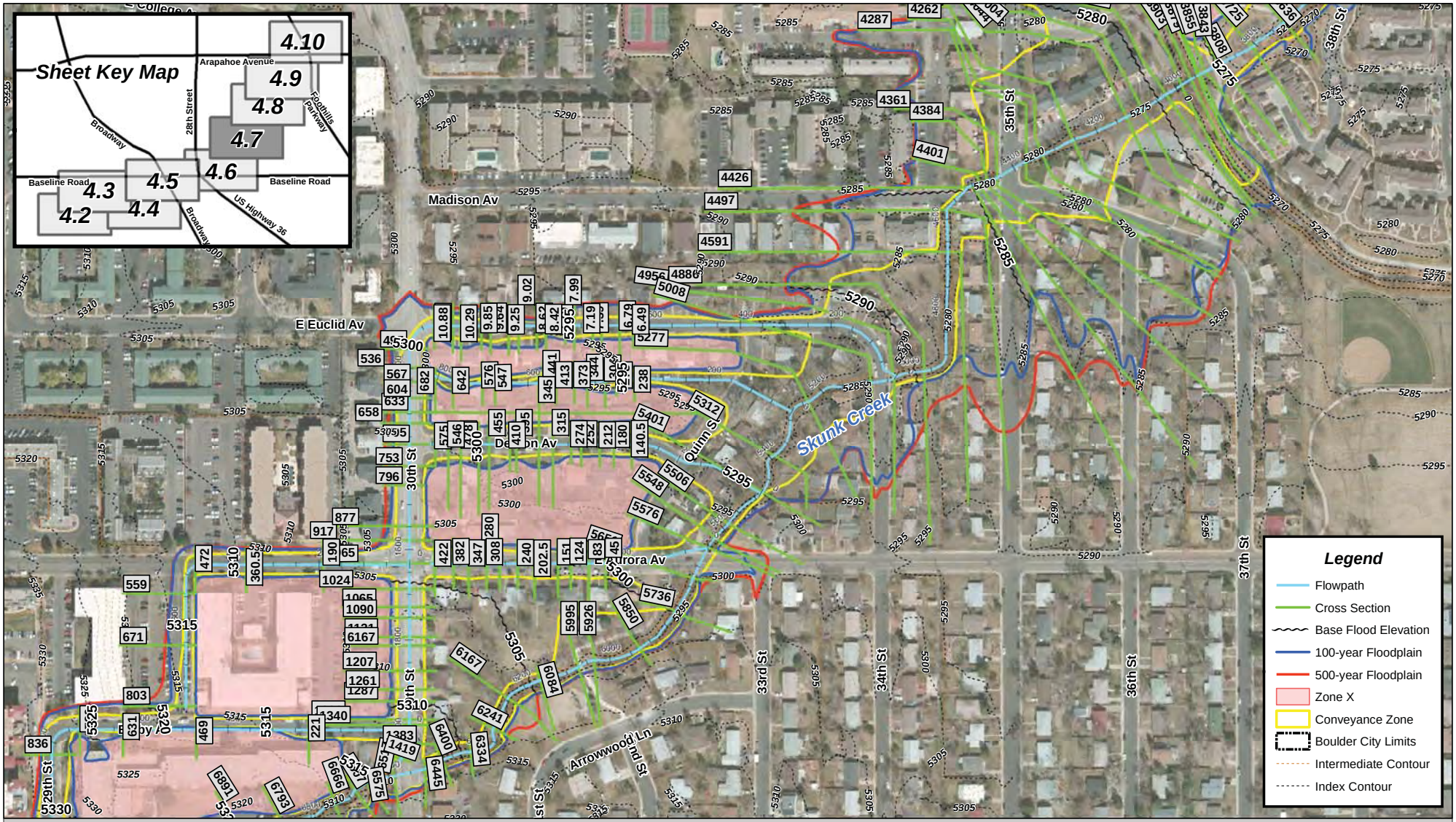

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Figure 4.7: Floodplain Workmap

N

200 Feet

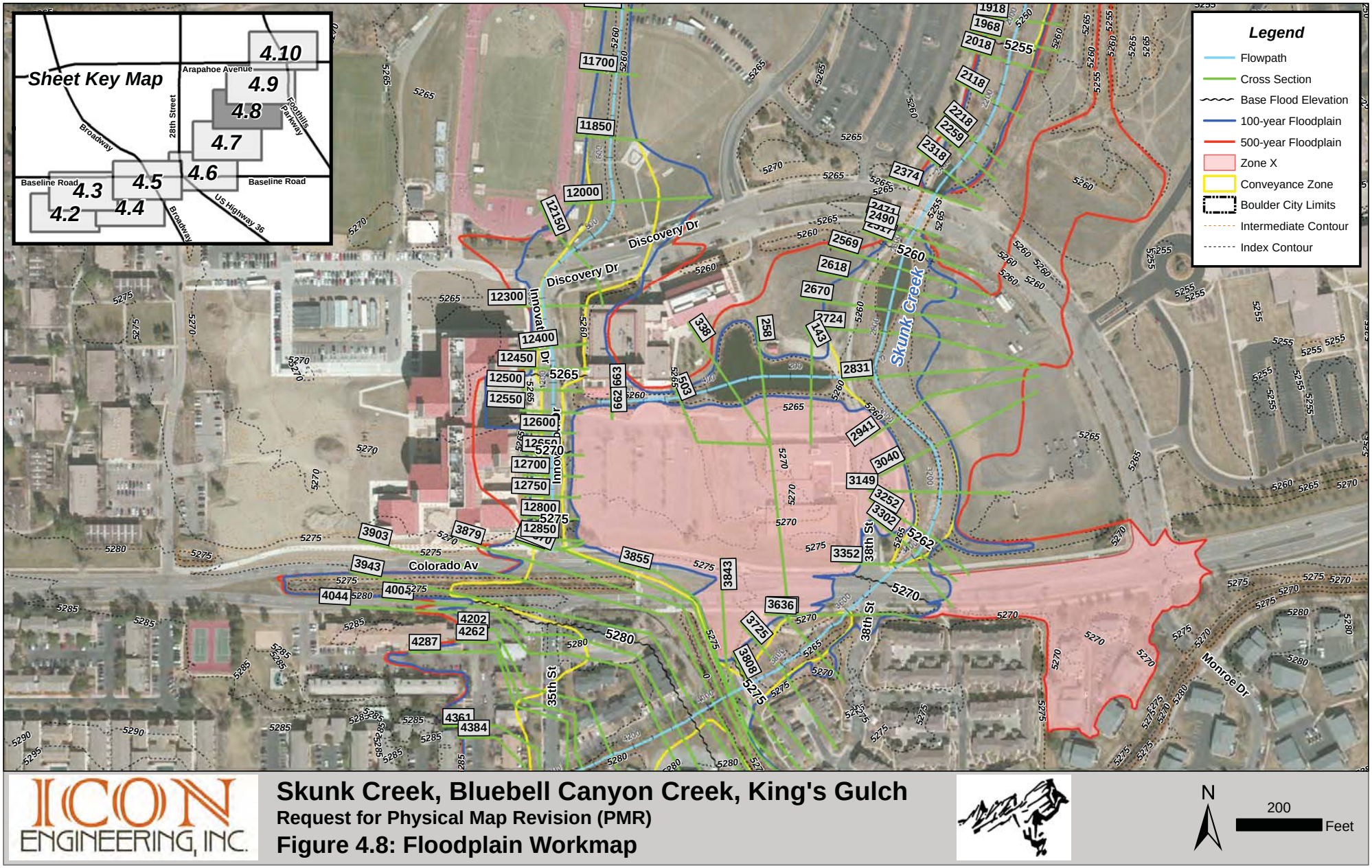

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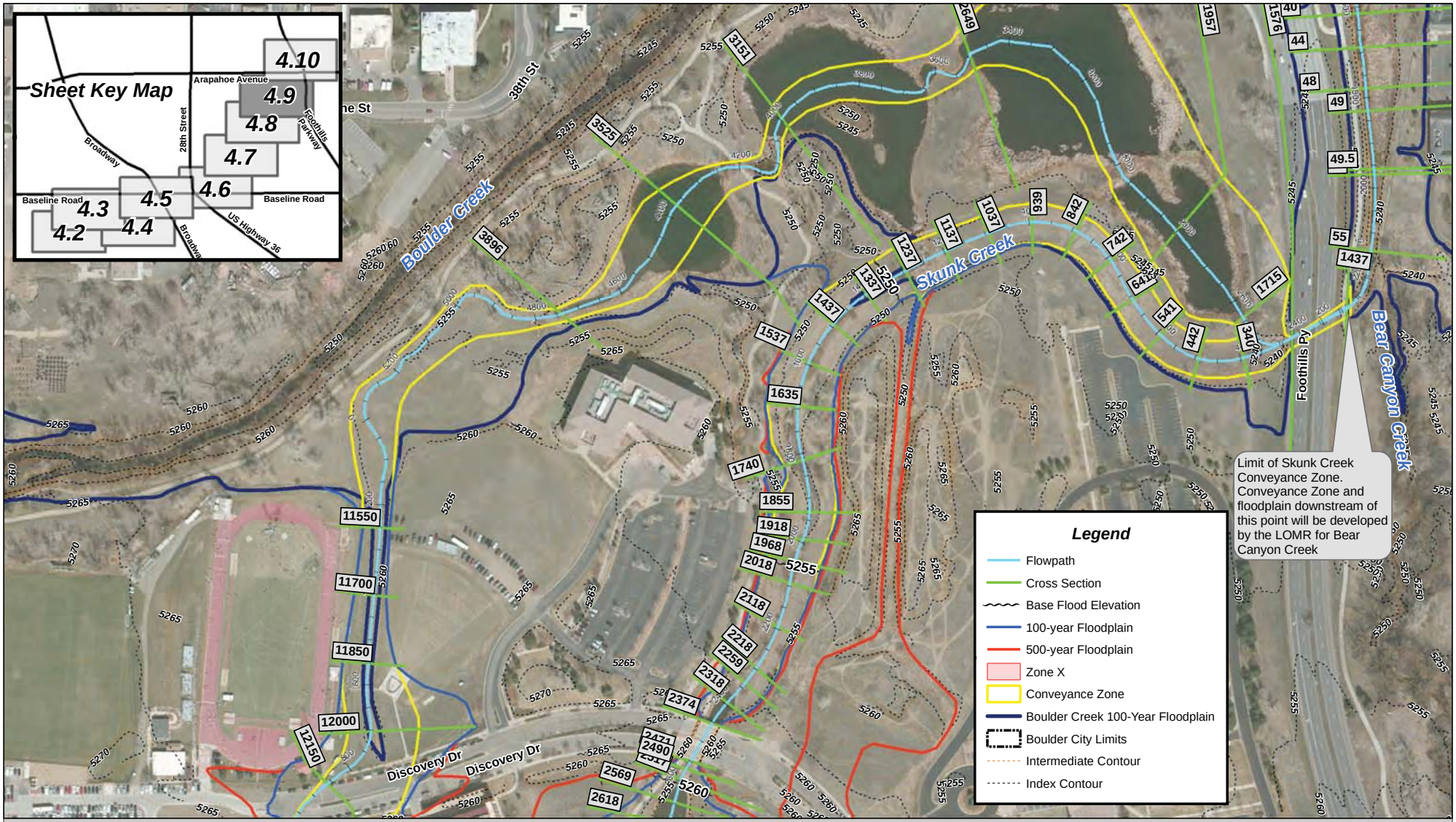
Figure 4.8: Floodplain Workmap



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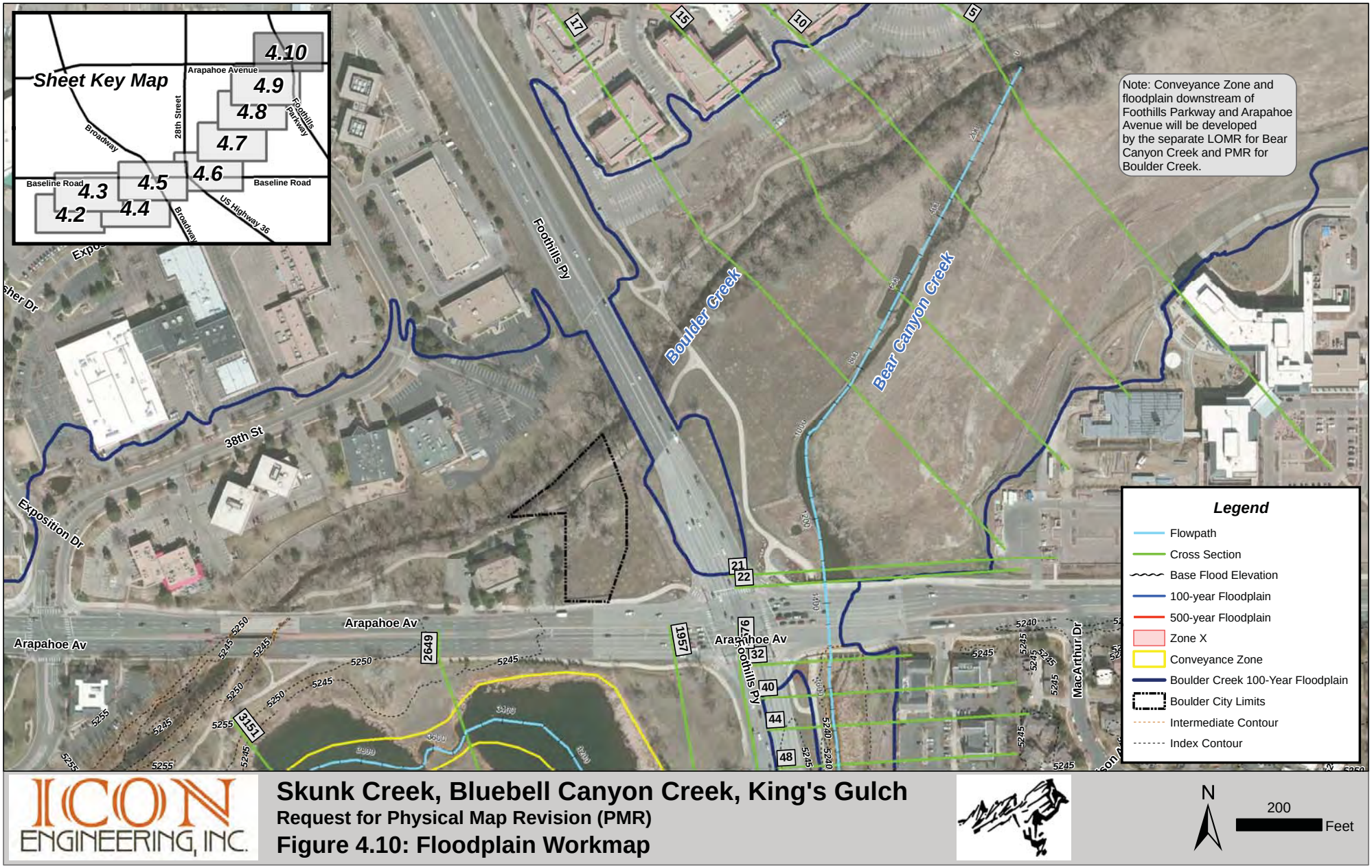
Skunk Creek, Bluebell Canyon Creek, King's Gulch

Request for Physical Map Revision (PMR)

Figure 4.9: Floodplain Workmap



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Skunk Creek, Bluebell Canyon Creek, King's Gulch

Request for Physical Map Revision (PMR)

Figure 4.10: Floodplain Workmap

N

200 Feet

Skunk Creek, Bluebell Canyon Creek and King's Gulch Remapping Study Public Comment Summary

Open House Date: Aug. 18, 2014

Open House Meeting Location: Municipal Building Lobby

Number of attendees that signed-in: 23

Staff in Attendance:

Robert Harberg	Katie Knapp	Kristin Dean
Laurel Olsen-Horen	Douglas Sullivan	

Public Comments:

1. **Location:** 2042 Baseline
   Commenter: Property owner (Ben Chancellor; Christina Jurgens)
   Comment: Did not see flooding in September 2013 and do not feel that the high hazard designation is warranted; question split values for Mariposa vs. Columbine
   Response: The high hazard zone delineations have been refined based on a review of adjacent grades. Adjacent to the structure at 2042 baseline, the delineation was revised such that the structure sits just outside of the high hazard zone. Split flow values for Mariposa and Columbine are being re-evaluated using 2Dmodeling to see if the September flood event can be more closely replicated in the modeling. It should be noted that the September 2013 flooding reflected a lower intensity and longer duration storm compared to the regulatory 100-year design storm that is a significantly higher intensity but shorter duration storm. This difference in storms can result in significant differences between the regulatory 100-year floodplain mapping and what was experienced in the September flood event.

2. **Location:** Area south of Baseline Road between 20th and Broadway
   Commenter: Several property owners
   Comment: Flooding in September 2013 was confined to streets; no flow behind homes; water did not appear to be originating from Bluebell Canyon Creek proper.
   Response: Split flow values for Mariposa and Columbine are being re-evaluated using 2Dmodeling to see if the September flood event can be more closely replicated in the modeling. It should be noted that the September 2013 flooding reflected a lower intensity and longer duration storm compared to the regulatory 100-year design storm that is a significantly higher intensity but shorter duration storm. This difference in storms can result

in significant differences between the regulatory 100-year floodplain mapping and what was experienced in the September flood event.

3. **Location:** 22nd and Mariposa Avenue
   Commenter: Several property owners
   Comment: Flows traveling east on Mariposa turned north on 22nd Street and continued to Columbine Avenue; this is not shown as 100-year flooding.
   Response: This flow path has been added to the documentation of the September flood event. The portion of 22nd Street between Mariposa and Columbine is shown as shallow flooding (Zone X) for the proposed floodplain. The proposed floodplain mapping is this area is being re-evaluated.

4. **Location:** 19th and Mariposa Avenue
   Commenter: Property owner
   Comment: structure at south east corner is shown in the 100-year floodplain but did not experience damage during the September 2013 event; please review assumptions here.
   Response: Split flow values for Mariposa and Columbine are being re-evaluated using 2Dmodeling to see if the September flood event can be more closely replicated in the modeling. It should be noted that the September 2013 flooding reflected a lower intensity and longer duration storm compared to the regulatory 100-year design storm that is a significantly higher intensity but shorter duration storm. This difference in storms can result in significant differences between the regulatory 100-year floodplain mapping and what was experienced in the September flood event.

5. **Location:** 955 Quinn Street
   Commenter: Property owner (Lee Payne)
   Comment: Structure does not show as impacted on floodplain maps (tree cover issue?); how was floodplain delineated at corner of Denton Avenue and Quinn Street.
   Response: Due to the large amount of tree cover, the structure was inadvertently excluded from the proposed floodplain map exhibit. The maps have been corrected to show the principal structure located outside of the proposed 100-year floodplain.

6. **Location**: 3130 Aurora
   Commenter: Property Owner
   Comment: It seems like the HHZ could be the result of a small depression that we may not want to include
   in the mapping.
   Response:

7. **Location**: 1700 Bluebell
   Commenter: Property Owner (Bill Mooz)
   Comment: Structure is shown as in proposed floodplain but was not impacted by September 2013 event; wants to know why actual data was disregarded.

Response: The September 2013 flooding reflected a lower intensity and longer duration storm compared to the regulatory 100-year design storm that is a significantly higher intensity but shorter duration storm. This difference in storms can result in significant differences between the regulatory 100-year floodplain mapping and what was experienced in the September flood event. Split flow values for Mariposa and Columbine are being re-evaluated using 2Dmodeling to see if the September flood event can be more closely replicated in the modeling.

8. **Location**: 1849 Mariposa Ave,
   Commenter: Property Owner (Steve Brown, Guen Simons)
   Comment: Water from Bluebell creek did not flow to Mariposa. It flowed down the Bluebell drainage but primarily to the north along 19th Street and down Columbine.
   Response: Split flow values for Mariposa and Columbine are being re-evaluated using 2Dmodeling to see if the September flood event can be more closely replicated in the modeling. It should be noted that the September 2013 flooding reflected a lower intensity and longer duration storm compared to the regulatory 100-year design storm that is a significantly higher intensity but shorter duration storm. This difference in storms can result in significant differences between the regulatory 100-year floodplain mapping and what was experienced in the September flood event.

9. **Location**: 2100 Baseline
   Commenter: Property Owner (Jamie Karpohl)
   Comment: a) There were no eastbound flows observed on Columbine west of 20th Street. b) The flooding at 20th and Columbine originated from the Anderson ditch on the north side of Columbine. This water flowed through properties to the north-east and down the Columbine North alley towards 21st. At 21st the flows split - continuing down the alley and heading north towards Baseline. c) During the flood, there was no flow observed coming down Columbine west of 20th. The only flows observed in Columbine were from Anderson ditch on the north side of the street. When I visited the location of Bluebell Canyon Creek at 15th St. on the morning of September 14th, I observed all of the flow heading down Mariposa. I did not observe any man-made diversions at this location.
   Response: a) The city has received conflicting information about the flooding observed along Columbine between 19th and 20th Streets. At this time the flood extent documentation shows this area as having flows that came north from Mariposa along 19th Street and then continuing east on Columbine. The documentation of the September 2013 flood extents will continue to be refined as additional information is received.
   b) Split flow values for Mariposa and Columbine are being re-evaluated using 2Dmodeling to see if the September flood event can be more closely replicated in the modeling. It should be noted that the September 2013 flooding reflected a lower intensity and longer duration storm compared to the regulatory 100-year design storm that is a significantly higher intensity but shorter duration storm. This difference in storms can result in significant differences between the regulatory 100-year floodplain mapping and what was experienced in the September flood event.

Public Hearing: WRAB Meeting, Aug. 18, 2014

Meeting Location: Council Chambers

Public Comments:

1. Steve Brown, Guen Simons - Water from Bluebell creek did not flow to Mariposa. It flowed down the Bluebell drainage but primarily to the north along 19th Street and down Columbine.

2. Lee Payne - My home does not show up as either added, removed or remaining in the 100 year floodplain on the "structures affected proposed 100 year floodplain". I believe this is due to the dense tree cover on my lot. The buildings on this lot look to be un-included in the 100 year flood zone, but it is unclear. The grading and slopes on my lot are high from the street and I believe the new mapping to be close to reality in that the homes are excluded. Can you please contact me to clarify if the structures are excluded and what the base flood elevation is in this area? There is also no information on sections or elevations for this lot on the city's website. Thank you!

Public Hearing: WRAB Meeting, Sept. 15, 2014

Meeting Location: Council Chambers

Public Comments:

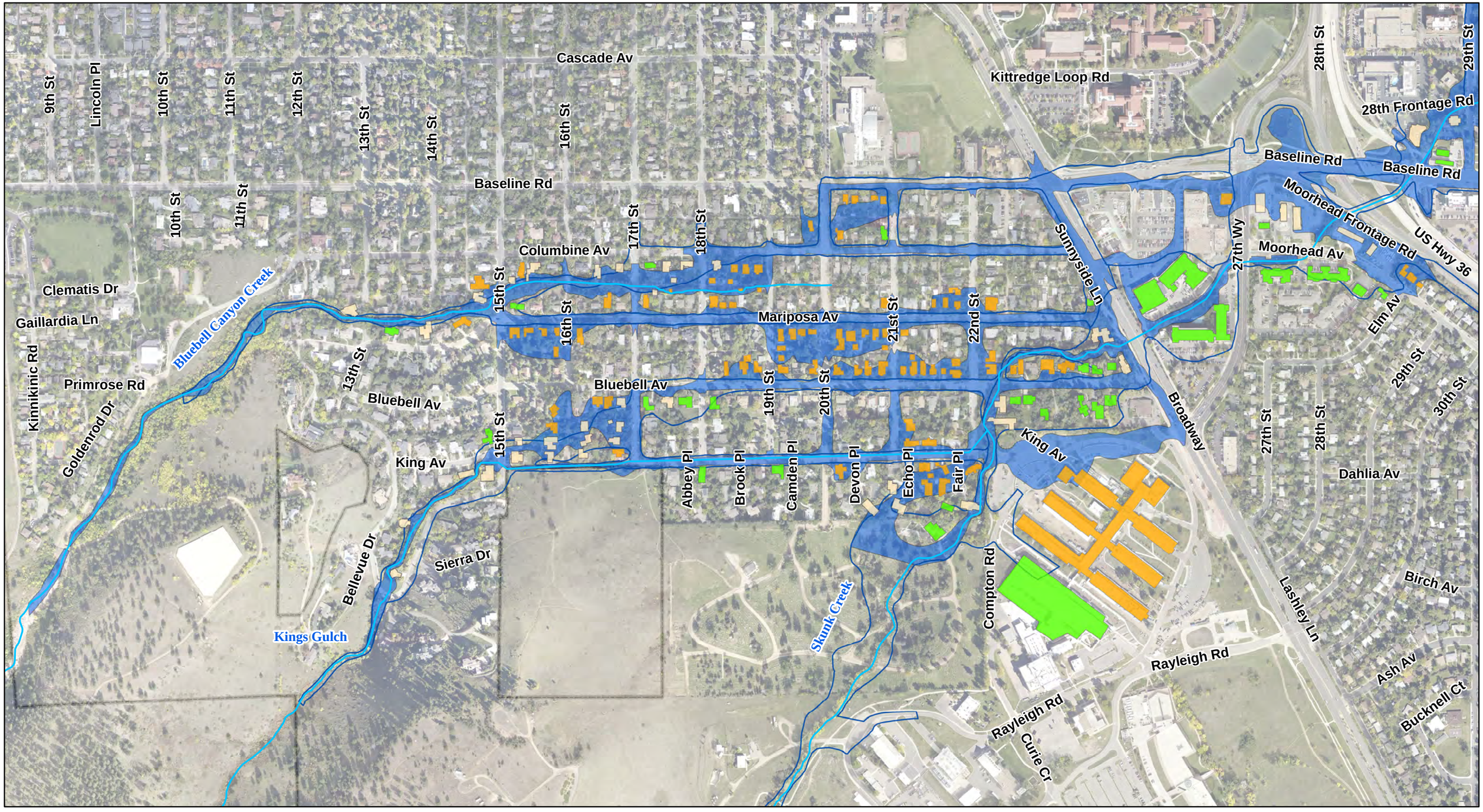
1. Christina Jurgens – Concerns are with the Bluebell and that there were no diversions, which isn't reflected accurately in the mapping presented. Question is if a lot of water falls in the area, water will not flow uphill to 19th street and over Columbine if it's natural direction is downhill. She would like for this to be considered when moving forward with the amendment.

2. Bryan Boots – Owns a home at 20th and Columbine, which is in a newly designated hazard zone. He was completely unaware of the changes in zoning and is feeling like he is coming to the conversation late. Questions the assumptions that are going into this decision making and having a hard time reconciling the recent studies with what he actually experienced last September. He would like to better understand the next steps in the process regarding what is decided. It doesn't seem reasonable to put the burden on residents. He is requesting better, more effective outreach to citizens.

3. Tim Fuller-Rowell – Lives on Columbine Avenue, which is affected by the new floodplain, which now makes up half of his property. Increase in the water table flooded the basement. Flow down Mariposa didn't affect us. Rock dam broke causing a flash flood and persistent rainfall and wonders if that was factored into the analysis, but didn't see any major flow on

Columbine. Wants to understand the actual impact of flood to his property and physical reasons why it is now included on the floodplain. What is the process for deciding how the new boundaries are drawn and decided? Premature to start approving a new floodplain before the previous event is fully understood and would like the city to have more interaction with the people who are actually affected.

4. Jamie Krapohl – Property owner affected by the proposed flow split changes at 15th is his major concern. He didn't observe what is being shown on the maps and feels there is a lack of correlation in how the split affects these three blocks. On the Saturday of the flood, he was at 15th and Mariposa and didn't observe any diversions that were put into place by residents. The flooding on his corner was due to the Anderson Ditch overflowing, which is not represented in the changes. Since the open house, he has reached out to neighbors, but there are many renters around his property. He contacted three other property owners and informed them of the recent flood mapping changes. Feels that neighbors were not aware of these new changes. Concerned with the accuracy of the models, based on observations from walking around the neighborhood and what is being reflected in the updated maps. He feels this just doesn't make sense.



Legend

- FEMA Effective 100 Year Floodplain
- Proposed Skunk Creek 100 Year Floodplain
- Revised Boulder Creek 100 Year Floodplain
- Buildings Newly Affected by 100 Year Floodplain (104)
- Buildings Remaining in the 100 Year Floodplain (113)
- Buildings No Longer Affected by 100 Year Floodplain (66)
- Creek
- City Limits

N

0 250 500 1,000 1,500 Feet

1:5,500

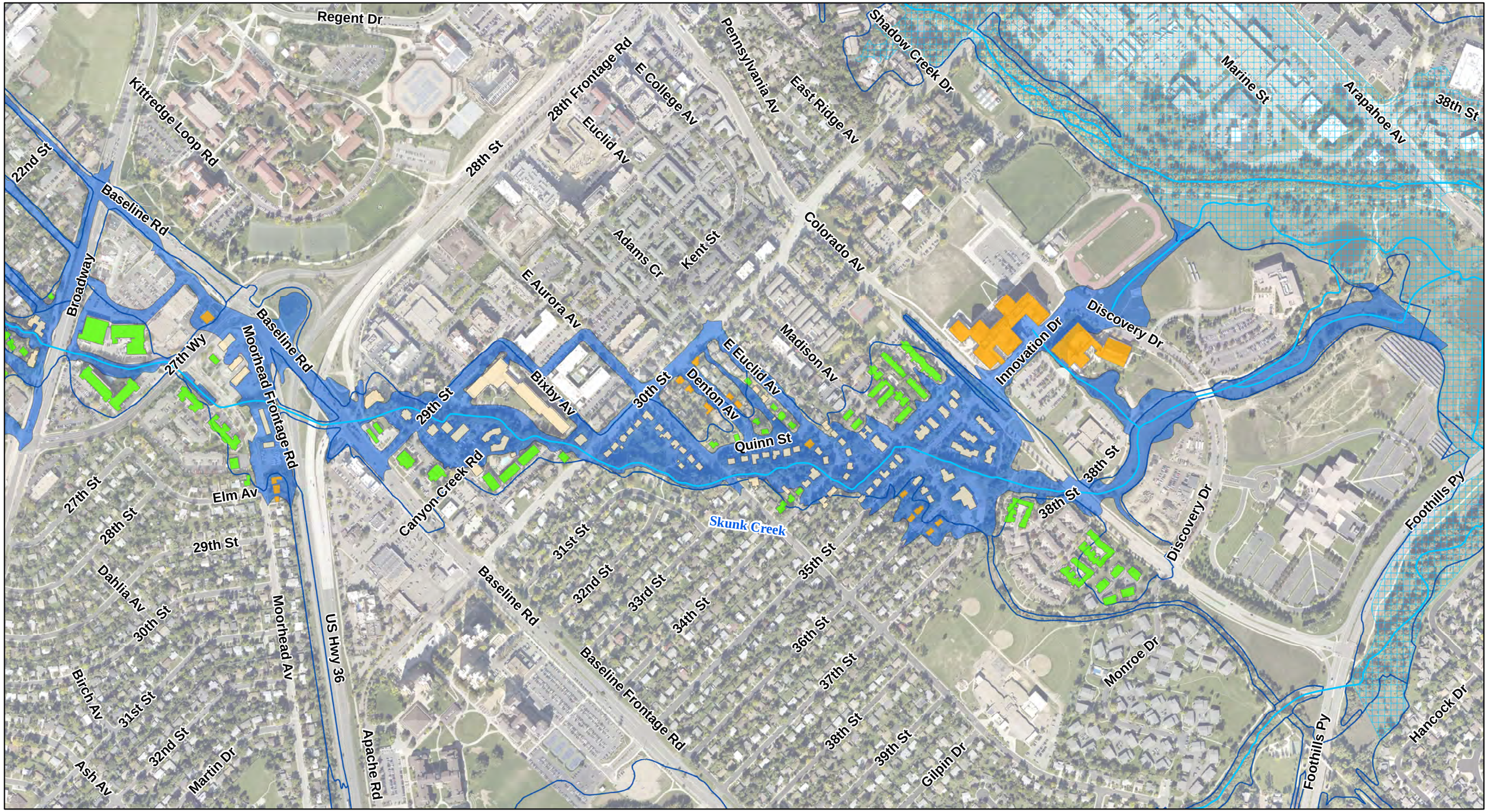
The information depicted on this map is provided as graphical representation only. The City of Boulder provides no warranty,expressed or implied, as to the accuracy and/or completeness of the information contained hereon.

Skunk Creek

Proposed 100 Year Floodplain Compared to FEMA Effective Map 1 of 2

Utilities Division

Rev: 4/28/2015



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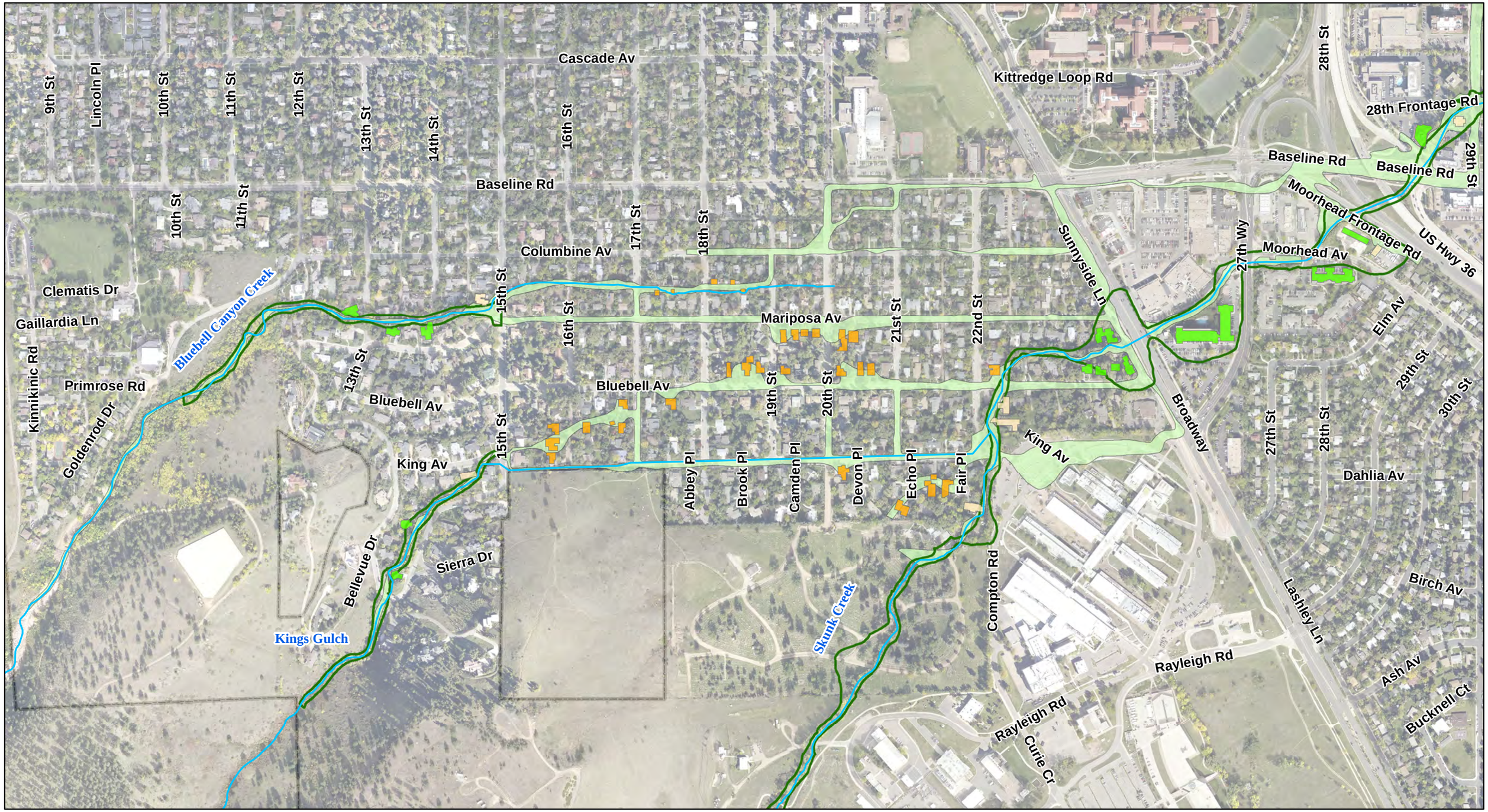
Skunk Creek

Proposed 100 Year Floodplain Compared to FEMA Effective

Map 2 of 2

Utilities Division

Rev: 4/28/2015



Legend

- Effective Conveyance Zone
- Proposed Skunk Creek Conveyance Zone
- Revised Boulder Creek Conveyance Zone
- Buildings Newly Affected by Conveyance Zone (33)
- Buildings Remaining in the Conveyance Zone (28)
- Buildings No Longer Affected by Conveyance Zone (55)
- Creek
- City Limits

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Skunk Creek

Proposed Conveyance Zone Compared to FEMA Effective

Map 1 of 2

Utilities Division

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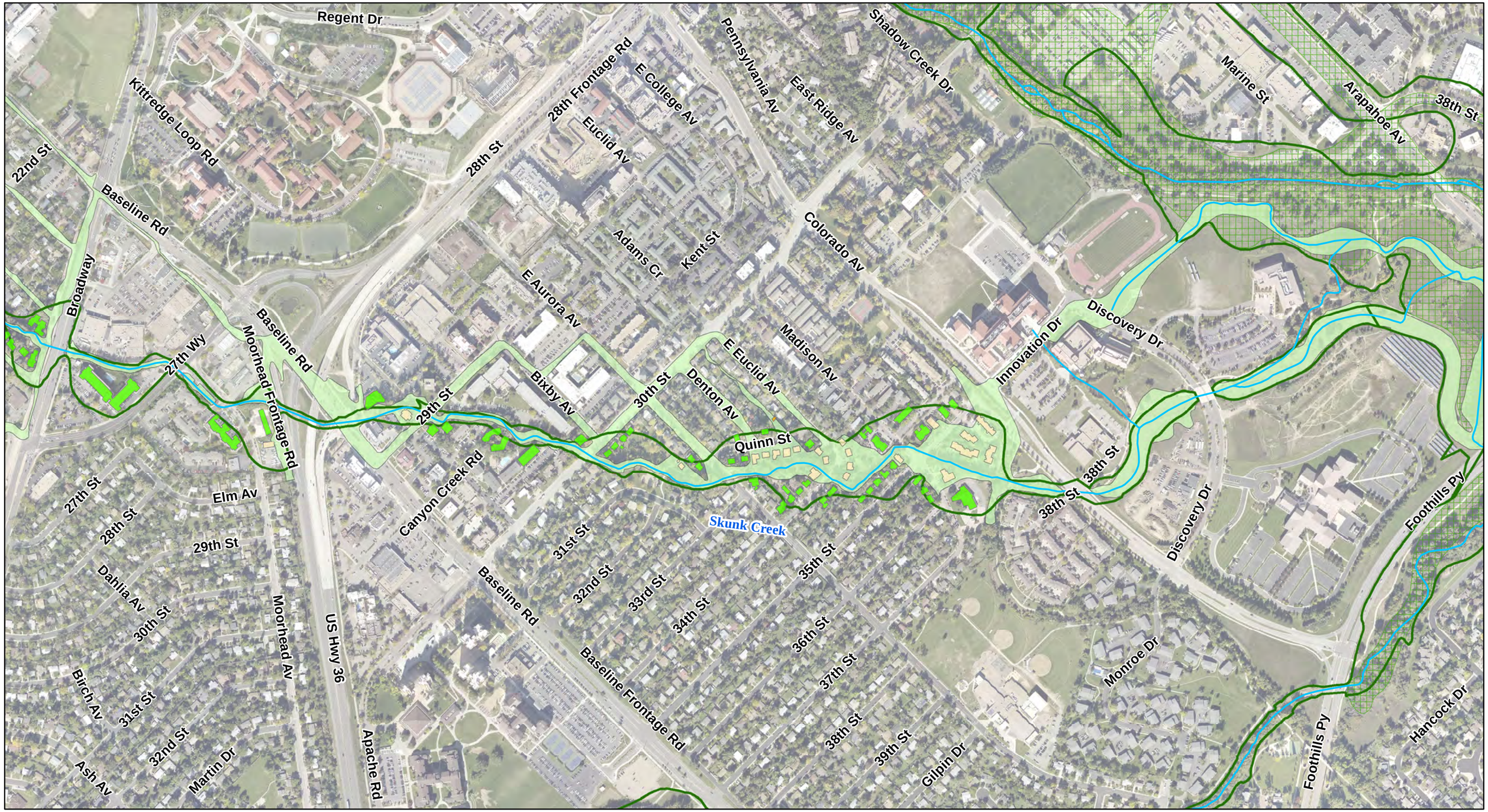

Legend

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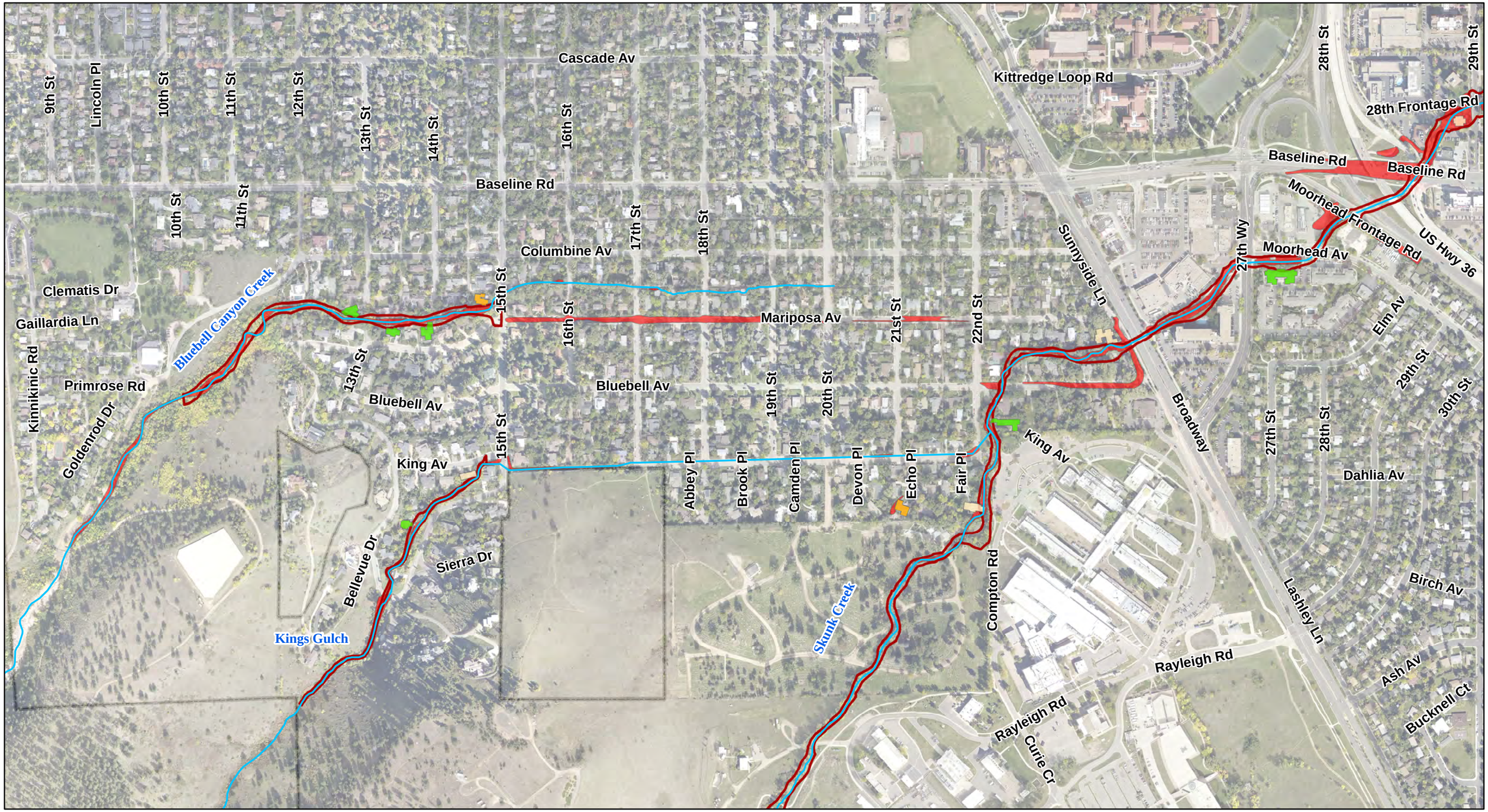
Skunk Creek

Proposed Conveyance Zone Compared to FEMA Effective

Map 2 of 2

Utilities Division

Rev: 4/28/2015



Legend

- Effective High Hazard Zone
- Proposed Skunk Creek High Hazard Zone
- Revised Boulder Creek High Hazard Zone
- Buildings Newly Affected by High Hazard Zone (3)
- Buildings Remaining in the High Hazard Zone (7)
- Buildings No Longer Affected by High Hazard Zone (22)
- Creek
- City Limits

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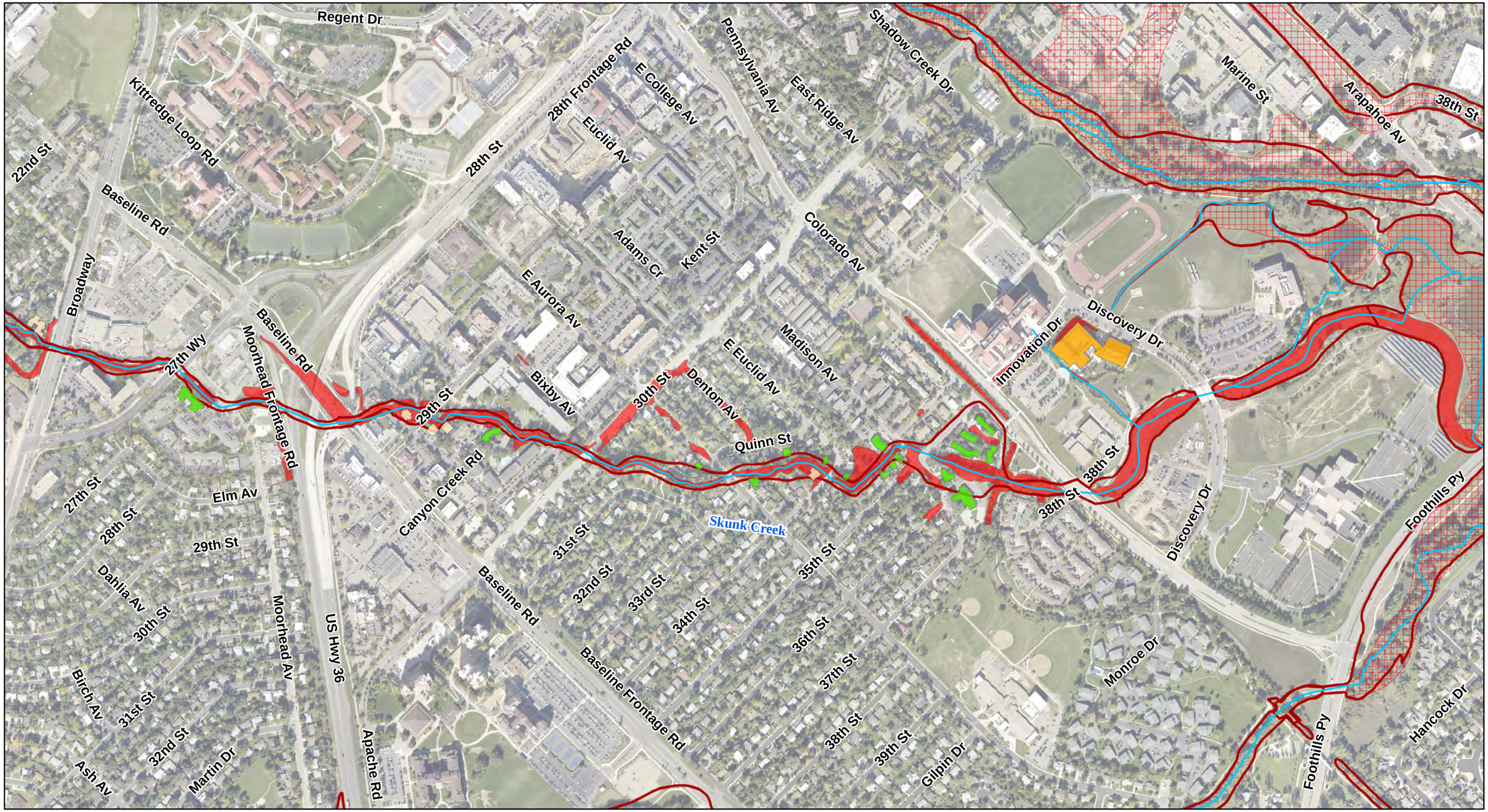
Skunk Creek

Proposed High Hazard Zone Compared to FEMA Effective

Map 1 of 2

Utilities Division

Rev: 4/28/2015



Legend

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Skunk Creek

Proposed High Hazard Zone Compared to FEMA Effective

Map 2 of 2

Utilities Division

Rev: 4/28/2015

C I T Y O F B O U L D E R
WATER RESOURCES ADVISORY BOARD
AGENDA ITEM

MEETING DATE: May 18, 2015

AGENDA TITLE: Public hearing and consideration of a recommendation to City Council regarding the South Boulder Creek Major Drainageway Flood Mitigation Plan.

PRESENTER/S:
Jeff Arthur, Director of Public Works for Utilities
Tracy Winfree, Interim Director, Open Space and Mountain Parks
Annie Noble, Acting Principal Engineer for Flood and Greenways
Don D'Amico, Ecological Systems Supervisor, Open Space and Mountain Parks
Kurt Bauer, Engineering Project Manager
Kristin Dean, Utilities Planner II

EXECUTIVE SUMMARY:

A Recommended Plan for flood mitigation along South Boulder Creek was presented to the public, Water Resources Advisory Board (WRAB), Open Space Board of Trustees (OSBT) and City Council at a Study Session in 2014. The Recommended Plan was comprised of three phases:

Phase I: Regional detention facility at US 36;
Phase II: West Valley improvements; and,
Phase III: Arapahoe Avenue detention.

In 2014, the WRAB and City Council were generally supportive of the mitigation proposed under Phases II and III. The OSBT also indicated their support for Phases II and III as it was not seen to have effects on city open space properties. However, significant concern was voiced by both boards and by City Council regarding potential environmental impacts, including those to Open Space and Mountain Parks (OSMP) lands from the proposed US 36 regional stormwater detention facility (Phase I). As a result, staff was directed to evaluate other options, including potential use of a larger portion of the University of Colorado's CU South property to shift impacts away from environmentally sensitive areas.

Since then, six additional options were developed for US 36 detention, all designed to prevent the overtopping of US 36 during a 100-year design storm and reduce flooding impacts downstream and each with fewer impacts to OSMP than the original proposal. This memorandum presents the US 36 regional detention options, a comparison of potential impacts to OSMP and CU lands and a summary of potential next steps. Staff is recommending that the Phases II and III concepts remain unchanged in the mitigation master plan and that Phase I be accomplished using Colorado Department of

Transportation (CDOT) Right of Way (ROW) and CU Campus South (Option D) for construction of a regional stormwater detention facility at US 36. In this alternative, the berm would be located within the existing CDOT right of way, and, with the exception of potential *temporary* impacts from construction of the berm, OSMP lands would only be affected when stormwaters are retained. Each of the additional options have a greater impact on CU's land than the plan that was presented in 2014. However, while CU prefers the 2014 plan, they have also indicated they are willing to discuss use of their land to facilitate the implementation of Option D for regional detention.

STAFF RECOMMENDATION:

Staff requests Water Resources Advisory Board consideration of this matter and recommends action in the form of the following motion:

> The Water Resources Advisory Board recommends that City Council accept the South Boulder Creek Major Drainageway Flood Mitigation Plan including Option D (single berm using Colorado Department of Transportation (CDOT) Right of Way) for 'Regional Detention at US 36' along with the Downstream Improvements as the recommended comprehensive alternative to mitigate flood risks associated with South Boulder Creek.

COUNCIL FILTER IMPACTS:

- Economic: A total of 700 structures (442 within city limits) and approximately 1,200 dwelling units (962 within city limits) are located within the 100-year South Boulder Creek floodplain. A risk assessment completed in June 2009 estimated a 100-year event would result in $215 million in damages[1]. South Boulder Creek (SBC) had the greatest reported property damage from the 2013 flood of all the city's 15 major drainageways. Approximately 362 structures (893 dwelling units) within the city limits would no longer be located in the 100-year floodplain if the study recommendation is constructed (approximately 80 structures would remain in the floodplain within city limits under the recommended plan). Structures removed from the floodplain would be less likely to be damaged from a flood and would also benefit from no longer being subject to paying for flood insurance.
- Environmental: One of the Boulder Valley Comprehensive Plan general policies emphasizes the city's commitment to open space preservation. OSMP land within the project area has some of the highest ecological values in the Boulder Valley. The project area on OSMP lies entirely within the South Boulder Creek State Natural Area (SBCSNA) which was designated by the State of Colorado in recognition of the state-wide significance of this exceptional riparian and floodplain ecosystem – including two federally threatened species: the Preble's Meadow Jumping Mouse (PMJM) and the Ute Ladies'- Tresses Orchid (ULTO) habitat, tallgrass prairie, wetlands, habitat for declining grassland and riparian bird species, habitat for declining amphibians such as the Northern Leopard Frog, and habitat for declining native fish. Tallgrass prairie is considered one of the most endangered plant

[1] This estimate includes properties in the city and the county.

communities in the world and OSMP land in the project area contains some of the highest quality remaining tallgrass prairie in the state and the region. Additionally, Boulder's ULTO population is one of the largest within the entire range for this federally threatened plant species. This area is also managed as part of one of the oldest and most productive agricultural landscapes on city open space. While previous flood mitigation options would have directly and permanently impacted these resources, construction of the recommended regional detention facility berm at US 36, Option D, has fewer impacts on OSMP lands and associated resources. Temporary impacts to OSMP lands may be necessary for the construction of the berm. In times of flooding, a portion of Open Space lands behind the berm will be inundated, depending on the magnitude of the storm, and sediment deposition is likely to occur. It should be noted that this area is currently in the 100-year floodplain, which could result in inundation and sediment deposition without the berm. However these effects are likely to increase by the construction of the berm. Newly deposited sediments will require management to avoid the establishment and spread of invasive plant species and habitats impacted by additional sediment deposition may require restoration.

- Social: The flood hazards associated with SBC are a significant risk to life, property and business. The SBC floodplain includes hundreds of residential structures, affordable housing, senior housing, medical facilities, and numerous businesses. In addition, federal highway US 36 overtops during major storm events, eliminating use of a major thoroughfare into and out of the city. While construction of the study recommendation would temporarily cause disruption to local residents, businesses, and transportation routes, mitigating these hazards would further the city's social sustainability goals and benefit a diverse set of community stakeholders by protecting them from the significant damage which can be caused from a large flood event.

OTHER IMPACTS:

- Fiscal: Implementation of the study recommendations is estimated to cost approximately $46 million for all three phases. Funding in the 2015-2020 Department of Public Works Utilities Division CIP budget for this project is $11,750,000. Staff will be recommending increasing the budget in the 2016-2021 CIP by $15 million (in 2018) to a total of $26,750,000. The project could be constructed in phases with each phase estimated to cost from $11 - $25 million. The city would also seek grants to fund this project.
- Staff Time: Time for completing the study is included in existing work plans. However, implementation of the recommended option will require additional staff time from multiple city departments including Public Works, Comprehensive Planning & Sustainability, Open Space & Mountain Parks, and Parks & Recreation.

BOARD AND COMMISSION FEEDBACK:

Conceptual alternatives were first presented to WRAB in 2010 with a recommendation from the Board to move forward with four of nine alternatives. The Open Space Board of Trustees was updated in 2010 by staff. A staff recommendation was presented in August 2014 to both WRAB and the Open Space Board of Trustees (OSBT), resulting in the following motions:

OSBT 2014 Motions:

- Recommend proceeding with the 'West Valley Improvements' and 'Arapahoe Detention' phases of the 'Regional Detention at US 36 with Downstream Improvements' flood mitigation alternative at this time. The motion passed unanimously.
- Recommend investigating alternatives to the 'Regional Detention at US 36' component which may have lesser potential for environmental impacts. The motion passed unanimously.
- Make a statement to City Council: The Board believes that constructing a regional detention facility at US 36 would require a significant disposal of Open Space lands, which would be subject to all applicable Open Space charter provisions. The motion passed unanimously.

Motions passed 4-0, Dunbar absent.

WRAB 2014 Motions:

- Recommend that City Council accept the 'West Valley Improvements and Arapahoe Detention Phases' of the South Boulder Creek Major Drainageway Plan and the 'Regional Detention at U.S. 36 with Downstream Improvements' as the recommended alternative to mitigate flood risks associated with South Boulder Creek.
- Recommends proceeding with the 'Regional Detention at US 36' component of the alternative only after looking at alternatives which may have lesser potential for environmental impacts, and which may provide faster and less costly opportunities for equivalent mitigation in that area, such as use of CU property detention, private property detention, and eminent domain options.

The motions passed unanimously (5-0).

A summary of the South Boulder Creek flood mitigation project along with Board recommendations were presented to City Council at a Study Session in September 2014. City Council supported development of additional alternatives involving CU South to reduce potential environmental impacts.

PUBLIC FEEDBACK:

Conceptual alternatives were initially presented at a public meeting in March 2010. Refined alternatives were then presented at a second public meeting in September 2010. A public open house was conducted just prior to the August 18, 2014 WRAB meeting to present the recommended plan and answer questions. Two OSBT meetings were also held in 2014 and there were public comments at both meetings.

The "South Boulder Creek Action Group", comprised of residents in the Frasier Meadows area, has met with several City Council members, several WRAB members, and city staff. They also presented a 15-minute video to the OSBT at the board's April 8, 2015 meeting. Approximately 65 residents from the Frasier Meadows area attended the April 27, 2015 WRAB meeting. Several residents spoke at the meeting and also presented a video of the 2013 flood.

A meeting with the OSBT was held on May 13, 2015. Prior to that meeting, staff was available to provide information about the seven options for providing regional detention at US 36.

BACKGROUND:

In the mid-1990s, CU evaluated the purchase of land located at US 36 and Table Mesa Drive. During this evaluation, inaccuracies in the 1986 regulatory flood mapping were discovered. Studies commissioned by the city and the Urban Drainage and Flood Control District (UDFCD) revised the 100-year floodplain and estimated that a 100-year storm event would result in approximately $215 million in damages in the South Boulder Creek drainage basin. During the 2013 flood, South Boulder Creek overtopped US 36. Reported property damage in the South Boulder Creek floodplain was the greatest of all the city's 15 major drainageways. Additional background information can be found on the South Boulder Creek Major Drainageway Flood Mitigation Project web site (www.southboulder creek.com) and in the study report (Draft South Boulder Creek Major Drainageway Plan).

The South Boulder Creek Flood Mitigation Planning Study began in early 2010 and is being funded by the city and the UDFCD. The study, completed by an engineering consulting firm, focused on developing and evaluating alternatives to mitigate flood hazards affecting structures and areas within the current incorporated city limits, primarily within the West Valley area (see **Attachment A).**

Conceptual alternatives which were initially developed included a wide range of flood mitigation measures. These concepts were then presented at a public meeting and to the WRAB in 2010. The concepts were subsequently screened based on input received at the meeting, hydraulic modeling and field visits. The results were used to formulate 15 alternative plans. Concept-level sizing, configurations and costs were developed for each of these 15 plans along with an estimate of likely benefits and environmental and social impacts. From this information, nine "Best Alternative Plans" were developed. These alternatives were presented at a second public meeting and to the WRAB in 2010. The WRAB recommended moving forward with the following four alternatives:

1. Maintaining the status quo;
2. High Hazard Zone mitigation and critical facility protection;
3. Regional detention at US 36 with downstream improvements; and
4. Distributed regional detention.

In 2014, a draft recommended plan was presented to the public, WRAB and OSBT and to City Council at a Study Session. The recommended plan included the following phases:

1. A regional stormwater detention facility at US 36;
2. West Valley improvements including a stormwater detention facility at or near Manhattan Middle School, a small stormwater detention storage area at the intersection of Foothills Parkway and Baseline Road, and placing a segment of Dry Creek No. 2 Ditch in a 72-inch diameter pipe;
3. A stormwater detention facility located at Flatirons Golf Course.

Both Boards made motions to recommend that City Council accept the second and third phases of the recommended plan but did not support the Phase I regional detention concept without first evaluating other options to reduce environmental and other Open Space impacts. Additionally, City Council directed staff to involve CU in discussions to develop a US 36 regional stormwater detention facility which would use more of their land in order to effectively reduce environmental and other Open Space impacts (see Board and Commission Feedback section above).

In response to the direction given by council, six new options for detention at US 36 have been developed. From a technical aspect, *all* options function to effectively mitigate flooding from South Boulder Creek in the same capacity. Construction of all the phases of the recommended alternative would eliminate overtopping of US 36 and subsequent flooding in the West Valley during a major storm event and all of the options reduce impacts to environmental resources and to Open Space compared to the 2014 recommended plan.

City Utilities and OSMP staff met with CU and on several occasions to discuss these options and to obtain their feedback. In those meetings, as well as at the 2014 public meetings, CU has stated they are willing to consider use of a portion of the CU South parcel for flood mitigation. In addition, staff has also met with CDOT to discuss an option that would use existing ROW. CDOT has stated that it would be willing to work with the city to develop an agreement for use of existing ROW for this project.

The CU-South Boulder Campus property consists of 302 acres. This property is located outside of city limits in Boulder County. CU developed a conceptual master development plan for this property in 2004. CU's master plan for this property identifies areas for building potential, flood storage, natural areas, ponds, and access points. This plan has not gone through any city review processes, nor has it been endorsed by the city. The 2010 Boulder Valley Comprehensive Plan (BVCP) currently designates the majority of CU South parcel as open space (214 acres) but also includes low- and medium density residential designation (27 and 67 acres, respectively). The property is located in Area II which are lands where the city anticipates future annexations. If City Council supports a flood mitigation alternative that requires land use discussions with CU, it is anticipated that those discussions would be integrated into the BVCP update that is currently underway.

ANALYSIS:

Based on feedback from the 2014 public process, six new and *very conceptual* options for stormwater detention at US 36 have been developed. As a result, engineering features and anticipated resource impacts presented in this memorandum are master planning level, but all of the options would prevent the overtopping of US 36 from a 100-year design storm. To avoid confusion in relationship to previously considered flood mitigation alternatives, the seven concepts for providing stormwater detention at US 36 are labeled as Options (A-G). Option A is the concept presented in 2014.

The options are variations of single and dual berm detention systems. Three dual berm detention options have been developed that include varying degrees of fill and excavation (Options E, F, and G). The dual berm detention system would require breaching the

existing CU South levee and constructing an open channel segment within the CU South parcel. Staff has concerns with these options because debris could block the breach in the levee which would then prevent water from reaching the secondary detention basin.

Three options have been developed that modify the single berm system (Option A) presented in 2014 (Options B, C, and D). These options also vary in the degree of fill and excavation. It should be noted that only Option A (the 2014 option) impacts federally designated Preble's Meadow Jumping Mouse (PMJM) critical habitat along South Boulder Creek. However, all other options would impact habitat occupied by PMJM. Impacts to PMJM habitat from Option D have already been mitigated by CDOT. **Attachment B** illustrates Options A through G. **Table 1.0** presents a comparison of analysis factors for the options including environmental impact.

Table 1.0: Summary Comparison of Conceptual Stormwater Detention Options Upstream of US 36
Green = lowest impacts of options compared
Yellow = medium impact relative to other options compared
Red = greatest impact of options compared

Option	Total Impacts to CU Parcel[1] (acres)	Total Berm impacts to OSMP (acres)	Total Detention on OSMP[2](acres)	Maximum Berm Height (feet)	Est. Cost ($millions)	Est. Benefit ($millions)	Est. Benefit to Cost Ratio
A – 2014 Option	56	5	35	34.5	24	26.5	1.1
B - Single Berm with Excavation	90	2	5	27.5	21.5	26.5	1.2
C – Single Berm with Excavation and Fill	80	3	17.5	30.5	22.5	26.5	1.2
D – Single Berm CDOT ROW	79	0	19	30.5	22	26.5	1.2
E- Dual Berm no Excavation	142	1	3.5	26.5	26	27[3]	1
F – Dual Berm with Excavation	100	2	5	27.5	31	27	0.9
G – Dual Berm with Excavation and Fill	99	0.5	8.5	28.5	34.5	27	0.8

[1] Includes berm footprint and detention storage area
[2] Includes only the storage pool area, not the current 100-year floodplain area
[3]The dual berm options do not reduce the floodplain downstream, but do reduce the flood depth in certain locations. Thus, the additional benefits from the dual berms reflect a decrease in damage from flooding, but it is still assumed that the structures in this area do experience some damage.

CU has stated that their preferred regional detention plan is Option A because it uses the least amount of university land compared to other options. CU has expressed an interest in working with the City to identify potential sites on their property where environmental impacts associated with Option A could be mitigated and additional enhancements could potentially be provided. However, staff does not believe that this approach is consistent with prior direction from Council and feedback from the boards. While Option D does impact more of CU's land, CU has indicated that they are willing to consider this option. CU is also open to discussing Option G, but staff does not recommend any dual berm configurations due to their cost, visual impacts, and relatively low benefit to cost ratio.

Staff recommends including Phases 2 and 3 unmodified as conceptually presented in 2014 in the final mitigation plan. Staff also recommends moving forward with Option D (single berm using CDOT Right of Way) as the concept for providing regional stormwater detention to prevent overtopping of US 36 during a 100-year design storm. This alternative would provide the least direct impact to OSMP lands and environmental resources from berm construction.

This "CDOT ROW" option calls for modifying the multi-use path that CDOT is currently constructing within land it owns. CDOT has already mitigated for environmental impacts for use of this land and therefore staff anticipates little or no mitigation for modification of the path for the regional stormwater detention berm would be needed.

The multi-use path would need to be modified including constructing walls and raising the path to a maximum height of 9' above US 36 (it is currently being constructed at grade to approximately 2' lower than the highway). Conceptually all permanent features could fit within the existing CDOT ROW, but the design phases would need to confirm this assumption and identify any possible temporary impacts that would need to be mitigated during construction.

CDOT representatives have stated that should the ultimate US 36 configuration be constructed, additional lanes could be built on the north side of the existing highway and within their existing ROW. This would eliminate the need to remove and replace the path a second time, and would leave the berm unaffected.

CDOT has also indicated in writing that they are agreeable to the city's *request to consider* developing an agreement to use a portion of the US 36 Phase 2 Bikeway located within CDOT ROW to function as a berm provided that the mainline of US 36 and the permanent water quality features remain intact. The estimated cost for this option is $22 million with a B/C ratio of 1.2.

CU has also indicated they are willing to engage in discussion to move forward with implementation of Option D. If this recommendation is accepted by City Council, the plans would be refined according to agreements reached with CDOT and CU. This mitigation plan would then need to be reviewed through the Community Environmental Assessment Process (CEAP) and the berm would need to be reviewed and approved by the Office of the State Engineer.

However, the Boards could recommend and City Council could accept other options for South Boulder Creek flood mitigation. **Table 2.0** below presents a summary of the anticipated next steps resulting from potential City Council decisions.

Table 2.0: Summary of Approval Processes

Council Decision	Environmental Process	CU Agreements	CDOT Agreements	Comp Plan Updates	Outcomes: # Structures in 100-Yr. Floodplain within city limits
Status Quo	None	None	None	None	442
Phase II and III Approved but US 36 Detention not Approved	CEAP	None	None	None	442
Staff Recommended Option D with Phases II and III Approved	CEAP[1]/OSE[2]	Yes	Yes	Yes	80
Option C with Phase II and III Approved	EA or EIS/OSE	Yes	No	Yes	80
Option A with Phases II and III Approved	EIS/OSE	Yes	No	Yes	80
Any of Options B, E, F, or G with Phase II and III Approved	EA or EIS/OSE	Yes	No	Yes	80

1. Assumes Option D can be constructed with no impacts to Threatened or Endangered Species or regulated wetlands.
2. Office of State Engineer review and approval of the detention facility.

Any City Council acceptance of a capital improvement project will also require a design phase and floodplain remapping submittals to FEMA, and may require wetland permits and USFWS consultation.

The remaining options are not being recommended at this time as they all have similar or greater berm and associated environmental impacts to OSMP lands. All other options, except for Option A, have greater impact on CU's property. Additionally, all of the dual berm options carry a higher cost and a lower benefit to cost ratio than the single-berm options.

NEXT STEPS:

The revised options and staff recommendation along with the WRAB and OSBT motions will be presented to City Council on Aug. 4, 2015. Should City Council accept the South Boulder Creek Flood Mitigation Plan with Option D as the concept for US 36 regional detention, city staff will initiate discussions with CU and CDOT in order to further refine the plans. Consideration of changes to the land use designations on CU Campus South as a component of the BVCP update will also factor into these discussions with CU. A CEAP will also be initiated once plans reach the appropriate stage of refinement.

ATTACHMENTS:

A. Study Area
B. US36 Regional Detention Options A-G

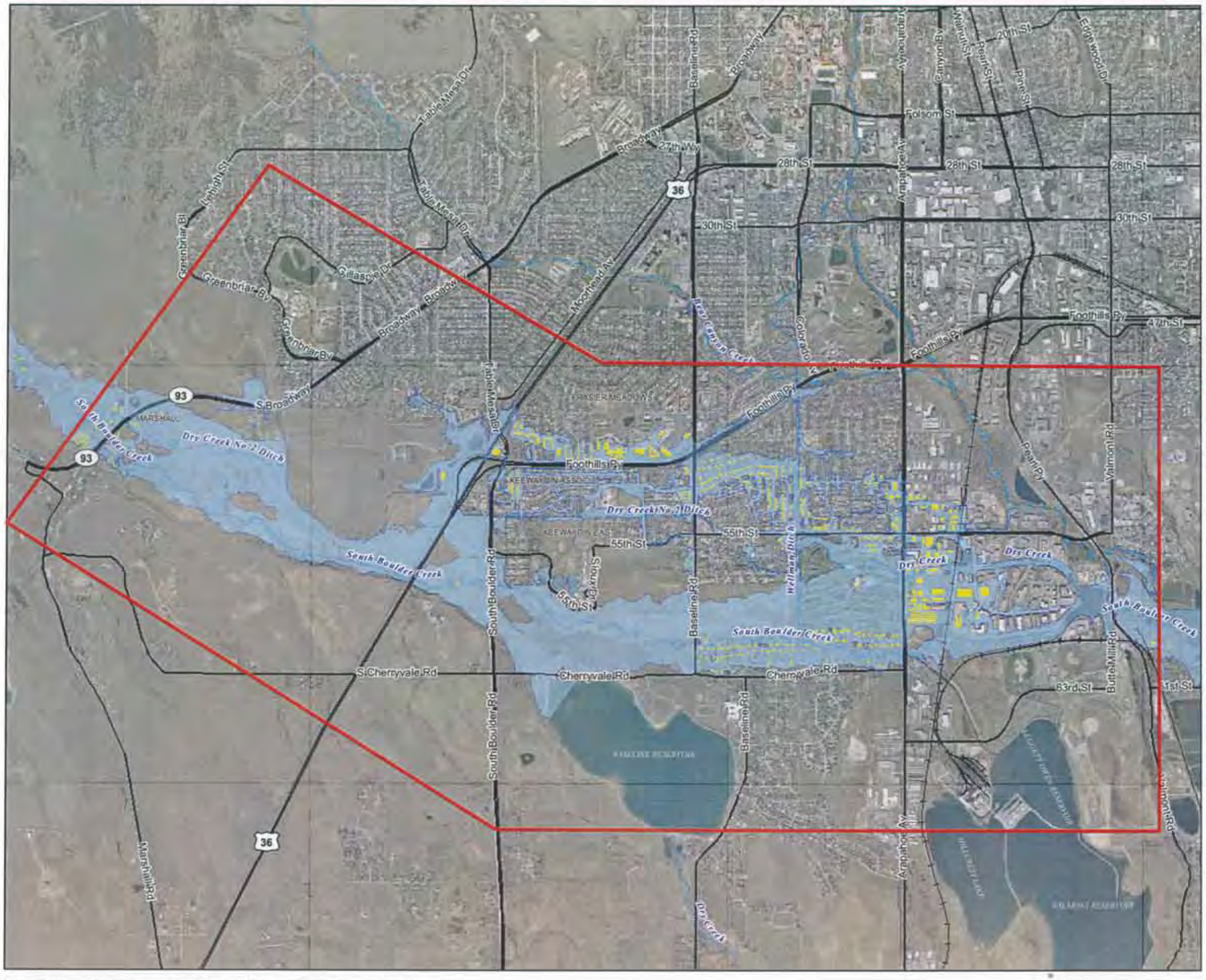


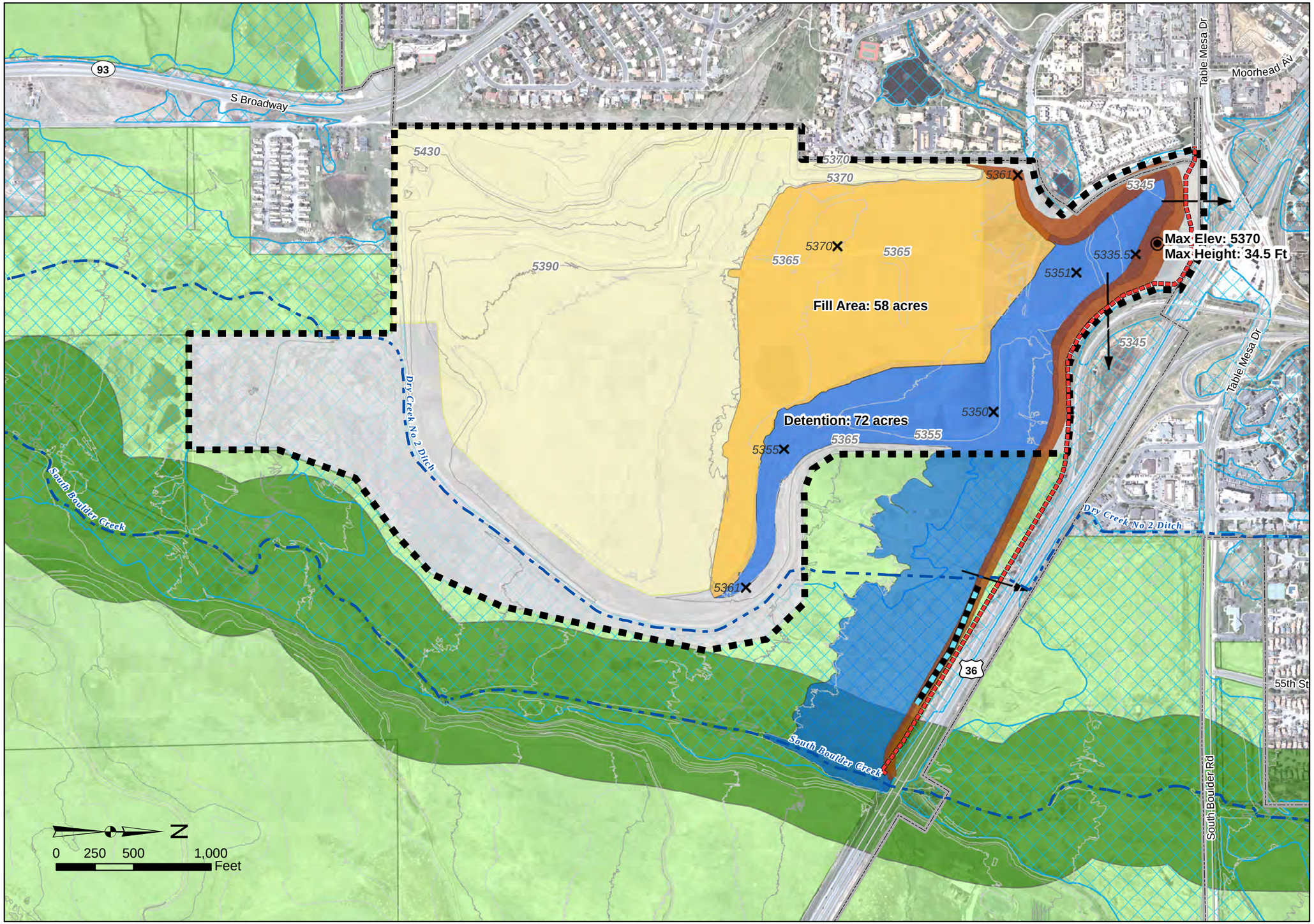
FIGURE 2-2
Revised Regulatory Floodplain
South Boulder Creek Flood Mitigation Report
South Boulder Creek Flood Mitigation Project

CH2MHILL

\\gecko\wtg\400168_South_Boulder_Creek_Phase_A\GIS\MapFiles\Report\Figure 4-4 Floodplain Figure.mxd

Stormwater Detention Upstream of US36

South Boulder Creek Flood Mitigation Project



Option A

Alternative presented to WRAB in 2014

Single Berm
No excavation
With fill
On CU and OSMP property
Max Berm Height 34.5ft

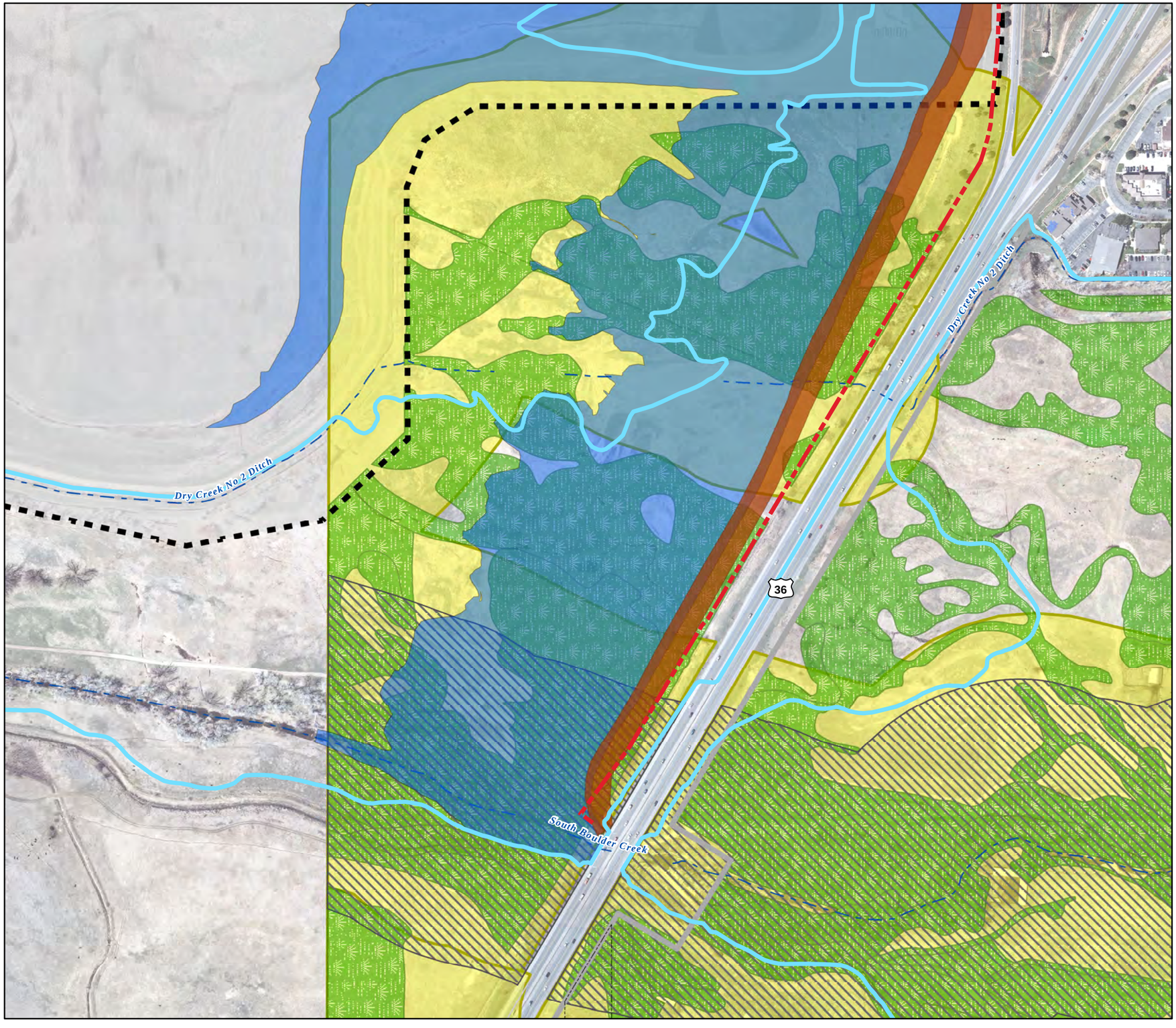
Description	Acres
Total CU Property	302
CU Property Impacted	56
CU Building Potential Impacted	6
OSMP Property Impacted	40

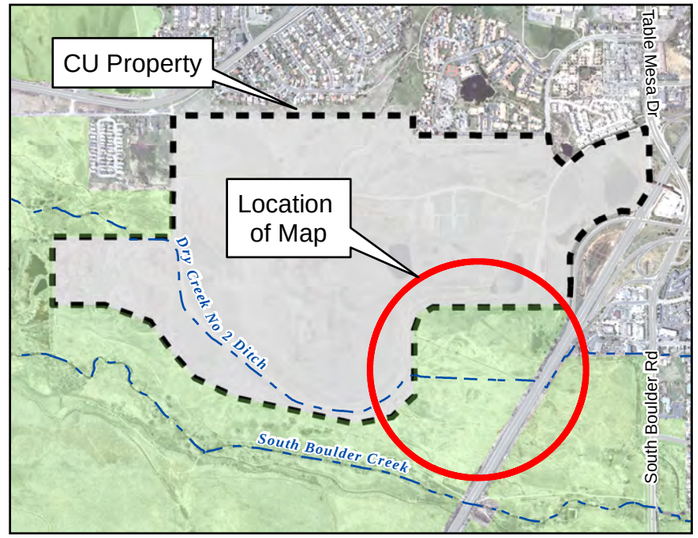
Proposed Conditions

- New Berm
- Pool Contained By Fill or Cut Slope
- Limits of Excavation
- Detention Pond Area
- Fill Area
- Out of 100yr Inundation
- Spot Elevation
- Max Berm Elevation
- Discharge Location
- Spillway

Existing Conditions

- Boulder City Limits
- CDOT Existing ROW
- CU Site Boundary
- OSMP Property
- Prebles Critical Habitat Area
- Effective 100 Year Floodplain
- 5 Foot Contours
- 10 Foot Contours





LEGEND

- CDOT Existing ROW
- CU Site Boundary
- New Berm
- Detention Pond Area
- Boulder City Limits
- Preble's Critical Habitat
- Preble's Conservation Zone
- OSMP Wetland Riparian Data
- Effective 100 Year Floodplain
- Streams, Creeks and Ditches

Option A: Proposed Berm

Approximate Maximum Width Base &
Approximate Detention Pond
Impacts to OSMP Land

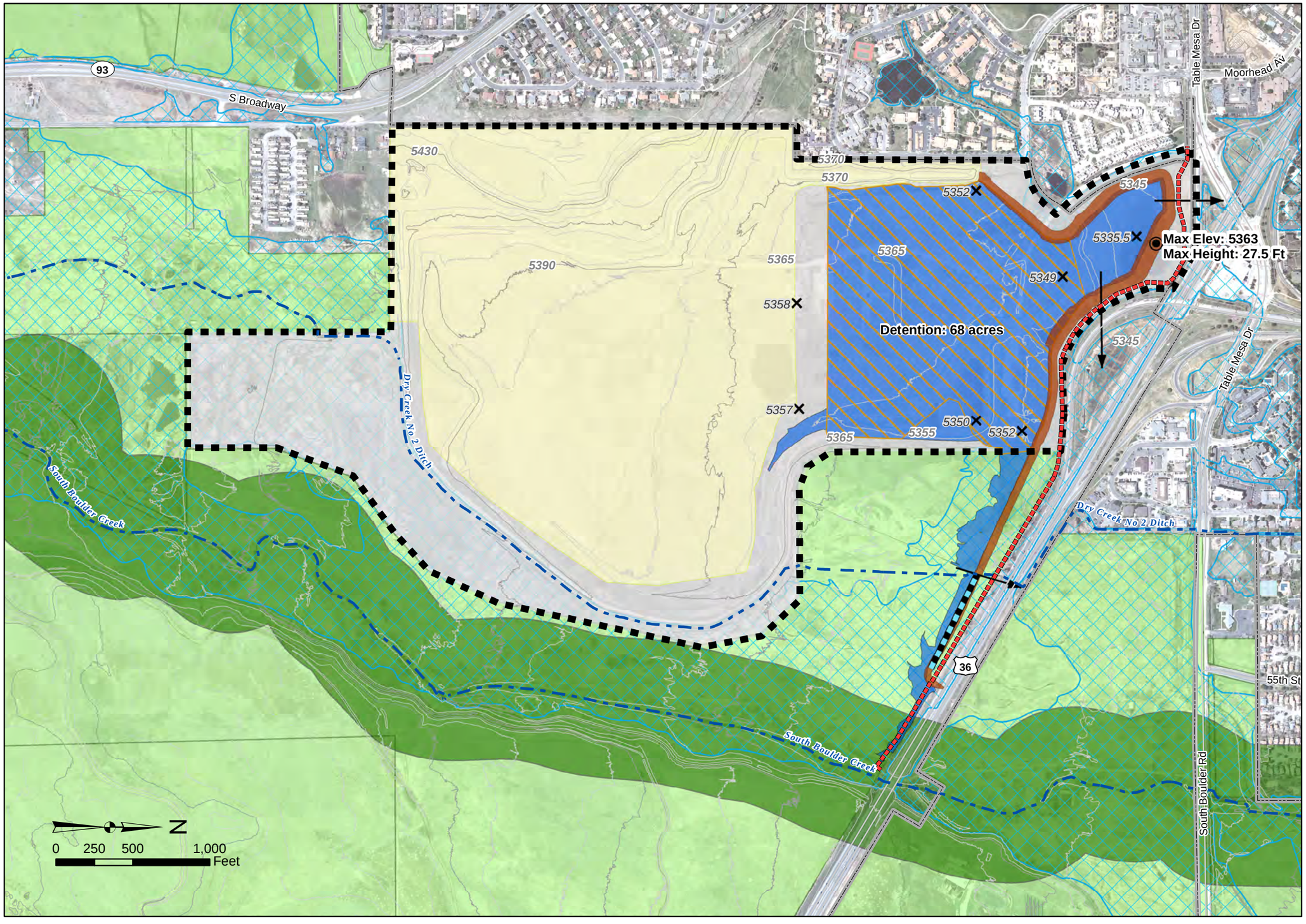
South Boulder Creek Flood Mitigation Project

N

0 125 250 500 750 1,000 Feet

Stormwater Detention Upstream of US36

South Boulder Creek Flood Mitigation Project



Option B

Single Berm
With excavation
No Fill
On CU and OSMP property
Max Berm Height 27.5ft
Berm length shortened to avoid critical habitat

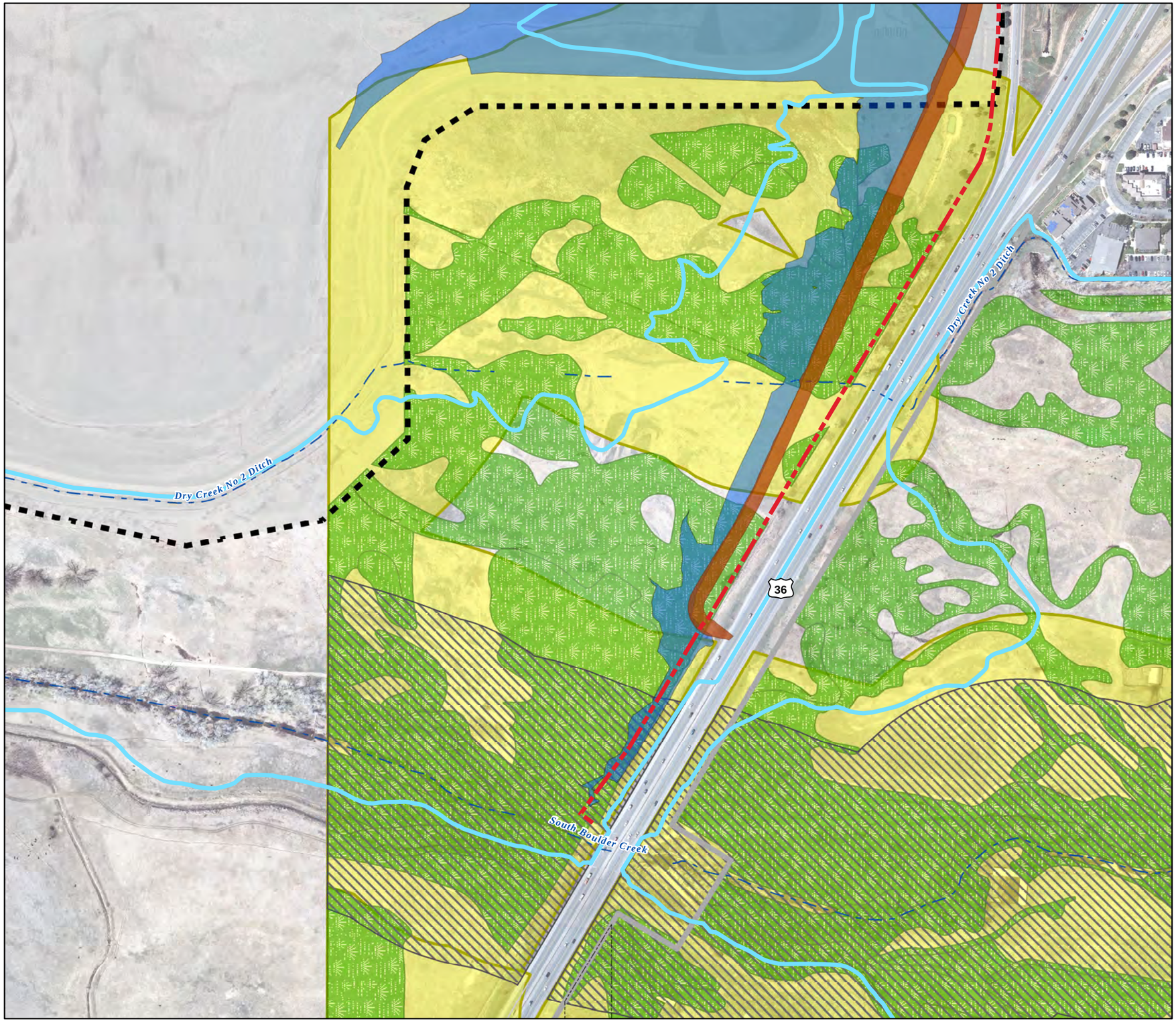
Description	Acres
Total CU Property	302
CU Property Impacted	90
CU Building Potential Impacted	36
OSMP Property Impacted	7

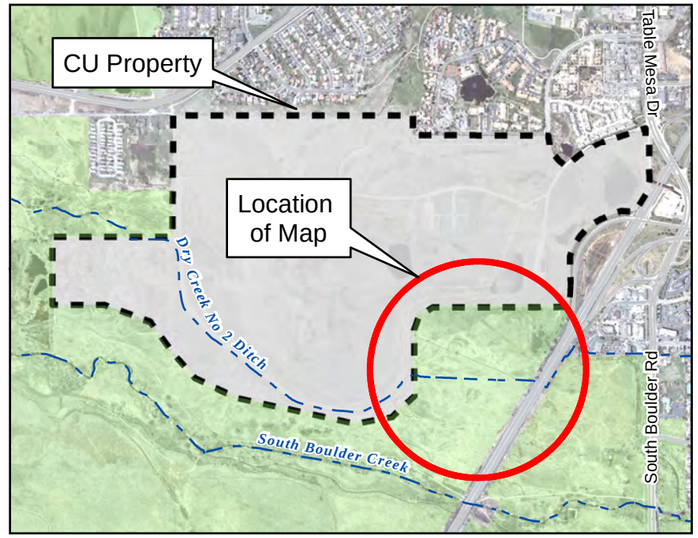
Proposed Conditions

- New Berm
- Pool Contained By Fill or Cut Slope
- Limits of Excavation
- Detention Pond Area
- Fill Area
- Out of 100yr Inundation
- Spot Elevation
- Max Berm Elevation
- Discharge Location
- Spillway

Existing Conditions

- Boulder City Limits
- CDOT Existing ROW
- CU Site Boundary
- OSMP Property
- Prebles Critical Habitat Area
- Effective 100 Year Floodplain
- 5 Foot Contours
- 10 Foot Contours





LEGEND

- CDOT Existing ROW
- CU Site Boundary
- New Berm
- Detention Pond Area
- Boulder City Limits
- Preble's Critical Habitat
- Preble's Conservation Zone
- OSMP Wetland Riparian Data
- Effective 100 Year Floodplain
- Streams, Creeks and Ditches

Option B: Proposed Berm

Approximate Maximum Width Base & Approximate Detention Pond Impacts to OSMP Land

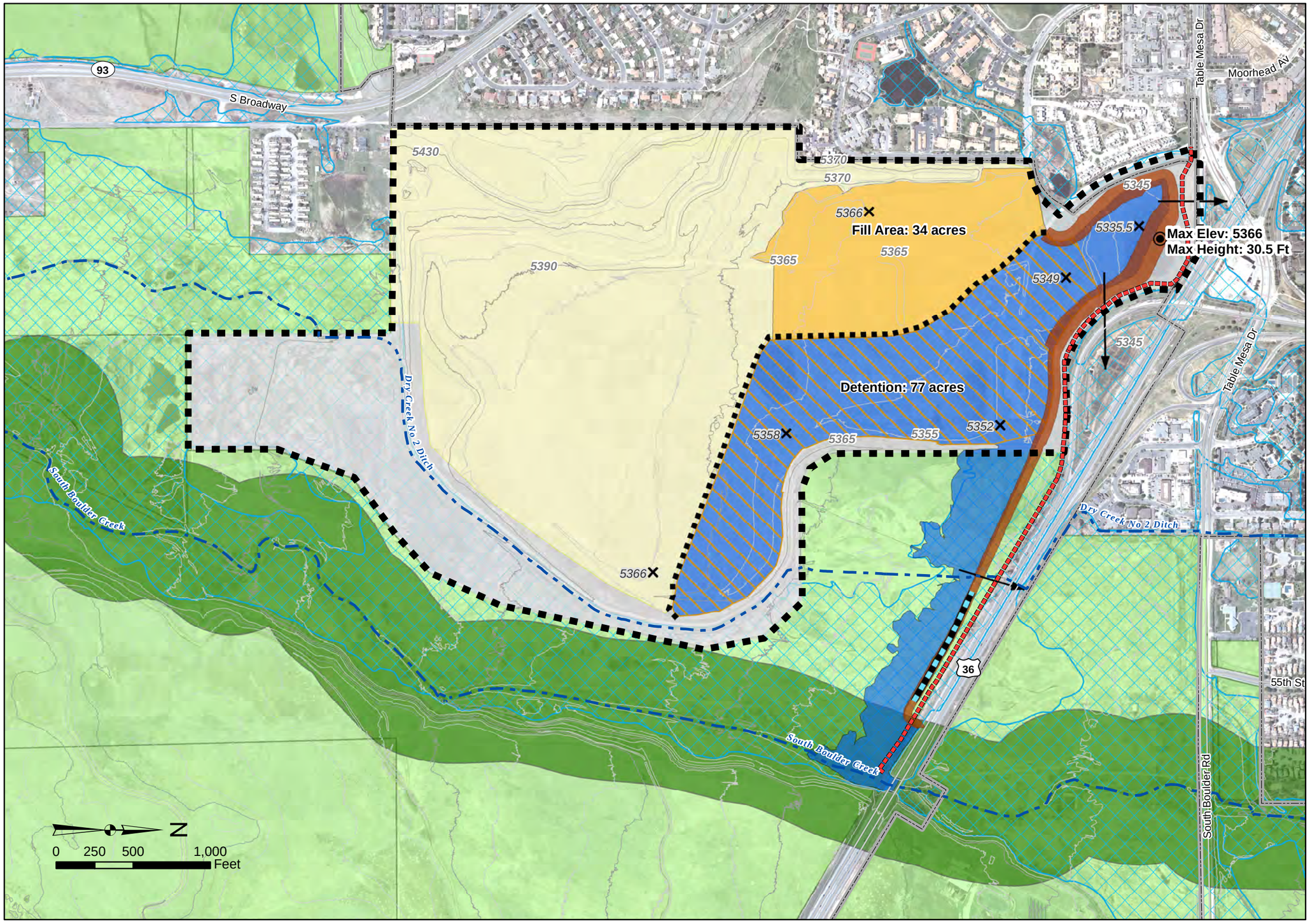
South Boulder Creek Flood Mitigation Project

N

0 125 250 500 750 1,000 Feet

Stormwater Detention Upstream of US36

South Boulder Creek Flood Mitigation Project



Option C

Single Berm
With excavation
With fill
On CU and OSMP property
Max Berm Height 30.5ft

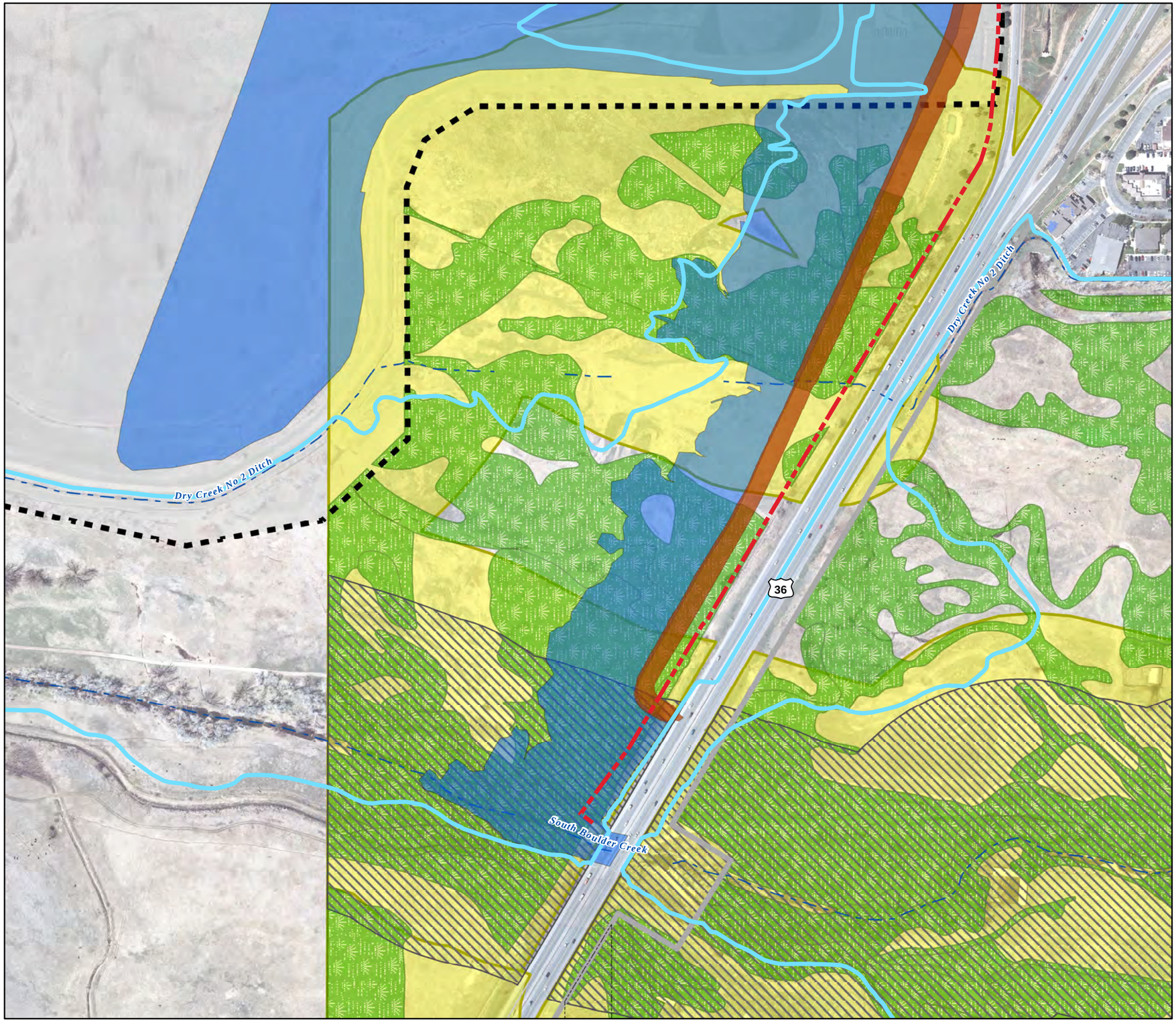
Description	Acres
Total CU Property	302
CU Property Impacted	80
CU Building Potential Impacted	30
OSMP Property Impacted	20

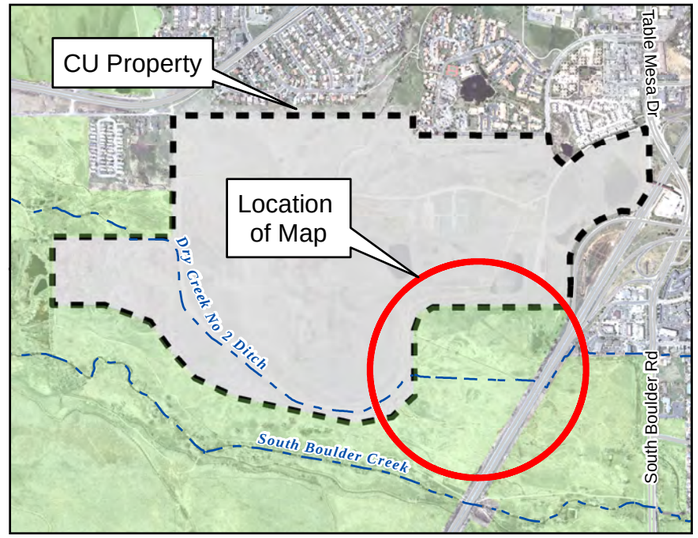
Proposed Conditions

- New Berm
- Pool Contained By Fill or Cut Slope
- Limits of Excavation
- Detention Pond Area
- Fill Area
- Out of 100yr Inundation
- Spot Elevation
- Max Berm Elevation
- Discharge Location
- Spillway

Existing Conditions

- Boulder City Limits
- CDOT Existing ROW
- CU Site Boundary
- OSMP Property
- Prebles Critical Habitat Area
- Effective 100 Year Floodplain
- 5 Foot Contours
- 10 Foot Contours





LEGEND

- CDOT Existing ROW
- CU Site Boundary
- New Berm
- Detention Pond Area
- Boulder City Limits
- Preble's Critical Habitat
- Preble's Conservation Zone
- OSMP Wetland Riparian Data
- Effective 100 Year Floodplain
- Streams, Creeks and Ditches

Option C: Proposed Berm

Approximate Maximum Width Base & Approximate Detention Pond Impacts to OSMP Land

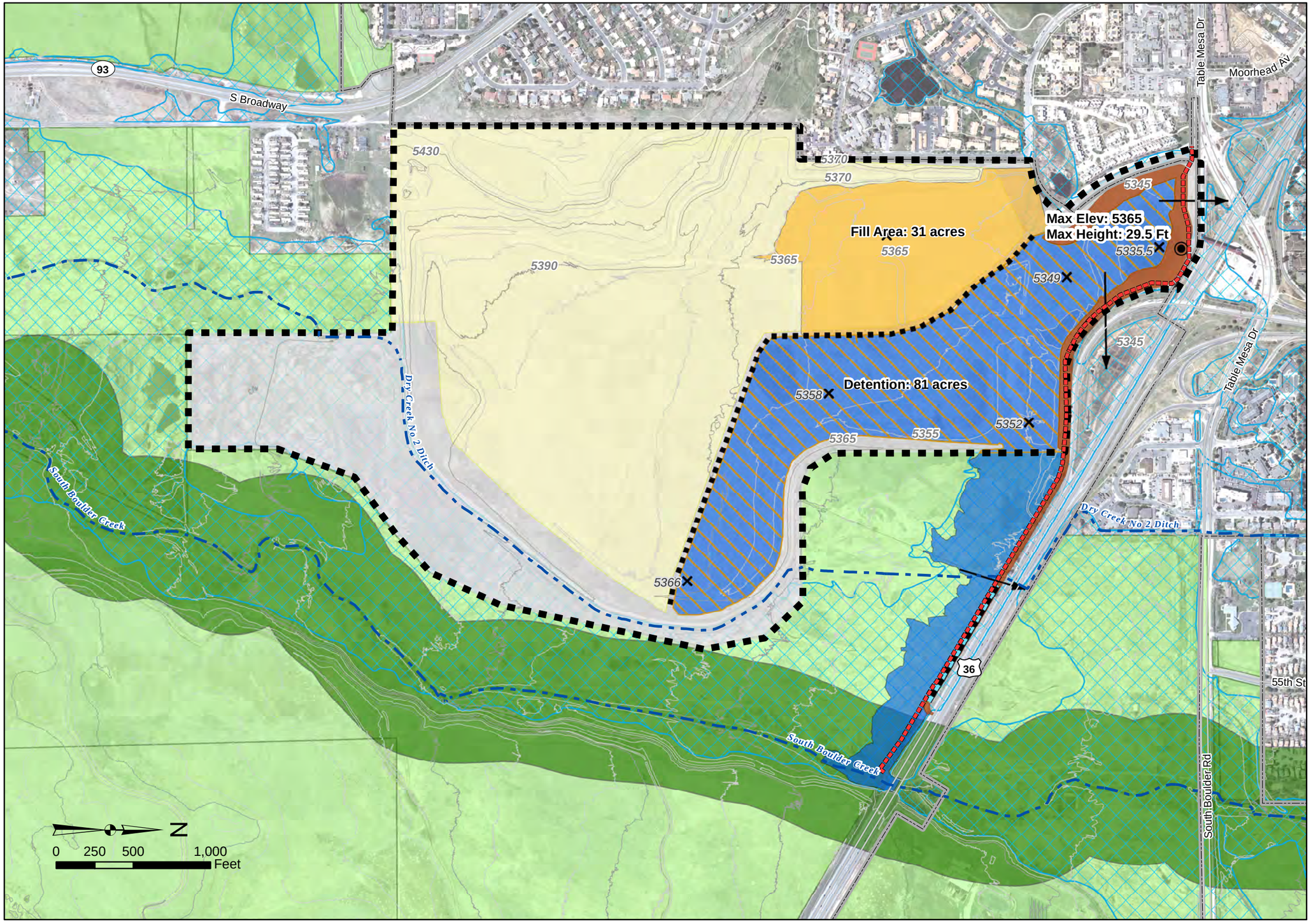
South Boulder Creek Flood Mitigation Project

N

0 125 250 500 750 1,000 Feet

Stormwater Detention Upstream of US36

South Boulder Creek Flood Mitigation Project



Option D

Single Berm
With excavation
With fill
On CU and OSMP property
In CDOT Existing ROW
Max Berm Height 29.5ft

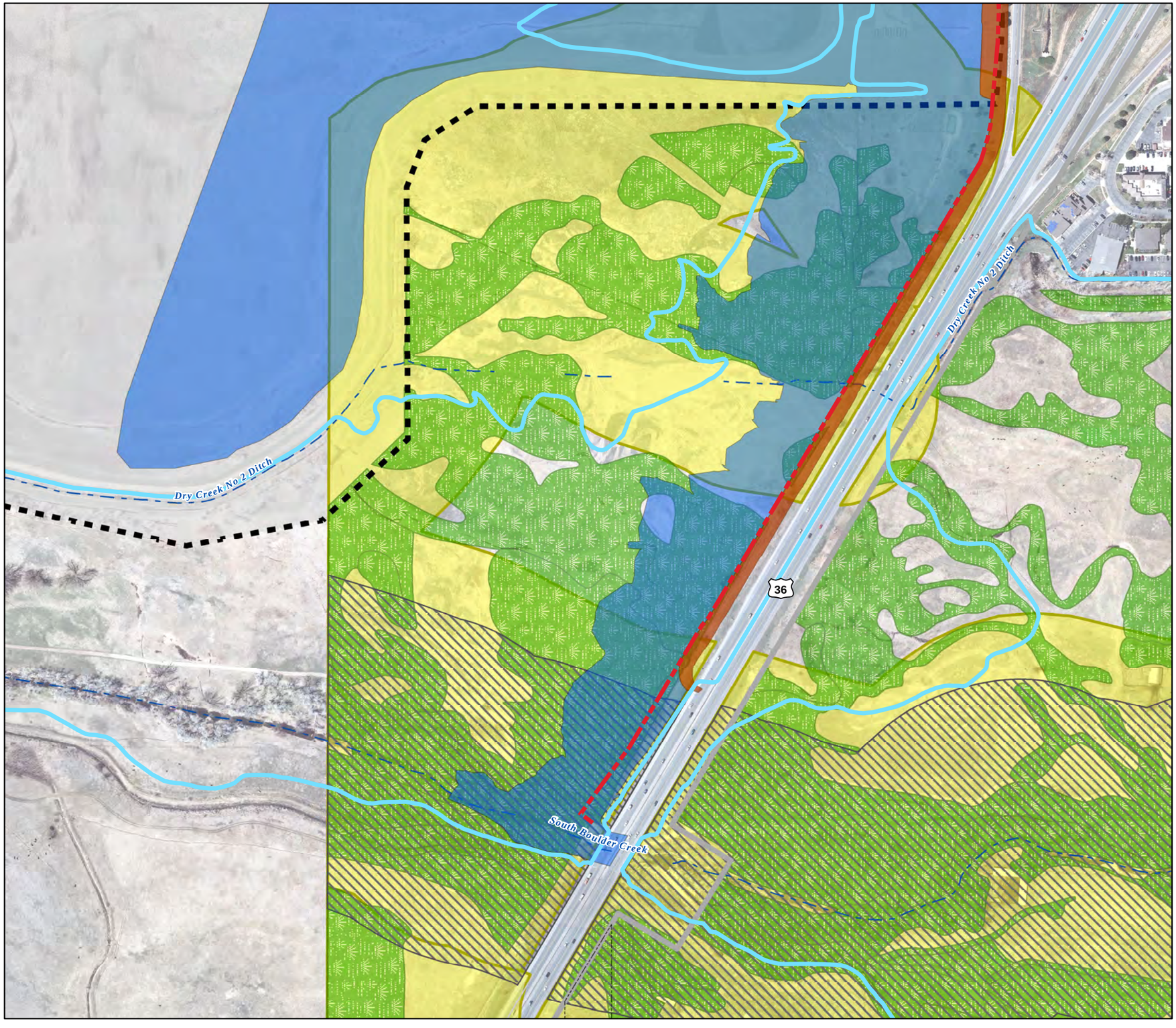
Description	Acres
Total CU Property	302
CU Property Impacted	78
CU Building Potential Impacted	30
OSMP Property Impacted	19

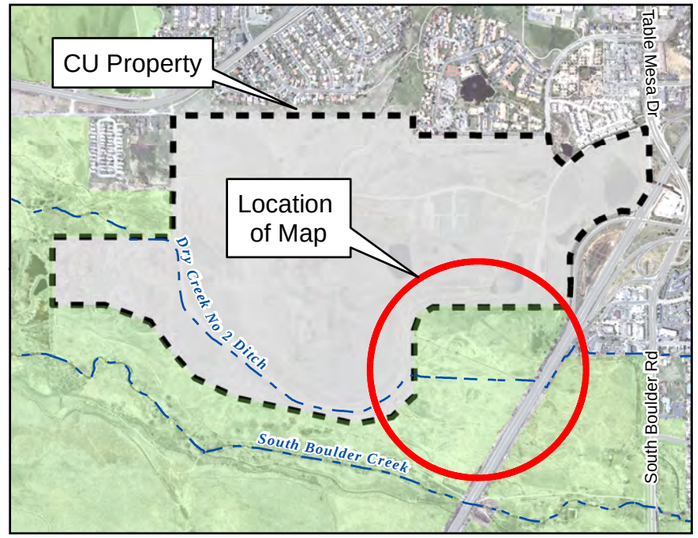
Proposed Conditions

- New Berm
- Pool Contained By Fill or Cut Slope
- Limits of Excavation
- Detention Pond Area
- Fill Area
- Out of 100yr Inundation
- Spot Elevation
- Max Berm Elevation
- Discharge Location
- Spillway

Existing Conditions

- Boulder City Limits
- CDOT Existing ROW
- CU Site Boundary
- OSMP Property
- Prebles Critical Habitat Area
- Effective 100 Year Floodplain
- 5 Foot Contours
- 10 Foot Contours





LEGEND

- CDOT Existing ROW
- CU Site Boundary
- New Berm
- Detention Pond Area
- Boulder City Limits
- Preble's Critical Habitat
- Preble's Conservation Zone
- OSMP Wetland Riparian Data
- Effective 100 Year Floodplain
- Streams, Creeks and Ditches

Option D: Proposed Berm

Approximate Maximum Width Base & Approximate Detention Pond Impacts to OSMP Land

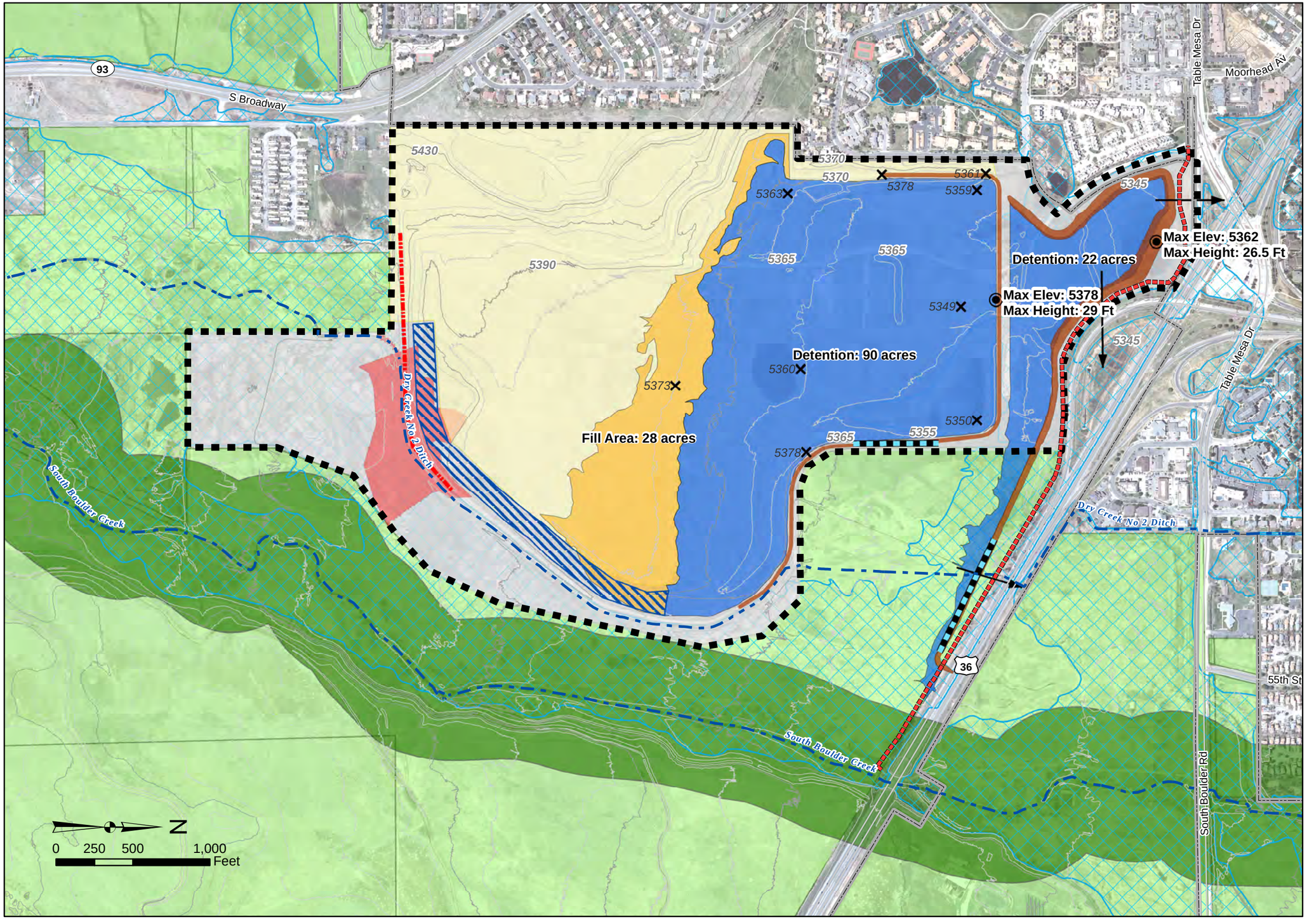
South Boulder Creek Flood Mitigation Project

N

0 125 250 500 750 1,000 Feet

Stormwater Detention Upstream of US36

South Boulder Creek Flood Mitigation Project



Option E

Dual Berm
No Excavation
No Fill
On CU and OSMP property
Max Berm Height 29ft and 26.5ft

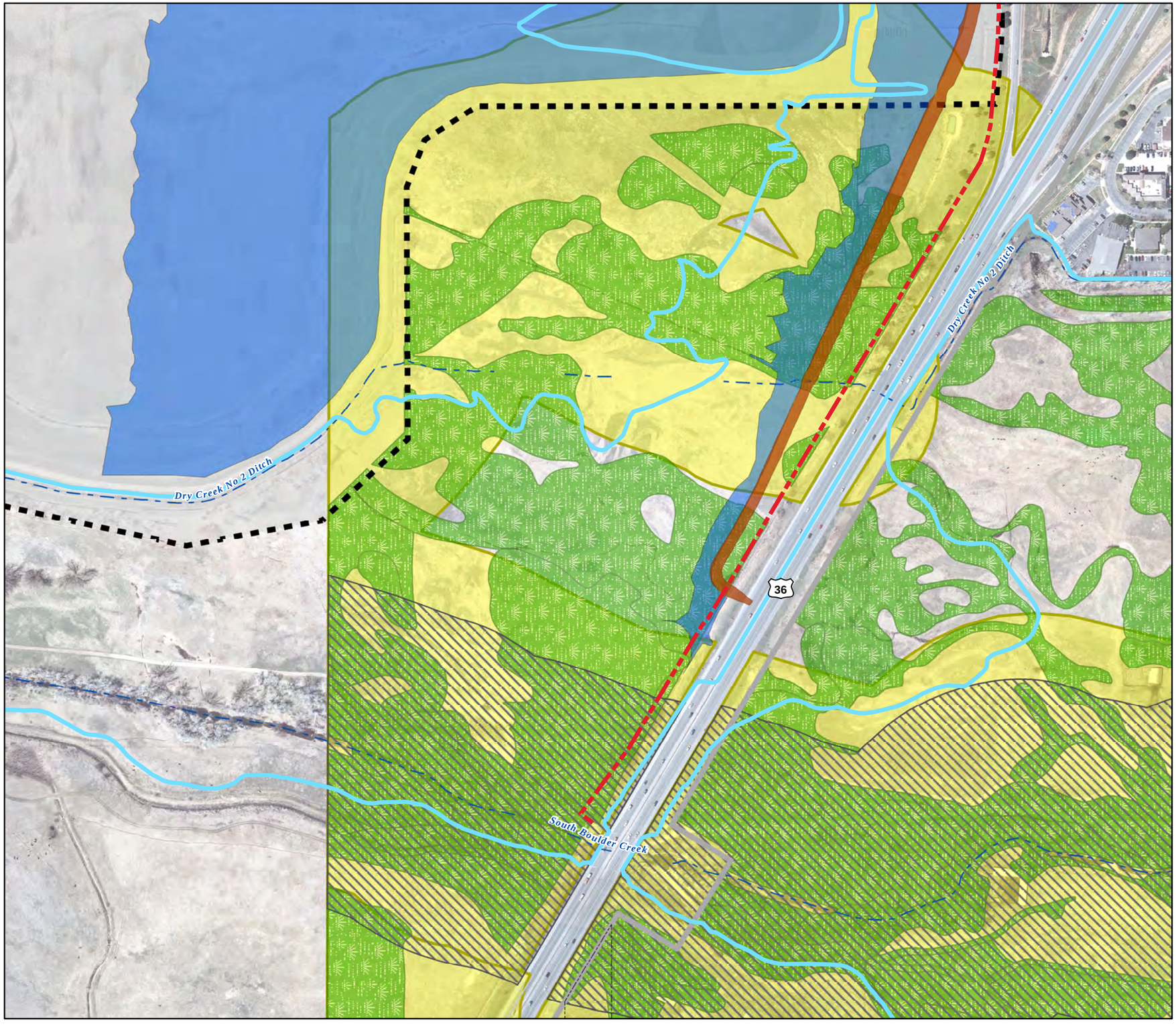
Description	Acres
Total CU Property	302
CU Property Impacted	142
CU Building Potential Impacted	73
OSMP Property Impacted	5

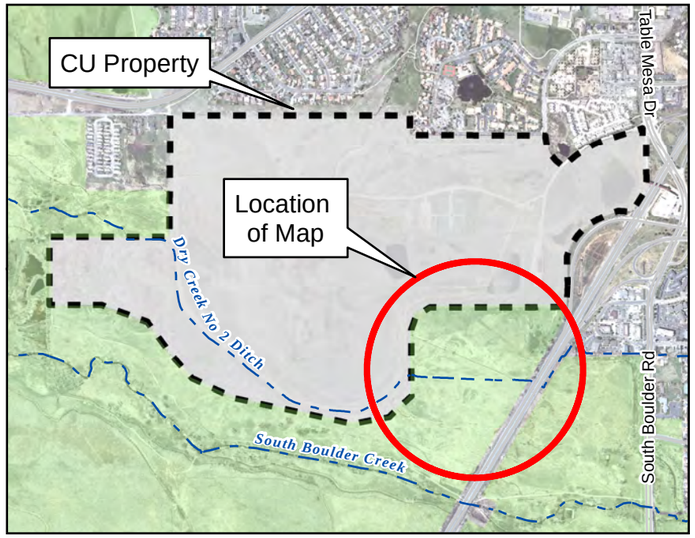
Proposed Conditions

- New Berm
- Limits of Excavation
- Detention Pond Area
- Fill Area
- New Channel
- Remove Existing Berm
- Lower Grade (Allows Flow to Pond)
- Out of 100yr Inundation
- Spot Elevation
- Max Berm Elevation
- Discharge Location
- Spillway

Existing Conditions

- Boulder City Limits
- CDOT Existing ROW
- CU Site Boundary
- OSMP Property
- Prebles Critical Habitat Area
- Effective 100 Year Floodplain
- 5 Foot Contours
- 10 Foot Contours





LEGEND

- CDOT Existing ROW
- CU Site Boundary
- New Berm
- Detention Pond Area
- Boulder City Limits
- Preble's Critical Habitat
- Preble's Conservation Zone
- OSMP Wetland Riparian Data
- Effective 100 Year Floodplain
- Streams, Creeks and Ditches

Option E: Proposed Berm

Approximate Maximum Width Base & Approximate Detention Pond Impacts to OSMP Land

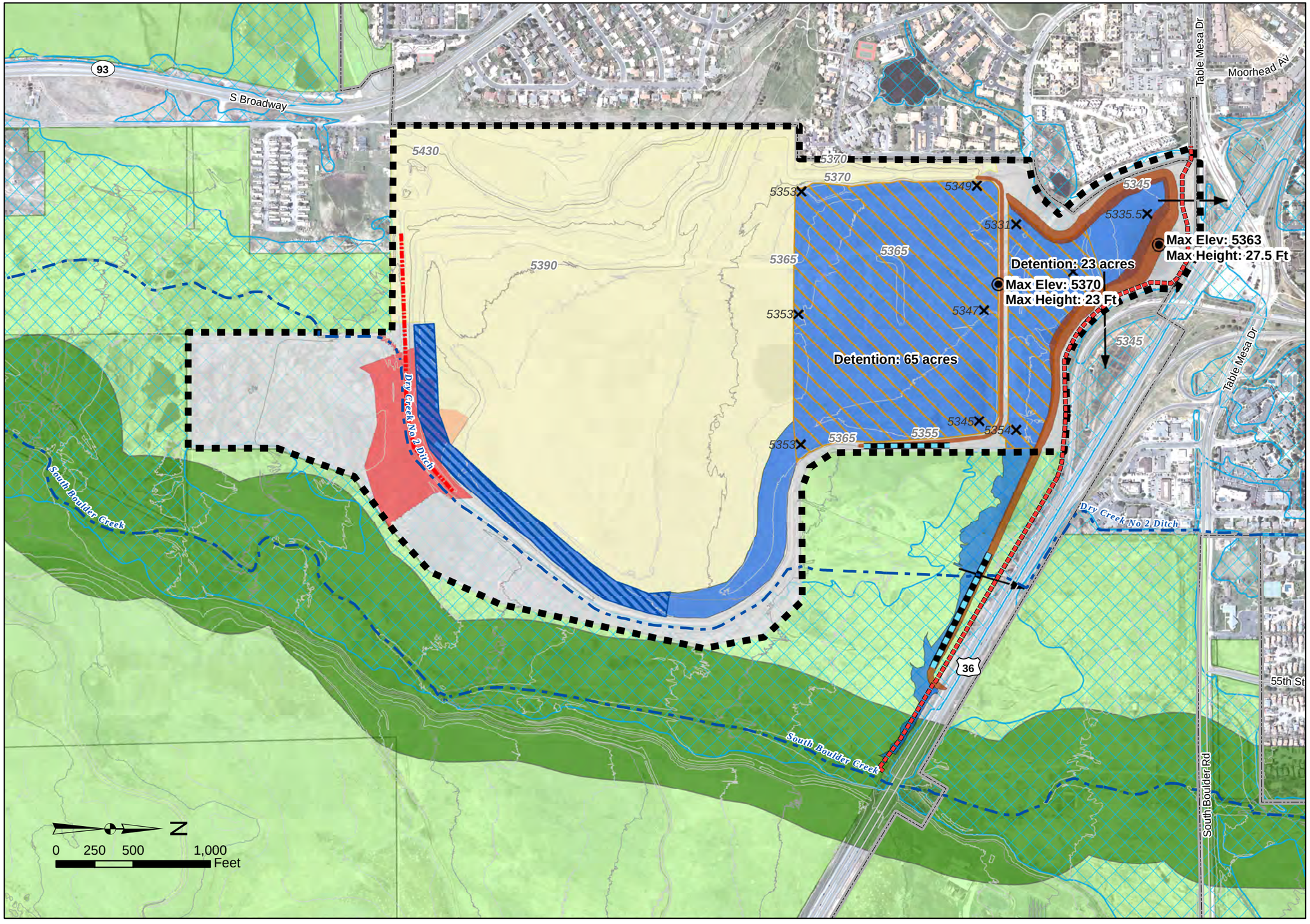
South Boulder Creek Flood Mitigation Project

N

0 125 250 500 750 1,000 Feet

Stormwater Detention Upstream of US36

South Boulder Creek Flood Mitigation Project



Option F

Dual Berm
With Excavation
No Fill
On CU and OSMP property
Max Berm Height 23ft and 27.5ft

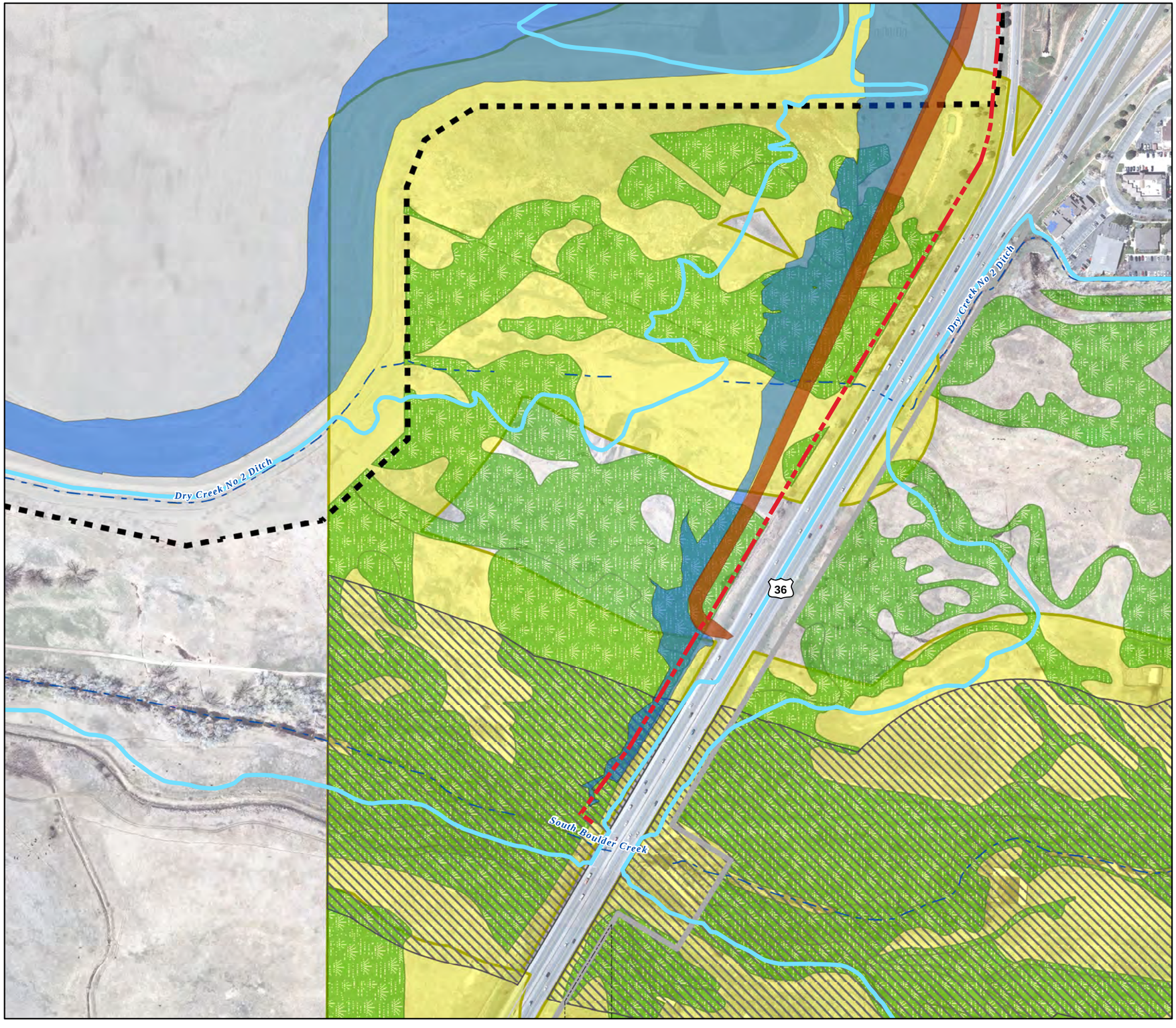
Description	Acres
Total CU Property	302
CU Property Impacted	100
CU Building Potential Impacted	41
OSMP Property Impacted	7

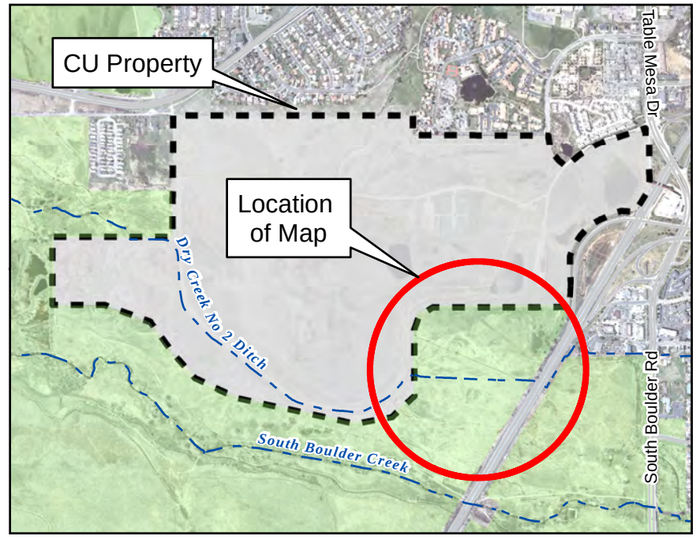
Proposed Conditions

- New Berm
- Limits of Excavation
- Detention Pond Area
- Fill Area
- New Channel
- Remove Existing Berm
- Lower Grade (Allows Flow to Pond)
- Out of 100yr Inundation
- Spot Elevation
- Max Berm Elevation
- Discharge Location
- Spillway

Existing Conditions

- Boulder City Limits
- CDOT Existing ROW
- CU Site Boundary
- OSMP Property
- Prebles Critical Habitat Area
- Effective 100 Year Floodplain
- 5 Foot Contours
- 10 Foot Contours





LEGEND

- CDOT Existing ROW
- CU Site Boundary
- New Berm
- Detention Pond Area
- Boulder City Limits
- Preble's Critical Habitat
- Preble's Conservation Zone
- OSMP Wetland Riparian Data
- Effective 100 Year Floodplain
- Streams, Creeks and Ditches

Option F: Proposed Berm

Approximate Maximum Width Base & Approximate Detention Pond Impacts to OSMP Land

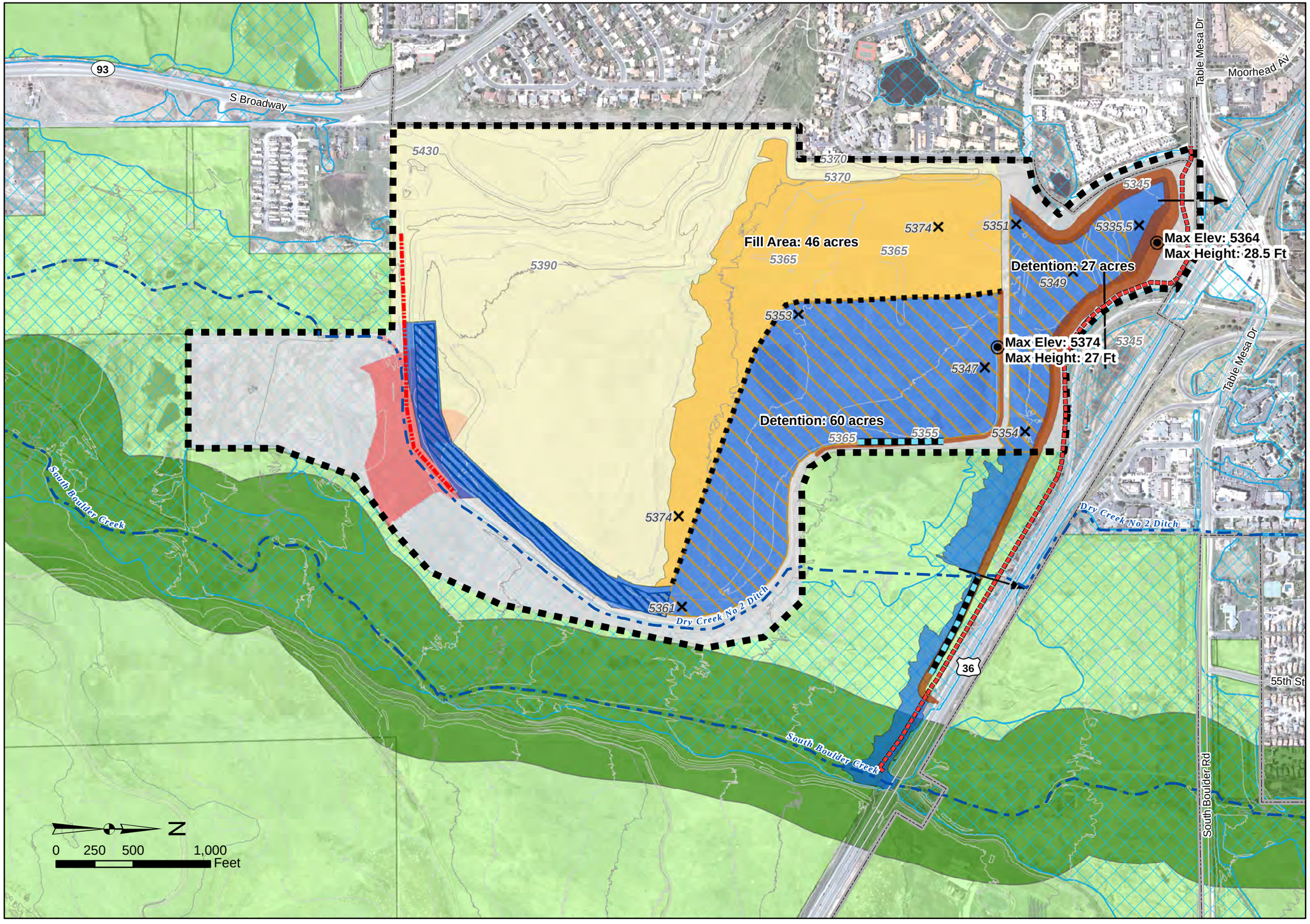
South Boulder Creek Flood Mitigation Project

N

0 125 250 500 750 1,000 Feet

Stormwater Detention Upstream of US36

South Boulder Creek Flood Mitigation Project



Option G

Dual Berm
With Excavation
With fill
On CU and OSMP property
Max Berm Height 27ft and 28.5ft

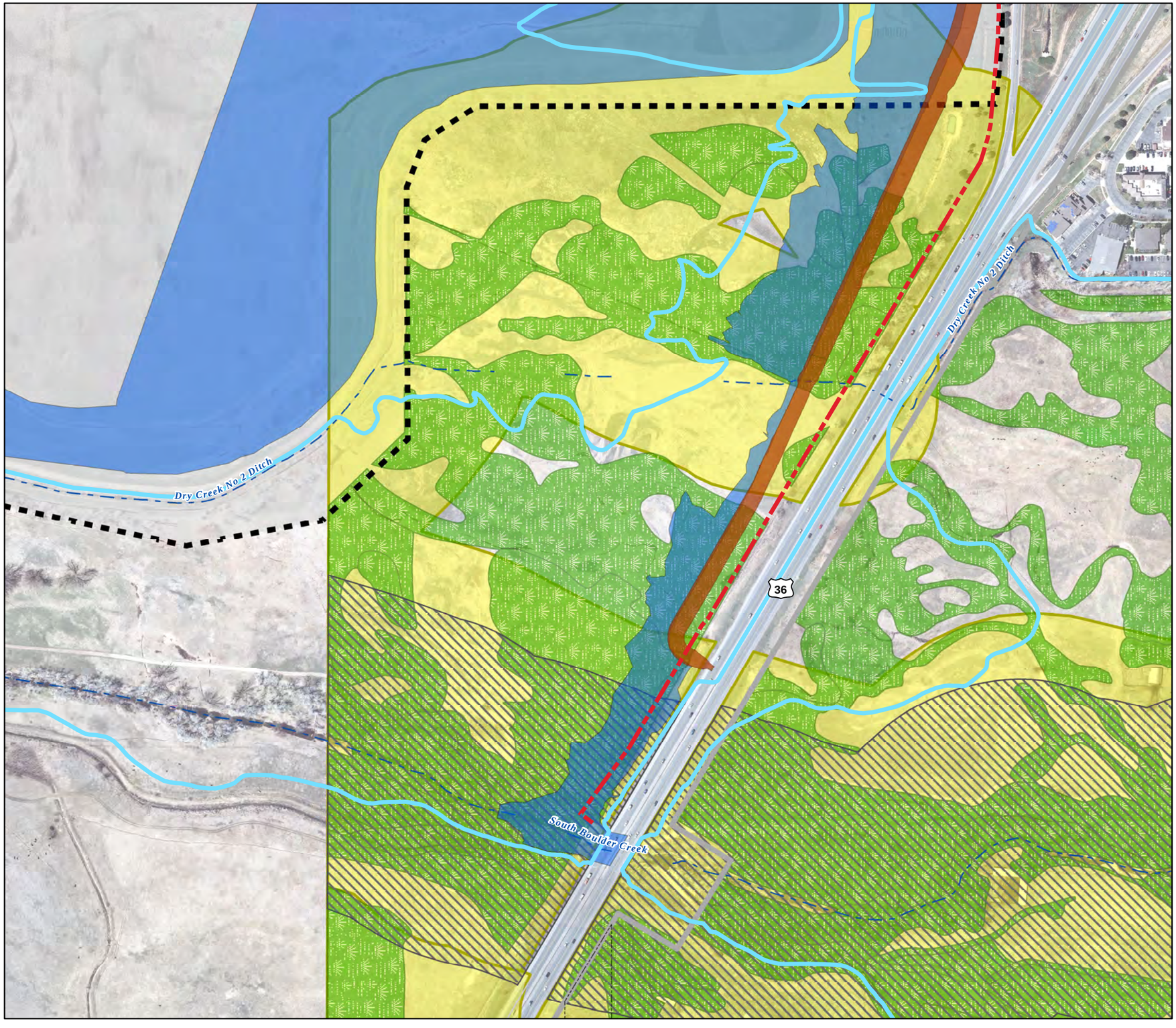
Description	Acres
Total CU Property	302
CU Property Impacted	99
CU Building Potential Impacted	43
OSMP Property Impacted	11

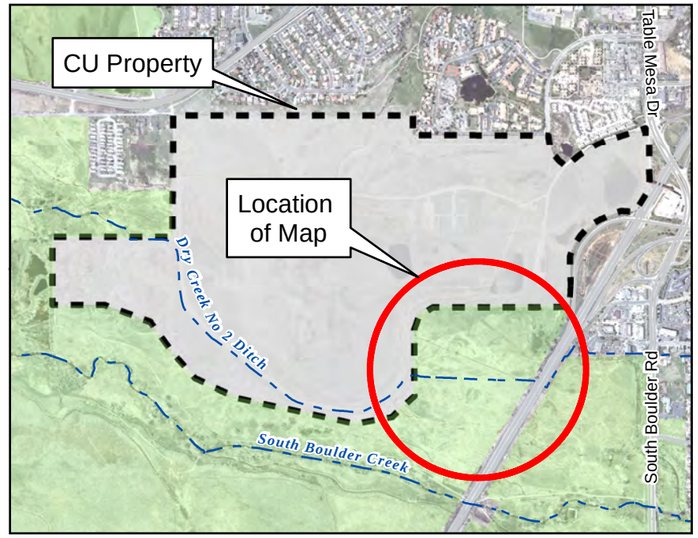
Proposed Conditions

- New Berm
- Pool Contained By Fill or Cut Slope
- Limits of Excavation
- Detention Pond Area
- Fill Area
- New Channel
- Remove Existing Berm
- Lower Grade (Allows Flow to Pond)
- Out of 100yr Inundation
- Spot Elevation
- Max Berm Elevation
- Discharge Location
- Spillway

Existing Conditions

- Boulder City Limits
- CDOT Existing ROW
- CU Site Boundary
- OSMP Property
- Prebles Critical Habitat Area
- Effective 100 Year Floodplain
- 5 Foot Contours
- 10 Foot Contours





LEGEND

- CDOT Existing ROW
- CU Site Boundary
- New Berm
- Detention Pond Area
- Boulder City Limits
- Preble's Critical Habitat
- Preble's Conservation Zone
- OSMP Wetland Riparian Data
- Effective 100 Year Floodplain
- Streams, Creeks and Ditches

Option G: Proposed Berm

Approximate Maximum Width Base &
Approximate Detention Pond
Impacts to OSMP Land

South Boulder Creek Flood Mitigation Project

N

0 125 250 500 750 1,000 Feet

CITY OF BOULDER

WATER RESOURCES ADVISORY BOARD
AGENDA ITEM

MEETING DATE: May 18, 2015

AGENDA TITLE: Information Item - Draft Proposed 2016 Utilities Budget (Water, Wastewater and Stormwater/ Flood Management) including the 6-year Capital Improvement Program (CIP)

PRESENTERS:
Jeff Arthur, Director of Public Works for Utilities
Ken Baird, Utilities Financial Manager
Douglas Sullivan, Acting Principal Engineer – Water, Wastewater, and Stormwater
Annie Noble, Acting Principal Engineer – Flood and Greenways
Joe Taddeucci, Water Resources Manager
Bret Linenfelser, Water Quality & Environmental Services Manager
Russ Sands, Watershed Sustainability & Outreach Supervisor

EXECUTIVE SUMMARY:

As part of the city's annual budget process, Utilities develops a six-year planning budget, this year for the time period of 2016 through 2021. The Water Resources Advisory Board (WRAB) role in this process is defined in the Boulder Revised Code: ". . . to review all environmental assessments and capital improvements conducted or proposed by the utilities division." Utilities staff has formulated initial revenue and expenditure projections for each of the three utility funds through the year 2021. Within the budget process, City Council approves and appropriates funds only for the first year, 2016.

WRAB will be asked to make a recommendation to City Council regarding the 2016-2021 CIP at its June meeting. The Planning Board will review the complete city CIP, including utilities, in July. City Council will discuss the CIP in August at a study session, and the overall budget is scheduled to be adopted by City Council in October.

This packet contains the draft proposed 2016 Utilities Budget and 2016-2021 Utilities CIP. The fund financials (**Attachment A**) have been updated to reflect actual revenues and expenditures for 2014, and the revised budget for 2015. These fund financials incorporate recommended changes to the CIP. There will be other likely less significant changes in the operating budget as the guidelines recently provided by the budget office are incorporated into each fund. The draft proposed CIP spreadsheets for Water, Wastewater and Stormwater/Flood Management are included in **Attachment B**.

FISCAL IMPACTS:

Based on updates to the CIP and updated Fund Financials, staff is recommending rate increases of 8% in the Water Fund, 5% in Wastewater, and 4% in Stormwater/Flood Management. These were the anticipated increases for 2016 based on the six year CIP presented through the 2015 budget process.

PUBLIC FEEDBACK:

A public hearing and recommendation is scheduled for the June WRAB meeting. At the June meeting, staff will request that the WRAB provide a final recommendation to City Council regarding the proposed 2016-2021 CIP and associated rates changes.

BACKGROUND and ANALYSIS:

The preliminary draft 2016 budget provided with this memorandum reflects the following billed revenue increases: 8% Water, 5% Wastewater, and 4% Stormwater/Flood Management. The following table summarizes the 2015 adopted increase and preliminary projections for 2016-2018. The preliminary 2016 increases are in bold.

Table 1 – Proposed Rate Increases

	2015	**2016**	2017	2018
Water	5%	**8%**	8%	8%
Wastewater	30%	**5%**	5%	5%
Stormwater/Flood Management	75%	**4%**	8%	8%

Utility Bill Comparisons

Estimated annual bills for the City's current and proposed rates are compared with other Colorado Front Range communities. **Attachment C** shows the annual single-family residential comparison for each of the three utilities. Since 2016 rate proposals are not yet available for the other cities, therefore, the survey uses their 2015 rates. Based on rate projections previously published by other utilities, it is expected that the City's relative position will be similar once all 2016 rates are known.

Single Family Residential Customer Bill Impact

The proposed preliminary 2016 revenue increases (8%-5%-4%) would increase a typical residential customer's monthly utility bill by $4.98 or an increase of $59.76 annually. The following table provides a breakdown of the potential increases by utility. Details about bill impacts for commercials will be provided during the May 18 WRAB meeting.

Table 2 – Average Monthly Bill Impacts

	Monthly Bill 2015 Rates	Monthly Bill 2016 Rates	Monthly Difference
Water	$36.59	$39.48	$2.89
Wastewater	$30.23	$31.78	$1.55
Stormwater/ Flood Mgmt	$13.46	$14.00	$0.54
Total	**$80.28**	**$85.26**	**$4.98**

Impact of Rate Changes

The impact of a 1% increase in revenue varies substantially across the three funds:

Table 3 – Rate Impact

	1%	2%	3%
Water	$235,000	$470,000	$705,000
Wastewater	$185,000	$370,000	$555,000
Stormwater / Flood Mgmt	$ 100,000	$200,000	$300,000

Also, as a point of reference, $100,000 provides for debt service coverage on a bond of approximately $1,000,000. So a revenue reduction of $100,000 could mean reduced funding for a one-time capital expense or capital bond project by $1,000,000.

Summary of Changes to the CIP Since April 28:

The current draft proposed CIPs contain several changes from the version reviewed by WRAB at the April 28 meeting:

Water Fund - $2,500,000 was removed in 2016 for the Annexation Related Water System Expansion project. These funds were included in last year's CIP for anticipated costs related to annexing properties into the City, but this level of funding is not needed. Reducing this project from the CIP will net to zero impact on the Water Fund Financial due to also eliminating the corresponding anticipated revenue that would have been received from the residents annexing into the City.

Wastewater Fund - $116,986 was added to the Wastewater Treatment Facility (WWTF) Activated Sludge project in 2017. This will fund regularly scheduled maintenance to the three blowers that supply the air requirements for the facility's Activated Sludge biological process.

Stormwater/Flood Management Fund - the funding of $2,250,000 for the Boulder Creek project has been moved from 2016 to 2018. The change in the timing for this project will better coincide with the Boulder Creek Mitigation Plan.

BOARD FEEDBACK:

At the April 27, 2015 WRAB meeting, staff provided an overview of the 2016-2021 CIP with an emphasis on key projects and asset management needs in each of the three funds. The WRAB was generally supportive of the proposed projects in the CIP and discussion focused largely on financial aspects. Additional information in response to WRAB feedback and discussion is provided below and will be presented in greater detail at the May 18, 2015 meeting.

Ongoing Rate Increases

Board members raised concerns that the proposed 2016 increases and those anticipated in future years were larger than what had been done historically. There was also concern about erosion of public support and customer ability to pay with increases being requested every year. The history of rate increases since 2003 is included in **Attachment D**. In the years 2010 through 2012, the increases were either 0% or 3%, but previous to that the rates were more varied, with the most notable being two years of 20% increases in the Wastewater Utility in 2005 and 2006. These larger rate increases corresponded to a Wastewater Treatment Facility project for which over $45 Million in bonds were issued. In the proposed 6-year CIP in the Water fund, there are nearly $72 Million in bonds anticipated to be issued for major projects. An alternative rate scenario in the Water Fund to having 8% increases for the next three years is to have a larger increase in 2016, followed by smaller inflationary increases in the subsequent years. For example, one option would be a 12% increase in 2016, and then 4% for the following years. The current recommendation of 8% aligns with the desire to, where possible, avoid 'rate shock' in one year and instead spread the impact to multiple years.

In considering the reasonableness of rate increases, a common comparison is the all items Consumer Price Index (CPI), which measures the average change over time in prices paid for a market 'basket' of consumer goods and services. As shown in **Attachment E**, the combined Boulder water and wastewater charges have increased at a greater rate than overall CPI since 2007. However, when compared to the national CPI for Water and Sewer only, Boulder's rates have increased at a lower rate between 2007 and 2014. With the larger rate increases in 2015, Boulder's water and wastewater increases are now closer to the national water and sewer index. This national trend of higher than CPI rate increases was also confirmed in a recently published rate survey that can be accessed at this link. The same is true when comparing rate increases with Front Range communities. **Attachment F** shows Boulders charges for water, wastewater and stormwater have lagged behind peer cities between 2007 and 2014, and the 2015 rate increases bring the bills to slightly below average of the comparison communities. The years of 0% to 3% rate increases created a relative lag behind other Utilities, and resulted in less funding available through those years.

It is also worth noting that several comparison cities have approved or are considering significant future increases to address issues such as increased regulatory requirements, aging infrastructure, and flood management. Indications are that the average rates charged in the past (both regionally and nationally) are not sufficient to address current and future infrastructure needs. There is also the question of whether maintaining below average rates is consistent with other city objectives.

The city has developed and maintains a water system with complexity more comparable to much larger cities, in part to ensure a high level of reliability into the future. The community places a high value on environmental stewardship and regularly strives to exceed minimum regulatory standards and industry norms. Finally, the city is widely recognized as having the highest flash flood risk in the state. The city has been able to maintain what is in many cases above average service with below average rates through a long history of innovation, strategic investments, and proactive approaches.

Utility Rate Study

The Utilities Division is in the early stages of conducting a rate study. The scope of the analysis will be determined after receiving feedback from the community, WRAB, and City Council. In April, post cards were sent to all customers inviting them to attend one of three open houses and to complete an online survey. . Approximately 10 members of the public attended each event. As of May 4, 2015 there have been 101 responses to the survey, out of approximately 29,000 customer accounts. The survey will remain open until May 22, 2015. Feedback received from these events and the survey will be brought to WRAB at the June 22 meeting. The rate study will not be completed in time to inform this year's budget process or 2016 rates. Data from the study will be available to inform next year's budget process including possible rate structure modifications that could be implemented for 2017.

Water Conservation Impact on Rates

Based on recommendations from the 1990 Treated Water Master Plan, the City of Boulder's (city) Water Conservation Program (WCP) officially started in 1992. Program goals included reducing total consumption, reducing peak usage, and helping to delay the need for capital improvement project investments (like the upgrades in capacity at the 63rd Water Treatment Plant which were, in part, achieved due to water conservation efforts).

Goals set in the 2000 Water Conservation Futures Study to reduce total water usage by 20% were shown to have been achieved in the 2011 Water Utility Master Plan. However, this reduction is not necessarily unique to Boulder or due to the city's WCP specifically. Lasting behavior change from the 2002-2003 drought combined with customer's purchasing increasingly more efficient fixtures/appliances have had significant impacts on reduced consumption levels across the Front Range.

The city's WCP estimates its active programs reduce annual water usage by about 4.9 Million gallons which could equate to roughly $15,000 in lost revenue each year. If the total loss in revenue was totaled for the 23 years the WCP has been in place and applied to a single year, the cumulative impact might result in a one-time, 2% rate increase. Thus, in any given year, water conservation savings likely have a negligible impact on rate increases. Rather, because water conservation efforts reduce the need to purchase new supply, decrease system water loss and minimize municipal water usage (which does not contribute to utility revenue), the water conservation program may actually help keep rates lower.

Today, the Water Conservation Program works to meet multiple goals across the city in addition to core conservation efforts (e.g. supporting climate goals through the water-energy nexus; water loss analysis; etc). In addition to the State Water Plan, there are also new state requirements for annual water conservation reporting and updating the city's Water Efficiency Plan (next due in 2016) which captures city water conservation goals and efforts. Staff will be working to update the Water Efficiency Plan in 2015-2016 and will coordinate with WRAB on setting any new water conservation goals.

Northern Water Rates and Carter Lake Pipeline Annual Maintenance Costs

WRAB commented on the cost of Northern Water, the approval structure within Northern's organization, and also had questions about annual operating costs associated with the Carter Lake Pipeline. Concerning costs, Northern Water completed a Cost-of-Service Rate Study in 2014. In September 2014, staff provided WRAB a brief overview of the Northern Study under "matters". The result of the Study is that open Colorado Big Thompson (CBT) rates will increase from $28 per acre-foot to $56.20 per acre-foot from 2014 to 2018 for municipal and industrial customers. By way of comparison based on very rough estimates, it costs the City of Boulder about $300 per acre-foot to deliver source water to the treatment facilities. Northern is able to deliver water at a lower cost due to economy of scale (more water and larger population served). As another point of reference, Section 5 of the Northern study presents benchmark comparisons and concludes that Northern Water employs fewer staff (FTEs), carries less debt, and has lower total expenses on average than other similar water providers.

Concerning Northern's approval structure, the rate study was approved by the Northern Water Board of Directors. The Board, similar to City Council, establishes policy and strategic direction for the district. Directors from the eight counties within Northern Water boundaries are appointed to 4-year terms by District Court judges. Boulder County has three representatives on the Northern Board. Any future policies or policy changes would need to be approved by the Northern Board, which holds monthly meetings that are open to the public. Like City Council, the Northern Board provides opportunity for public input on policy matters.

Once completed, the Carter Lake Pipeline will carry the City's allotment of CBT water to the Boulder Reservoir Water Treatment Facility. The pipeline will be operated and maintained by Northern Water, and there will be an annual operating cost to each of the project participants, including the City of Boulder. Staff will work with Northern Water to confirm operating costs prior to the 2017 budget process. Staff will also work with Northern to establish plans for hydro development associated with the project and whether hydro would be a City or Northern facility (City hydro revenue would be obtained either way).

Master Plan Updates

The Stormwater Master Plan (SMP) was completed in 2007 and provided the City with the necessary planning tools and capital improvement projects to address flood management and water quality. The SMP focused on assessment of the City's collector storm drainage conveyance system, consisting of storm drains 18-inch diameter and greater, as well as larger open channel drainage systems that are not a part of the City's major drainageways.

The September 2013 flood event resulted in localized flooding throughout the City, and highlighted that much of the city was developed prior to the adoption of current stormwater management practices. Many areas of the city are "underserved" by current standards including many areas with no formal stormwater facilities currently in place. . As described in the 2007 SMP and the City's Design and Construction Standards (DCS), the current level of service specified for residential areas is the 2-year design storm. All other areas of local and collector storm drain system are designed for a 5-year storm level of service. With this master plan update, the City is republishing the 2007 SMP to address both the areas of "underserved" storm drainage conveyance and stormwater regulatory compliance. A draft update to the SMP is expected to be completed for WRAB review in the summer of 2015.

The Wastewater Collection System Master Plan (WWCSMP) was completed in 2009. The master plan included the development of a new GIS based hydraulic model and a list of collection system recommendations.

The September 2013 flood was an extreme event that overwhelmed the sanitary sewer system in numerous locations through rainfall induced inflow and infiltration (I&I). Following the event, the city undertook a city-wide flow monitoring study to assess the level of baseline I&I in the collection system. The flow monitoring evaluation consisted of 58 flow meters installed in the collection system to measure flows for a three month period from May to July 2014.

The objectives of the WWCSMP Update include the following:

1. Incorporate I&I Evaluation data and results
2. Incorporate new information regarding flow split manholes
3. Incorporate 2013 flooding system capacity observations
4. Refine level of service recommendations from the 2009 WWCSMP

A draft update to the WWCSMP is expected to be completed for WRAB review in the summer of 2015.

BUDGET SCHEDULE:

The current schedule of major budget milestones is provided below. Elements involving the WRAB are highlighted in bold italics.

Milestone	Date
WRAB Draft CIP Review	**May 18, 2015**
Proposed Budget Submittal to City Manager	May 29, 2015
WRAB Recommendation on CIP/Budget	**June 22, 2015**
Departmental Budget Review by City Manager	May/June 2015
Planning Board Recommendation on CIP	July 2014
City Council Study Session on CIP	August 11, 2015
City Council Study Session on Budget	September 8 and 22, 2015
City Council Consideration/Adoption of Budget	October 6 and 20, 2015

NEXT STEPS:

Staff will present additional information to the WRAB at the May 18 meeting and staff is seeking feedback on the draft proposed CIP, updated financial information, and potential rate impacts. This feedback will be considered in finalizing the proposed budget that will be presented at the June 22, 2015 WRAB meeting. At that meeting, staff will request that WRAB provide a final recommendation concerning the proposed 2016-2021 CIP to Planning Board and City Council.

Attachments:

A: Fund Financials – Water, Wastewater, Stormwater/Flood Management
B: Draft Proposed 2016-2021 CIP, Water, Wastewater, Stormwater/Flood Management
C: Colorado Utility Bill Comparisons – Water, Wastewater and Stormwater/Flood Management
D: City of Boulder Utility Rate Change History
E: Consumer Price Index Comparison
F: Residential Annual Bill Change Comparison – Boulder and Front Range Average

Attachment A

DRAFT
CITY OF BOULDER
2016 FUND FINANCIAL

	A	B	G	I	K	M	O	Q	S	U
1	WATER UTILITY									
3										
5			2014 Actual	2015 Revised	2016 Projected	2017 Projected	2018 Projected	2019 Projected	2020 Projected	2021 Projected
6										
7										
8	**Beginning of Year Fund Balance**		$ 34,394,472	$ 37,283,402	$ 33,644,313	$ 30,254,829	$ 30,242,855	$ 36,309,005	$ 36,398,973	$ 39,608,014
9										
10		**Sources of Funds**								
11		Operating-	4.0%	5.0%	8.0%	8.0%	8.0%	4.0%	4.0%	4.0%
12		Sale of Water to General Cust	$ 20,232,876	$ 22,363,662	$ 23,528,592	$ 25,461,486	$ 27,553,185	$ 29,816,739	$ 31,071,211	$ 32,378,472
13		Projected Rate Increase	-	1,118,183	1,882,287	2,036,919	2,204,255	1,192,670	1,242,848	1,295,139
14		Bulk/Irrigation Water Sales	233,116	143,050	143,050	143,050	143,050	143,050	143,050	143,050
15		Hydroelectric Revenue	2,395,835	2,217,600	2,226,600	2,177,730	2,313,000	2,313,000	2,313,000	2,313,000
16		Miscellaneous Operating Revenues	52,006	25,000	25,000	25,000	25,000	25,000	25,000	25,000
19		Non-Operating--								
20		Plant Investment Fees	6,733,984	3,500,000	2,600,000	2,600,000	2,500,000	2,500,000	2,500,000	2,500,000
21		Connection Charges	235,060	130,000	130,000	130,000	130,000	130,000	130,000	130,000
22		Special Assessments	(24,892)	2,505,000	5,000	5,000	5,000	5,000	5,000	5,000
23		Federal, State, County Grants	1,286,716	-	-	-	-	-	-	-
24		Interest on Investments	188,574	186,417	252,332	453,822	756,071	907,725	909,974	990,200
25		Rent, assessments and other misc revenues	92,128	20,500	20,500	20,500	20,500	20,500	20,500	20,500
26		Sale of Real Estate	-	1,014,750	-	-	-	-	-	-
27		Transfer from General Fund - Fire Training Center	92,785	92,785	92,785	92,785	92,785	92,785	92,785	92,785
28		Projected Bond Proceeds	-	-	24,240,000	-	37,915,263	-	10,455,509	-
30										
31		**Total Sources of Funds**	$ 31,518,187	$33,316,947	$55,146,147	$ 33,146,292	$ 73,658,109	$ 37,146,469	$ 48,908,878	$ 39,893,146
32										
33		**Uses of Funds**								
34		Operating-								
35		Administration	$ 914,078	$ 930,877	$ 958,803	$ 987,567	$ 1,017,194	$ 1,047,710	$ 1,079,142	$ 1,111,516
36		Planning and Project Management	640,957	615,356	633,817	652,831	672,416	692,589	713,366	734,767
37		Water Resources and Hydroelectric Operations	2,254,874	2,622,787	2,701,471	2,782,515	2,865,990	2,951,970	3,040,529	3,131,745
38		Water Treatment	4,406,801	4,655,178	4,794,833	4,938,678	5,086,839	5,239,444	5,396,627	5,558,526
39		Water Quality and Environmental Svcs	948,877	1,042,902	1,074,189	1,106,415	1,139,607	1,173,795	1,209,009	1,245,280
40		Water Conservation	328,578	414,185	426,611	439,409	452,591	466,169	480,154	494,559
41		System Maintenance	3,025,098	3,134,469	3,228,503	3,325,358	3,425,119	3,527,872	3,633,709	3,742,720
42		Windy Gap Payment	2,093,254	2,634,004	2,696,959	2,314,181	251,200	258,736	266,498	274,493
45		Sick and Vacation Accrual	91,600	100,000	103,000	106,090	109,273	112,551	115,927	119,405
46		TOTAL OPERATING USES OF FUNDS	$ 14,704,118	$ 16,149,758	$16,618,186	$16,653,044	$15,020,229	$15,470,836	$15,934,961	$16,413,010
47										

Attachment A

DRAFT
CITY OF BOULDER
2016 FUND FINANCIAL

WATER UTILITY

	2014 Actual	2015 Revised	2016 Projected	2017 Projected	2018 Projected	2019 Projected	2020 Projected	2021 Projected
Debt-								
BRWTP 1996 Revenue Bond; Refunding in 2006	858,469	857,708	858,531	-	-	-	-	-
Refunding of the 1999 and 2000 Revenue Bonds	2,523,521	2,522,054	2,517,388	2,524,233	2,524,650	1,375,102	-	-
Lakewood 2001 Rev Bond; Refunded in 2012	2,057,000	2,065,733	2,065,950	2,065,333	2,072,083	2,080,817	2,081,367	2,088,883
Projected Bond-Betasso WTP Improvements	-	-	1,920,000	1,920,000	1,920,000	1,920,000	1,920,000	1,920,000
Projected Bond-NCWCD Conveyance Line	-	-	-	-	3,568,700	3,568,700	3,568,700	3,568,700
Projected Bond - Barker Dam	-	-	-	-	-	-	983,773	983,773
TOTAL DEBT SERVICE	$5,438,990	$5,445,495	7,361,869	6,509,566	10,085,433	8,944,619	8,553,840	$8,561,356
Transfers -								
Cost Allocation	1,255,221	1,020,728	1,071,764	1,125,353	1,181,620	1,240,701	1,302,736	1,367,873
Planning & Development Services	212,564	218,941	225,509	232,275	239,243	246,420	253,813	261,427
General Fund - City Attorney	52,888	59,665	62,052	64,534	67,115	69,800	71,894	74,050
TOTAL TRANSFERS OUT	$1,520,673	$1,299,334	$1,359,325	$1,422,161	$1,487,978	$1,556,921	$1,628,443	$1,703,351
Capital	$7,057,076	9,780,007	$9,059,251	8,679,585	3,192,329	11,196,676	9,243,011	12,318,145
Projected Bond - Betasso WTP IMP	-	-	$24,000,000	-	-	-	-	-
Projected Bond - NCWCD Conveyance	-	-	-	-	$37,565,263	-	-	-
Projected Bond - Barker Dam/Boulder Reservoir WTP	-	-	-	-	-	-	$10,355,509	-
Projected Bond - Issuance Costs	-	-	$240,000	-	$350,000	-	$100,000	-
Encumbrances, Carryover and Adjustments to Base	-	4,381,442	-	-	-	-	-	-
Total Uses of Funds	$ 28,720,857	$ 37,056,036	$58,638,631	$33,264,356	$67,701,231	$ 37,169,052	$45,815,764	$ 38,995,862
Sick/Vacation Accrual Adjustment	$ 91,600	$ 100,000	$ 103,000	$ 106,090	$ 109,273	$ 112,551	$ 115,927	$ 119,405
Ending Fund Balance Before Reserves	$ 37,283,402	$ 33,644,313	$ 30,254,829	$ 30,242,855	$ 36,309,005	$ 36,398,973	$ 39,608,014	$ 40,624,704
Reserves								
Bond Reserve	$ 3,034,796	$ 3,034,796	$ 4,954,796	$ 4,101,429	$ 7,670,129	$ 7,670,129	$ 7,278,800	$ 7,278,800
Lakewood Pipeline Remediation Reserve	15,852,739	16,262,501	17,223,131	18,212,981	19,232,937	19,962,812	21,035,991	22,141,813
Sick/Vacation/Bonus Reserve	591,445	609,189	627,464	646,288	665,677	685,647	706,217	727,403
Pay Period 27 Reserve	163,400	214,400	265,400	316,400	367,400	418,400	469,400	520,400
Operating Reserve	4,056,198	4,362,273	4,494,378	4,518,801	4,127,052	4,256,939	4,390,851	4,529,090
Capital Reserve	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Total Reserves	$ 25,698,578	$ 26,483,158	$ 29,565,170	$ 29,795,899	$ 34,063,195	$ 34,993,928	$ 35,881,259	$ 37,197,506
Ending Fund Balance After Reserves	**$ 11,584,824**	**$ 7,161,154**	**$ 689,659**	**$ 446,956**	**$ 2,245,810**	**$ 1,405,045**	**$ 3,726,755**	**$ 3,427,197**

Note:
Operating reserve levels are based on industry standards and are maintained for revenue bonds, revenue fluctuations (weather and water usage impacts) and the capital intensive nature of the utility.

Attachment A

DRAFT
CITY OF BOULDER
2016 FUND FINANCIAL

	A	B	K	M	O	Q	S	U	W	Y
1	WASTEWATER UTILITY									
2										
3										
4			2014 Actual	2015 Revised	2016 Projected	2017 Projected	2018 Projected	2019 Projected	2020 Projected	2021 Projected
5										
6	**Beginning Fund Balance**		$ 12,495,508	$ 13,610,757	$ 7,749,646	$ 8,251,302	$ 7,864,800	$ 8,654,612	$ 8,462,676	$ 8,662,110
7										
8		**Sources of Funds**								
9		Operating-	5.0%	30.0%	5.0%	5.0%	5.0%	5.0%	10.0%	5.0%
10		Sewer Charges to General Customers	$ 13,850,189	$ 14,126,140	$ 18,400,710	$ 19,359,387	$ 20,368,011	$ 21,429,185	$ 22,545,645	$ 24,849,810
11		Projected Rate Increase		4,237,842	920,036	967,969	1,018,401	1,071,459	2,254,565	1,242,491
13		Surcharge/ Pretreatment Fees	127,274	118,000	118,000	118,000	118,000	118,000	118,000	118,000
17		Plant Investment Fees	2,221,937	700,000	700,000	700,000	700,000	700,000	700,000	700,000
18		Connection Charges	11,263	10,000	10,000	10,000	10,000	10,000	10,000	10,000
19		Special Assessments	(9,795)	5,000	5,000	5,000	5,000	5,000	5,000	5,000
20		Federal & State Grants	681,482	1,486,018	-	-	-	-	-	-
21		Interest on Investments	73,622	193,754	154,993	206,283	235,944	259,638	253,880	259,863
22		Rent and other miscellaneous revenue	5,423	1,500	1,500	1,500	1,500	1,500	1,500	1,500
23		Sale of Real Estate - Yards Masterplan	-	357,375	-	-	-	-	-	-
25		Bond Proceeds	-	10,125,000	-	-	-	-	20,625,000	-
27										
28		**Total Sources of Funds**	$ 16,961,395	$ 31,360,629	$ 20,310,239	$ 21,368,139	$ 22,456,856	$ 23,594,782	$ 46,513,590	$ 27,186,664
29										
30		**Uses of Funds**								
31		Operating-								
32		Administration	$ 581,235	$ 585,713	$ 603,284	$ 621,383	$ 640,024	$ 659,225	$ 679,002	$ 699,372
33		Planning and Project Management	268,324	386,778	398,381	410,333	422,643	435,322	448,382	461,833
34		Wastewater Quality & Environmental Svcs	1,127,229	1,392,332	1,434,102	1,477,125	1,521,439	1,567,082	1,614,094	1,662,517
35		System Maintenance	1,640,118	1,923,718	1,981,430	2,040,872	2,102,099	2,165,162	2,230,116	2,297,020
36		Wastewater Treatment	4,872,877	5,166,106	5,321,089	5,480,722	5,645,144	5,814,498	5,988,933	6,168,601
39		Sick/Vacation Accrual	(71,987)	75,000	77,250	79,568	81,955	84,413	86,946	89,554
40		TOTAL OPERATING USES OF FUNDS	8,417,797	9,529,647	9,815,536	10,110,003	10,413,303	10,725,702	11,047,473	11,378,897
41										
42		Debt-								
43		2012 Refunding of the WWTP 2005 Revenue Bond	3,463,046	3,439,462	3,199,450	3,177,125	3,153,292	3,145,375	3,132,458	3,132,458
44		WWTP UV, Digester, Headworks Imp 2010 Rev Bond	673,529	672,638	673,863	670,938	672,700	674,013	669,888	670,450
45		WWTP Nutrient Compliance Bond 2020							1,947,500	1,947,500
46		Sanitary Sewer Rehabilitation Bond 2015		800,000	800,000	800,000	800,000	800,000	800,000	800,000
52	TOTAL DEBT SERVICE		4,136,575	4,912,100	4,673,313	4,648,063	4,625,992	4,619,388	6,549,846	6,550,408
53										

Attachment A

DRAFT
CITY OF BOULDER
2016 FUND FINANCIAL

	A	B	K	M	O	Q	S	U	W	Y
1	WASTEWATER UTILITY									
2										
3										
4			**2014 Actual**	**2015 Revised**	**2016 Projected**	**2017 Projected**	**2018 Projected**	**2019 Projected**	**2020 Projected**	**2021 Projected**
54		Transfers-								
55		Cost Allocation	900,430	756,671	794,505	834,230	875,942	919,739	965,726	1,014,012
56		Planning & Development Services	213,210	219,607	226,195	232,981	239,970	247,169	254,584	262,222
57		General Fund - Utilities Attorney	17,629	19,888	20,684	21,511	22,371	23,266	24,197	24,923
58		TOTAL TRANSFERS OUT	1,131,269	996,166	1,041,384	1,088,722	1,138,283	1,190,174	1,244,507	1,301,157
59										
62		Capital Improvement Program	$2,073,371	6,768,978	4,355,600	5,987,421	5,571,420	7,335,867	6,934,277	7,242,543
65		2011 Bond-UV, Digester, Headworks IMP	$15,148	1,198	-	-	-	-	-	-
66		Projected Bond-WWTP Improvements	-	-	-	-	-	-	$20,500,000	-
67		Projected Bond-Sanitary Sewer Rehab	-	$10,000,000	-	-	-	-	-	
68		Bond Issuance Costs	-	125,000	-	-	-	-	125,000	-
69		Carryover, Encumbrances and Adjustments to Base	-	4,963,651	-	-	-	-	-	-
70										
71		**Total Uses of Funds**	$ 15,774,160	$ 37,296,740	$ 19,885,833	$ 21,834,209	$ 21,748,998	$ 23,871,131	$ 46,401,102	$ 26,473,005
72										
73		Sick/Vacation Accrual Adjustment	$ (71,987)	$ 75,000	$ 77,250	$ 79,568	$ 81,955	$ 84,413	$ 86,946	$ 89,554
74										
75	**Ending Fund Balance Before Reserves**		$ 13,610,757	$ 7,749,646	$ 8,251,302	$ 7,864,800	$ 8,654,612	$ 8,462,676	$ 8,662,110	$ 9,465,323
76										
77		**Reserves**								
78		Bond Reserves	$ 670,139	$ 1,470,139	$ 1,470,139	$ 1,470,139	$ 1,470,139	$ 1,470,139	$ 3,417,139	$ 3,417,139
79		Sick/Vacation/Bonus Reserve	602,059	620,120	638,724	657,886	677,622	697,951	718,890	740,456
80		Pay Period 27 Reserve	142,480	181,480	220,480	259,480	298,480	337,480	376,480	415,480
84		Operating Reserve	2,387,266	2,631,453	2,714,230	2,799,681	2,887,896	2,978,969	3,072,995	3,170,013
85		Capital Reserve	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
86		**Total Reserves**	$ 4,301,944	$ 5,403,193	$ 5,543,573	$ 5,687,186	$ 5,834,138	$ 5,984,539	$ 8,085,503	$ 8,243,089
87										
88	**Ending Fund Balance After Reserves**		**$ 9,308,813**	**$ 2,346,453**	**$ 2,707,729**	**$ 2,177,614**	**$ 2,820,474**	**$ 2,478,137**	**$ 576,606**	**$ 1,222,234**
92										

Attachment A

DRAFT
CITY OF BOULDER
2016 FUND FINANCIAL

	A	B	G	I	K	M	O	Q	S	U
1	STORMWATER/FLOOD MANAGEMENT UTILITY									
2										
3			2014 Actual	2015 Projected	2016 Projected	2017 Projected	2018 Projected	2019 Projected	2020 Projected	2021 Projected
4										
5										
6	**Beginning Fund Balance**		$ 16,195,856	$ 15,450,198	$ 14,338,274	$ 13,500,621	$ 11,968,957	$ 7,902,949	$ 7,609,462	$ 7,045,501
7										
8		**Sources of Funds**								
9		Operating-	3%	75%	4%	8%	8%	7%	4%	4%
10		Service Charge Fees	$ 5,592,683	$ 5,482,012	$ 9,612,708	$ 10,017,210	$ 10,840,224	$ 11,730,857	$ 12,577,121	$ 13,106,367
11		Projected Rate Increases		4,111,509	384,508	801,377	867,218	821,160	503,085	524,255
12			-							
13		TOTAL OPERATING SOURCES OF FUNDS	5,592,683	9,593,521	9,997,216	10,818,587	11,707,442	12,552,017	13,080,206	13,630,621
14										
15		Non-Operating--								
16		Plant Investment Fees	818,369	600,000	300,000	300,000	300,000	300,000	300,000	300,000
17		Urban Drainage District Funds	50,000	2,176,454	195,000	670,000	530,000	400,000	400,000	400,000
18		State and Federal Grants	4,794,503	2,655,468	-	-	-			
19		Interest on Investments	71,936	97,318	143,383	202,509	239,379	158,059	152,189	140,910
20		Intergovernmental Transfers (KICP Program)	2,000	144,200	148,526	152,982	157,571	162,298	167,167	172,182
21		Rent and other miscellaneous revenue	44,561	40,000	40,000	40,000	40,000	40,000	40,000	40,000
22		Miscellaneous nonrecurring revenue	-	-	-	-	-	-	-	-
23		Sale of Real Estate - Yards Masterplan	-	357,375	-	-	-	-	-	-
24		Projected Bonds	-	23,075,000	-	-	25,325,000	-	-	-
25		TOTAL NON-OPERATING SOURCES OF FUN	5,781,369	$29,145,814	$826,909	$1,365,491	$26,591,950	$1,060,357	$1,059,357	$1,053,092
26										
27		**Total Sources of Funds**	$ 11,374,052	$ 38,739,335	$10,824,125	$ 12,184,078	$ 38,299,393	$ 13,612,375	$ 14,139,563	$ 14,683,714
28										
29		**Uses of Funds**								
30		Operating-								
31		Administration	$ 439,228	$ 433,414	$ 446,416	$ 459,809	$ 473,603	$ 487,811	$ 502,446	$ 517,519
32		Planning and Project Management	1,066,947	1,253,577	1,291,184	1,329,920	1,369,817	1,410,912	1,453,239	1,496,836
33		Stormwater Contract Management	61,111	49,442	50,925	52,453	54,027	55,647	57,317	59,036
34		Stormwater Quality and Education	782,766	943,360	971,661	1,000,811	1,030,835	1,061,760	1,093,613	1,126,421
35		System Maintenance	1,035,053	1,618,165	1,294,710	1,333,551	1,373,558	1,414,765	1,457,207	1,500,924
38		Sick/Vacation Accrual	4,326	50,000	51,500	53,045	54,636	56,275	57,964	59,703
39		TOTAL OPERATING USES OF FUNDS	3,389,431	4,347,958	4,106,397	4,229,589	4,356,476	4,487,171	4,621,786	4,760,439
40										
41		Debt--								
42		Goose Creek 1998 Revenue Bond	-	-	-	-	-	-	-	-
43		Refunding of the Goose Creek 1998 Revenue Bon	385,117	387,038	381,675	386,138	380,175	-	-	-
44		Projected Bond - South Boulder Creek	-	-	-	-	2,375,000	2,375,000	2,375,000	2,375,000
45		Projected Bond - Wonderland Creek	-	862,500	1,725,000	1,725,000	1,725,000	1,725,000	1,725,000	1,725,000
47		TOTAL DEBT SERVICE	385,117	1,249,538	2,106,675	2,111,138	4,480,175	4,100,000	4,100,000	4,100,000
48										
49		Transfers-								
50		Cost Allocation	219,451	246,288	258,602	271,533	285,109	299,365	314,333	330,049
51		Planning & Development Services	128,511	132,367	136,338	140,428	144,641	148,980	153,450	158,053
52		General Fund - Utilities Attorney	17,629	19,986	20,785	21,617	22,482	23,381	24,082	24,805
53		TOTAL TRANSFERS OUT	365,591	398,641	415,726	433,578	452,232	471,726	491,865	512,907

Attachment A

DRAFT
CITY OF BOULDER
2016 FUND FINANCIAL

	A	B	G	I	K	M	O	Q	S	U
1	STORMWATER/FLOOD MANAGEMENT UTILITY									
2										
3			2014 Actual	2015 Projected	2016 Projected	2017 Projected	2018 Projected	2019 Projected	2020 Projected	2021 Projected
4										
54										
55										
56		Capital	$7,983,897	$3,212,900	$5,084,480	6,994,483	$7,806,155	4,903,241	$5,547,837	5,039,859
58		Projected Bond - South Boulder Creek	-	-	-	-	25,000,000	-	$0	-
59		Projected Bond - Wonderland Creek/4-Mile	-	$23,000,000						
60		Projected Bond Issuance Costs	-	$75,000	-	-	325,000	-	-	-
61										
62		Encumbrances, Carryover and Adjustments to Base	-	7,617,222	-	-	-	-	-	-
63										
64		**Total Uses of Funds**	$ 12,124,036	$ 39,901,259	$ 11,713,278	$ 13,768,787	$ 42,420,038	$ 13,962,137	$ 14,761,488	$ 14,413,206
65										
66		Sick and Vacation Accrual Adjustment	$ 4,326	$ 50,000	$ 51,500	$ 53,045	$ 54,636	$ 56,275	$ 57,964	$ 59,703
67										
68	**Ending Fund Balance Before Reserves**		$ 15,450,198	$ 14,338,274	$ 13,500,621	$ 11,968,957	$ 7,902,949	$ 7,609,462	$ 7,045,501	$ 7,375,711
70		**Reserves**								
71		Bond Reserves	$ 324,984	$ 2,049,984	$ 2,049,984	$ 2,049,984	$ 4,100,000	$ 4,100,000	$ 4,100,000	$ 4,100,000
72		Post Flood Property Acquisition	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000
73		Sick/Vacation/Bonus Reserve	61,279	63,117	65,011	66,961	68,970	71,039	73,170	75,365
74		Pay Period 27 Reserve	34,480	47,480	60,480	73,480	86,480	99,480	113,169	115,952
78		Operating Reserve	938,756	1,186,650	1,130,531	1,165,792	1,202,177	1,239,724	1,278,413	1,318,337
79		Capital Reserve	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
80		**Total Reserves**	$ 2,609,498	$ 4,597,231	$ 4,556,005	$ 4,606,216	$ 6,707,627	$ 6,760,243	$ 6,814,752	$ 6,859,654
81										
82	**Ending Fund Balance After Reserves**		**$12,840,700**	**$9,741,043**	**$8,944,616**	**$7,362,741**	**$1,195,322**	**$849,219**	**$230,749**	**$ 516,057**
83										
92	**Note:**									
93	Operating reserve levels are based on industry standards and are maintained for revenue bonds, revenue fluctuations (weather and water usage impacts) and the capital intensive nature of the utility.									

	A	H	I	J	K	L	M	N	O
1	11-May-15			CITY OF BOULDER					
2				DRAFT 2016-2021 CAPITAL IMPROVEMENT PROGRAM					
3				WATER UTILITY FUND					
4									
5									
6	**Assumed Inflation Rate**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
7	**PROJECT NAME**	**ACTUAL**	**REVISED**	**PROJECTED**	**PROJECTED**	**PROJECTED**	**PROJECTED**	**PROJECTED**	**PROJECTED**
8									
9	**Treated Water Pressure Reducing and Hydroelectric Facilities**								
10	Kohler Hydro/PRV Facility	$0	$50,000	$0	$0	$0	$0	$0	$0
11	Maxwell Hydro/PRV Facility	$0	$50,000	$0	$0	$0	$0	$0	$0
12	Orodell Hydro/PRV Facility	$0	$0	$75,000	$0	$0	$0	$0	$0
13	Sunshine Hydro/PRV Facility	$0	$0	$0	$271,875	$0	$0	$0	$0
14	Pearl Street Hydro/PRV Facility	$0	$0	$0	$0	$24,333	$243,331	$0	$0
15	**Subtotal - Treated Water PRV and Hydro**	$0	$100,000	$75,000	$271,875	$24,333	$243,331	$0	$0
16									
17	**Water Treatment Facilities**								
18	Betasso WTF	$413,974	$1,108,318	$900,000	$0	$0	$0	$0	0
19	Betasso WTF - Bond Proceeds	$0	$0	$24,000,000	$0	$0	$0	$0	$0
20	Bond Issuance Costs	$0	$0	$240,000	$0	$350,000	$0	$100,000	$0
21	Boulder Reservoir WTF	$203,296	$7,100	$164,000	$0	$0	$0	$2,000,000	$0
22	Boulder Res WTF - Bond Proceeds	$0	$0	$0	$0	$0	$0	$0	$0
23	**Subtotal - Water Treatment Facilities**	$617,270	$1,115,418	$25,304,000	$0	$350,000	$0	$2,100,000	$0
24									
25	**Treated Water Pump Stations**								
26	Cherryvale Pump Station	$0	$0	$0	$0	$0	$0	$0	$0
27	Boulder Reservoir WTF High Service Pump	$0	$84,289	$0	$0	$0	$0	$0	$0
28	Iris Pump Stations	$0	$0	$0	$0	$0	$0	$0	$0
29	**Subtotal - Treated Water Pump Stations**	$0	$84,289	$0	$0	$0	$0	$0	$0
30									
31	**Treated Water Storage Tanks**								
32	Gunbarrel Storage Tank	$644,449	$39,746	$0	$0	$0	$0	$0	$0
33	Maxwell Storage Tank	$0	$0	$0	$0	$0	$0	$0	$0
34	Booten Storage Tank	$0	$0	$0	$0	$0	$0	$0	$0
35	Devil's Thumb Storage Tank	$0	$50,000	$0	$0	$0	$0	$0	$0
36	Kohler Storage Tank	$64	$103,487	$799,875	$0	$0	$0	$0	$0
37	Chautauqua Storage Tank	$0	$0	$0	$0	$0	$0	$0	$0
38	Betasso Storage Tank	$0	$0	$0	$292,465	$0	$0	$0	$0
39	Boulder Reservoir Storage Tank	$0	$0	$0	$0	$0	$0	$0	$0
40	**Subtotal - Treated Water Storage Tanks**	$644,513	$193,233	$799,875	$292,465	$0	$0	$0	$0
41									
42	**Treated Water Distribution System**								
43	Zone Isolation Valves	$0	$0	$0	$0	$0	$0	$0	$0
44	Cathodic Protection	$0	$0	$0	$0	$0	$0	$0	$0
45	Waterline Replacement	$3,293,113	$3,522,017	$3,352,960	$3,487,078	($0)	$3,771,624	$3,922,489	$4,079,389
46	**Subtotal - Treated Water Distribution System**	$3,293,113	$3,522,017	$3,352,960	$3,487,078	($0)	$3,771,624	$3,922,489	$4,079,389
47									
48	**Treated Water Transmission System**								
49	Sunshine Transmission Pipe	$568,313	$2,259,938	$0	$0	$0	$0	$0	$0
50	Boulder Canyon - Orodell to Fourmile Pipe	$0	$0	$0	$0	$0	$0	$0	$0
51	Mountain Transmission Pipes	$0	$0	$0	$0	$0	$0	$0	$0
52	Zone 1 Transmission Pipes	$0	$0	$0	$0	$250,000	$0	$0	$250,000
53	Zone 2 Transmission Pipes	$0	$0	$0	$250,000	$0	$0	$250,000	$0
54	Zone 3 Transmission Pipes	$0	$0	$1,200,000	$0	$0	$250,000	$0	$0
55	**Subtotal - Treated Water Transmission Syste**	$568,313	$2,259,938	$1,200,000	$250,000	$250,000	$250,000	$250,000	$250,000
56									
57	**Source Water Transmission System**								
58	Lakewood Pipeline	$0	$530,400	$0	$0	$0	$316,330	$0	$0
59	Silver Lake Pipeline	$0	$0	$0	$0	$0	$0	$0	$0
60	Source Water Transmission Pipe Inspection	$0	$73,653	$0	$0	$0	$0	$0	$0
61	**Subtotal - Source Water Transmission Syste**	$0	$604,053	$0	$0	$0	$316,330	$0	$0
62									
63	**Barker Water System**								
64	Barker Gravity Pipeline Repair	$305,389	$475,882	$667,416	$1,169,859	$1,216,653	$1,265,319	$1,315,932	$1,368,569
65	Barker-Kossler Penstock Repair	$0	$0	$0	$116,986	$0	$0	$0	$0
66	Barker Dam Outlet	$0	0	$100,000	$175,000	$0	$835,551	$0	$0
67	Barker Dam Outlet - Bond Proceeds	$0	$0	$0	$0	$0	$0	$8,355,509	$0
68	Barker Dam and Reservoir	$2,625	$495,174	$65,000	$50,000	$0	$0	$0	$0
69	Barker Hydro System Integration	$0	$0	$0	$0	$0	$0	$0	$0
70	Barker Relicensing	$25,377	$0	$0	$0	$0	$0	$0	$0
71	Barker Instream Flow Release	$0	$6,052	$0	$0	$0	$0	$0	$0
72	Barker Residence	$78,481	$214,799	$0	$0	$0	$0	$0	
73	Betasso Penstock	$0	$0	$0	$0	$0	$0	$0	$0
74	Kossler Dam	$56,204	$135,738	$75,000	$0	$0	$0	$0	$0
75	**Subtotal - Barker Water System**	$468,076	$1,327,645	$907,416	$1,511,844	$1,216,653	$2,100,870	$9,671,441	$1,368,569
76									
77	**Raw Water Storage Reservoirs**								
78	Albion Dam	$0	$80,000	$125,000	$0	$341,636	$3,416,361	$0	$0
79	Silver Lake Dam	$0	$75,000	$0	$0	$100,000	$0	$0	$0
80	Island Lake Dam	$0	$0	$0	$0	$50,000	$0	$0	$0
81	Green Lake 1 Dam	$0	$0	$0	$0	$0	$0	$0	$0
82	Green Lake 2 Dam - Bond Proceeds	$0	$0	$0	$0	$0	$0	$0	$0
83	Green Lake 2 Dam	$0	$24,719	$0	$0	$0	$0	$75,000	$486,773
84	Green Lake 3 Dam	$0	$0	$0	$0	$0	$0	$0	$0
85	Goose Lake Dam	$0	$20,000	$0	$0	$75,000	$0	$0	$0
86	Boulder Reservoir	$0	$0	$50,000	$0	$0	$0	$118,434	$0

Attachment B - DRAFT WATER CIP

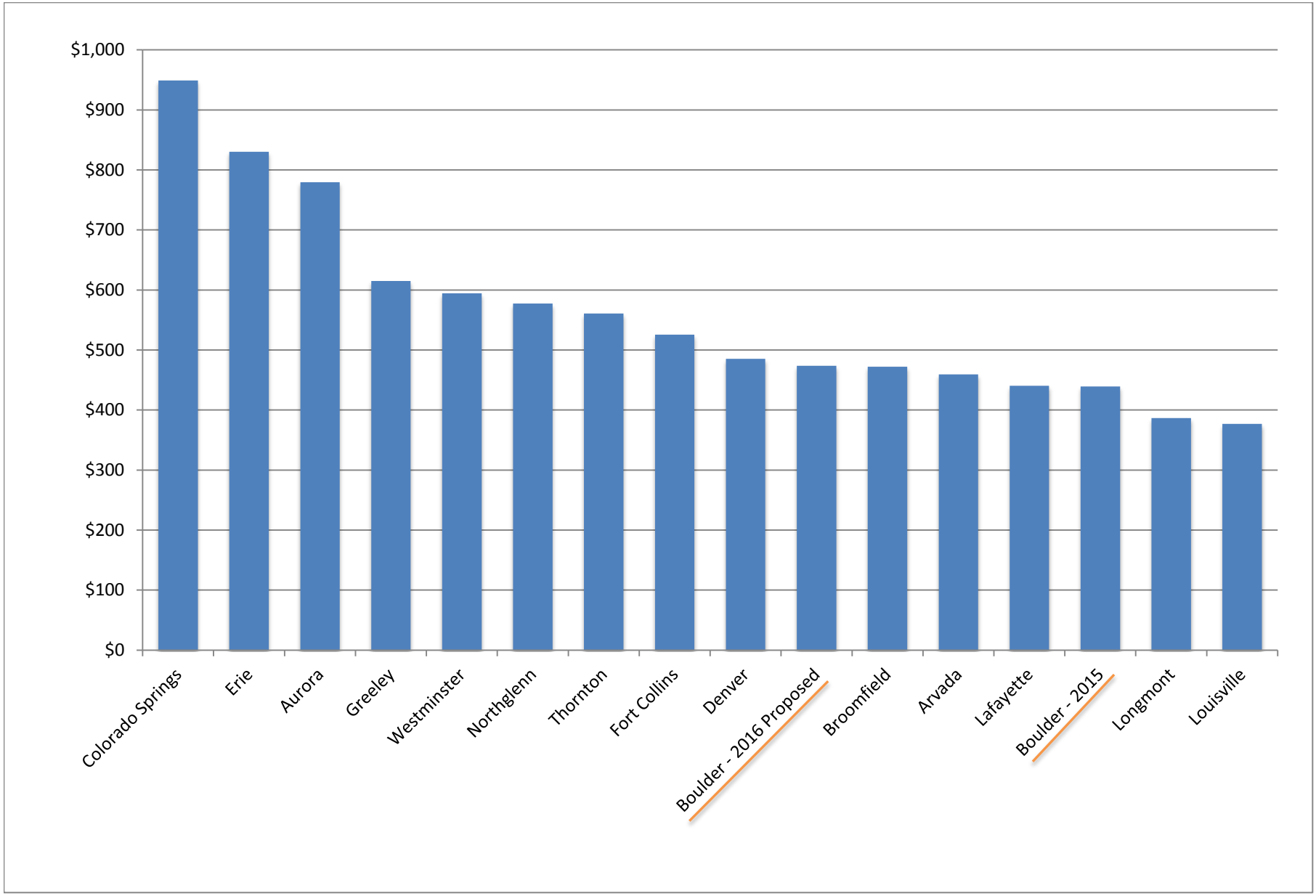
	A	H	I	J	K	L	M	N	O
1	11-May-15			CITY OF BOULDER					
2				DRAFT 2016-2021 CAPITAL IMPROVEMENT PROGRAM					
3				WATER UTILITY FUND					
4									
5									
6	**Assumed Inflation Rate**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
7	**PROJECT NAME**	**ACTUAL**	**REVISED**	**PROJECTED**	**PROJECTED**	**PROJECTED**	**PROJECTED**	**PROJECTED**	**PROJECTED**
8									
87	Lakewood Dam	$0	$0	$0	$0	$124,707	$0	$0	$0
88	Skyscraper Dam	$0	$0	$0	$0	$0	$0	$0	$171,071
89	Wittemyer Ponds	$0	$0	$0	$0	$0	$100,000	$492,685	$4,926,849
90	**Subtotal - Raw Water Storage Reservoirs**	$0	$199,719	$175,000	$0	$691,343	$3,516,361	$686,119	$5,584,692
91									
92	**Other Raw Water Facilities**								
93	Farmer's Ditch	$0	$0	$0	$0	$0	$108,160	$0	$0
94	Anderson Ditch	$0	$0	$0	$0	$0	$0	$0	$0
95	Source Water Facilities Rehab Program			$150,000	$150,000	$150,000	$150,000	$150,000	$150,000
96	Watershed Improvements	$78,886	$146,357	$80,000	$0	$0	$0	$100,000	$0
97	Nederland WWTP	$0	$0	$0	$0	$0	$0	$0	$0
98	Instream Flow Structures and Gaging	$0	$48,428	$0	$0	$0	$0	$0	$0
99	Como Creek Diversion Structure	$0	$0	$0	$0	$0	$0	$0	$0
100	Lakewood Diversion Structure	$0	$0	$0	$0	$0	$0	$0	$0
101	Silver Lake Diversion Structure	$0	$0	$0	$0	$0	$0	$0	$0
102	NCWCD Conveyance - Boulder Feeder Can	$25	$61,271	$0	$0	$0	$0	$0	$0
103	NCWCD Conveyance - Carter Lake Pipeline	$250,000	$500,000	$850,000	$2,036,322	$0	$0	$0	$0
104	NCWCD Conveyance/Waterline replacemer	$0	$0	$0	$0	$37,565,263	$0	$0	$0
105	**Subtotal - Other Raw Water Facilities**	$328,910	$756,056	$1,080,000	$2,186,322	$37,715,263	$258,160	$250,000	$150,000
106									
107	**Source Water Pressure Reducing, Pumping and Hydroelectric**								
108	Lakewood Hydroelectric/PRV	$0	$0	$130,000	$0	$0	$300,000	$0	$0
109	Silver Lake Hydroelectric/PRV	$0	$150,000	$25,000	$50,000	$80,000	$0	$0	$0
110	Boulder Reservoir Intake and Pumping	$0	$0	$0	$0	$0	$0	$0	$0
111	Betasso Hydroelectric / Pressure Reducing I	$134,404	$0	$0	$380,000	$480,000	$0	$0	$0
112	Barker Dam Hydroelectric	$0	$0	0	$0	$0	$0	$0	$0
113	Barker Dam Hydro	$0	$0	$0	$0	$0	$0	$0	$0
114	Boulder Canyon Hydroelectric	$100,755	$33,641	$0	$0	$0	$0	$0	$0
115	Boulder Canyon Hydro - Grant	$0	$0	$0	$0	$0	$0	$0	$0
116	Boulder Canyon Hydro - Grant	$0	$0	$0	$0	$0	$0	$0	$0
117	Carter Lake Hydroelectric	$0	$0	$0	$0	$50,000	$250,000	$0	$0
118	Carter Lake Hydro	$0	$0	$0	$0	$0	$0	$2,500,000	$0
119	Source Water Pressure Reducing, Pumping	$0	$0	$0	$0	$0	$0	$193,472	$201,210
120	**Subtotal - Source Water PRV, Pumping and H**	$235,159	$183,641	$155,000	$430,000	$610,000	$550,000	$2,693,472	$201,210
121									
122	**Water Distribution System Expansion**								
123	Annexation Related Water System Expansio	$0	$2,551,700	$0	$0	$0	$0	$0	$0
124	**Subtotal - Water Distribution System Expans**	$0	$2,551,700	$0	$0	$0	$0	$0	$0
125									
126	**Water System Monitoring and Metering**								
127	Automated Meter Reading	$0	$0	$0	$0	$0	$0	$0	$684,285
128	Water System Security/Quality Improvement	$13,996	$150,000	$150,000	$150,000	$150,000	$90,000	$0	$0
129	Source Water Monitoring and Protection	$0	$100,000	$100,000	$100,000	$100,000	$100,000	$0	$0
130	Distribution System Water Quality	$14,100	$0	$0	$0	$0	$0	$0	$0
131	Data Communications System	$0	$0	$0	$0	$0	$0	$0	$0
132	September 2013 Flood Disaster Recovery	$860,072	$304,301	$0	$0	$0	$0	$0	$0
133	Yards Master Plan Implementation	$13,553	$86,321	$0	$0	$0	$0	$0	$0
134	Utility Billing Computer System	$0	$100,000	$0	$0	$0	$0	$125,000	$0
135	**Subtotal - Water System Monitoring and Mete**	$901,722	$740,622	$250,000	$250,000	$250,000	$190,000	$125,000	$684,285
136									
137	**TOTAL CAPITAL USES OF FUNDS**	$7,057,076	$13,638,331	$33,299,251	$8,679,585	$41,107,591	$11,196,676	$19,698,520	$12,318,145

	A	H	I	J	K	L	M	N	O
1	11-May-15		CITY OF BOULDER						
2			DRAFT 2016 - 2021 CAPITAL IMPROVEMENT PROGRAM						
3			WASTEWATER UTILITY FUND						
4									
5									
6	**Assumed Inflation Rate**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
7	**PROJECT NAME**	**ACTUAL**	**REVISED**	**PROJECTED**	**PROJECTED**	**PROJECTED**	**PROJECTED**	**PROJECTED**	**PROJECTED**
8									
9	**Wastewater Treatment**								
10	WWTF Pumps	$0	$0	$150,000	$0	$0	$0	$0	$0
11	WWTF Permit Improvements	$438,080	$4,194,112	$150,000	$0	$750,000	$1,500,000	$0	$136,857
12	WWTF Nutrient Management Grant	$144,485							
13	WWTF Permit Improvements - Proj. Bond	$0	$0	$0	$0	$0	$0	$18,500,000	$0
14	WWTF Laboratory	$25,163	$0	$50,000	$0	$0	$0	$0	$0
15	Lower Boulder Creek Enhancement	$0	$0	$0	$0	$0	$0	$0	$0
16	WWTF Headworks	$0	$0	$0	$0	$0	$0	$0	$0
17	WWTF Headworks - Proj. Bond	$0	$0	$0	$0	$0	$0	$0	$0
18	WWTF Instrumentation/Control	$0	$1,127,477	$0	$674,918	$701,915	$729,992	$759,191	$0
19	WWTF Electrical	$0	$0	$120,000	$1,200,000	$0	$0	$0	$0
20	WWTF Activated Sludge	$0	$389,376	$0	$175,479	$0	$0	$0	$0
21	WWTF Primary Clarifiers	$0	$0	$0	$0	$0	$0	$0	$0
22	WWTF Secondary Clarifiers	$0	$0	$0	$0	$0	$0	$0	$0
23	WWTF UV Disinfection	$2,356	$2,998	$0	$0	$0	$0	$0	$0
24	WWTF UV Disinfection - Proj. Bond	$0	$0	$0	$0	$0	$0	$0	$0
25	WWTF Permit Improvements - 2010 Bond	$15,148	$1,198	$0	$0	$0	$0	$0	$0
26	WWTF Rehabilitation	$0	$0	$0	$0	$0	$0	$150,000	$375,000
27	Valmont Butte	$0	$0	$0	$0	$0	$0	$0	$0
28	Biosolids Processing & Dewatering	$110,044	$0	$0	$0	$0	$0	$0	$0
29	WWTF Biosolids Digester	$20,000	$0	$0	$0	$0	$0	$0	$0
30	WWTF Biosolids Digester - Proj. Bond	$0	$0	$0	$0	$0	$0	$0	$0
31	WWTF Cogeneration	$0	$39,995	$0	$0	$0	$0	$184,481	$0
32	WWTF Digester Complex	$0	$0	$0	$0	$0	$200,000	$2,000,000	$0
33	September 2013 Flood Disaster Recovery	$453,442	$606,987	$0	$0	$0	$0	$0	$0
34	WWTF Digester Cleaning	$0	$0	$0	$0	$0	$0	$0	$0
35	Bond Issuance Costs	$0	$125,000	$0	$0	$0	$0	$125,000	$0
36	**Subtotal - Wastewater Treatment Plant**	$1,208,718	$6,487,143	$470,000	$2,050,397	$1,451,915	$2,429,992	$21,718,672	$511,857
37									
38	**Marshall Landfill**								
39	Marshall Landfill	$0	$0	$100,000	$0	$0	$0	$0	$0
40	**Subtotal - Marshall Landfill**	$0	$0	$100,000	$0	$0	$0	$0	$0
41									
42	**Wastewater System Monitoring and Metering**								
43	Yards Master Plan Implementation	$6,777	$36,046	$0	$0	$0	$0	$0	$0
44	Automated Meter Reading	$0	$0	$0	$0	$0	$0	$0	$0
45	Utility Billing Computer System	$0	$50,000	$0	$0	$0	$0	$65,000	$0
46	**Subtotal - Monitoring and Metering**	$6,777	$86,046	$0	$0	$0	$0	$65,000	$0
47									
48	**Collection and Conveyance System Rehabilitation**								
49	Collection System Monitoring	$338,636	$3,426	$0	$0	$0	$0	$0	$0
50	Condition Assessment Program		$780,000	$811,200	$843,648	$877,394	$912,490	$948,989	$986,949
51	Sanitary Sewer Rehabilitation	$403,808	$3,000,161	$2,758,080	$2,868,403	$2,983,139	$3,102,465	$3,226,563	$3,355,626
52	Sanitary Sewer Rehabilitation - Bond	-	10,000,000	-	-	-	-	-	-
53	Sanitary Sewer Manhole Rehabilitation	$51,186	$208,000	$216,320	$224,973	$233,972	$243,331	$253,064	$657,966
54	IBM Pump Station	$79,395	$1,235,402	$0	$0	$0	$0	$0	$0
55	Tier 1 Boulder Creek 2 Master Plan Project	$0	$0	$0	$0	$0	$0	$0	$0
56	Tier 1 Goose Creek 1/1A Master Plan Proje	$0	$0	$0	$0	$0	$0	$0	$329,278
57	Tier 1 Goose Creek 3 Master Plan Project	$0	$0	$0	$0	$0	$0	$0	$0
58	Tier 1 Goose Creek 5 Master Plan Project	$0	$0	$0	$0	$25,000	$647,590	$1,346,988	$1,400,867
59	Tier 2 Boulder Creek 1 Master Plan Project	$0	$0	$0	$0	$0	$0	$0	$0
60	Tier 2 Boulder Creek 3 Master Plan Project	$0	$0	$0	$0	$0	$0	$0	$0
61	Tier 2 Boulder Creek 4 Master Plan Project	$0	$0	$0	$0	$0	$0	$0	$0
62	Tier 2 Goose Creek 4 Master Plan Project	$0	$0	$0	$0	$0	$0	$0	$0
63	Tier 2 Gunbarrel 1 Master Plan Project	$0	$0	$0	$0	$0	$0	$0	$0
64	Tier 2 Gunbarrel 2 Master Plan Project	$0	$0	$0	$0	$0	$0	$0	$0
65	Tier 2 South Boulder Creek 1 Master Plan F	$0	$0	$0	$0	$0	$0	$0	$0
66	**Subtotal - Sewer System Rehabilitation**	$873,024	$15,226,990	$3,785,600	$3,937,024	$4,119,505	$4,905,875	$5,775,604	$6,730,686
67									
68	**Wastewater System Expansion**								
69	Annexation Related WW System Expansior	$0	$0	$0	$0	$0	$0	$0	$0
70	**Subtotal - Wastewater System Expansion**	$0	$0	$0	$0	$0	$0	$0	$0
71									
72	**TOTAL CAPITAL USES OF FUNDS**	$2,088,519	$21,800,178	$4,355,600	$5,987,421	$5,571,420	$7,335,867	$27,559,277	$7,242,543

	A	G	H	I	J	K	L	M	N
1	11-May-15		CITY OF BOULDER						
2		DRAFT 2016-2021 CAPITAL IMPROVEMENT PROGRAM							
3		STORMWATER AND FLOOD MANAGEMENT UTILITY FUND							
4									
5									
6	Assumed Inflation Rate	2014	2015	2016	2017	2018	2019	2020	2021
7	PROJECT NAME	ACTUAL	PROJECTED	PROJECTED	PROJECTED	PROJECTED	PROJECTED	PROJECTED	PROJECTED
8									
9	**Major Drainageways**								
10	Elmer's Twomile Creek	$0	$0	$0	$0	$0	$0	$0	$0
11	Goose Creek	$0	$0	$0	$0	$0	$0	$0	$0
12	South Boulder Creek	$72,856	$451,683	$750,000	$750,000	$0	$0	$0	$0
13	South Boulder Creek - Bond Proceeds	$0	$0	$0	$0	$25,000,000	$0	$0	$0
14	Bond Issuance Costs	$0	$0	$0	$0	$325,000	$0	$0	$0
15	Skunk Canyon Creek	$0	$0	$0	$100,000	$500,000	$0	$0	$0
16	Sunshine Creek	$0	$0	$0	$0	$0	$0	$0	$0
17	Twomile Canyon Creek	$0	$0	$0	$100,000	$500,000	$0	$0	$0
18	Bluebell Canyon Creek - King's Gulch	$0	$0	$0	$100,000	$500,000	$0	$0	$0
19	Viele Channel	$0	$0	$0	$0	$0	$0	$0	$0
20	Four Mile Canyon Creek	$0	$0	$0	$0	$500,000	$1,250,000	$1,250,000	$500,000
21	Four Mile Canyon Creek - Upland to Violet	$0	$0	$500,000	$500,000	$500,000	$250,000	$0	$0
22	Four Mile Canyon Creek - 19th to 22nd - Bor	$71,909	$2,000,000	$0	$0	$0	$0	$0	$0
23	Bear Canyon Creek	$0	$100,000	$500,000	$0	$0	$0	$0	$0
24	Gregory Canyon Creek	$0	$100,000	$500,000	$0	$0	$0	$0	$0
25	Boulder Creek	$0	$600,000	$0	$2,500,000	$2,250,000	$0	$0	$0
26	Boulder Slough	$788,165	$0	$0	$0	$0	$0	$0	$0
27	Wonderland Creek	$0	$0	$0	$0	$0	$0	$0	$0
28	Wonderland Creek - Foothills to 30th	696,684	$1,708,735	$0	$0	$0	$0	$0	$0
29	Wonderland Creek at 28th St.	399,202	$628,221	$0	$0	$0	$0	$0	$0
30	Wonderland Creek - Bond Proceeds	$0	$21,000,000	$0	$0	$0	$0	$0	$0
31	Bond Issuance Costs	$0	$75,000	$0	$0	$0	$0	$0	$0
32	Preflood Acquisition	$875	$3,355,520	$500,000	$550,000	$600,000	$633,000	$660,000	$684,285
33	Greenways Program Transfer	$814	$710,282	$97,500	$97,500	$97,500	$97,500	97,500	133,435
34	**Subtotal - Major Drainageway Improvements**	$2,030,505	$30,729,441	$2,847,500	$4,697,500	$30,772,500	$2,230,500	$2,007,500	$1,317,720
35									
36	**Miscellaneous**								
37	Yards Master Plan Implementation	$6,777	$43,223	$0	$0	$0	$0	$0	$0
38	CU Bike/Ped Bridge Replacement I	$0	$200,000	$0	$0	$0	$0	$0	$0
39	September 2013 Flood Disaster Recovery	5,314,477	$494,672						
40	Utility Billing Computer System	$0	$50,000	$0	$0	$0	$0	$65,000	$0
41	**Subtotal - Miscellaneous Drainage Improvem**	$5,321,254	$787,895	$0	$0	$0	$0	$65,000	$0
42									
43	**Stormwater Management**								
44	Upper Goose Creek	$0	$175,000	$750,000	$750,000	$750,000	$1,000,000	$1,165,547	$1,221,869
45	Local Drainage Improvements		$712,400	$730,080	$759,283	$789,655	$821,241	$854,090	$986,949
46	Stormwater Quality Improvements	$1,322	$274,675	$162,000	$169,000	$175,500	$182,500	$190,000	$197,390
47	Storm Sewer Rehabilitation	$194,114	$444,156	$270,400	$281,200	$292,500	$304,000	$632,700	$657,966
48	Transportation Coordination	$436,702	$366,017	$324,500	$337,500	$351,000	$365,000	$633,000	$657,966
49	**Subtotal - Localized Drainage Improvements**	$632,138	$1,972,248	$2,236,980	$2,296,983	$2,358,655	$2,672,741	$3,475,337	$3,722,139
50									
51	**TOTAL CAPITAL USES OF FUNDS**	$7,983,897	$33,489,583	$5,084,480	$6,994,483	$33,131,155	$4,903,241	$5,547,837	$5,039,859

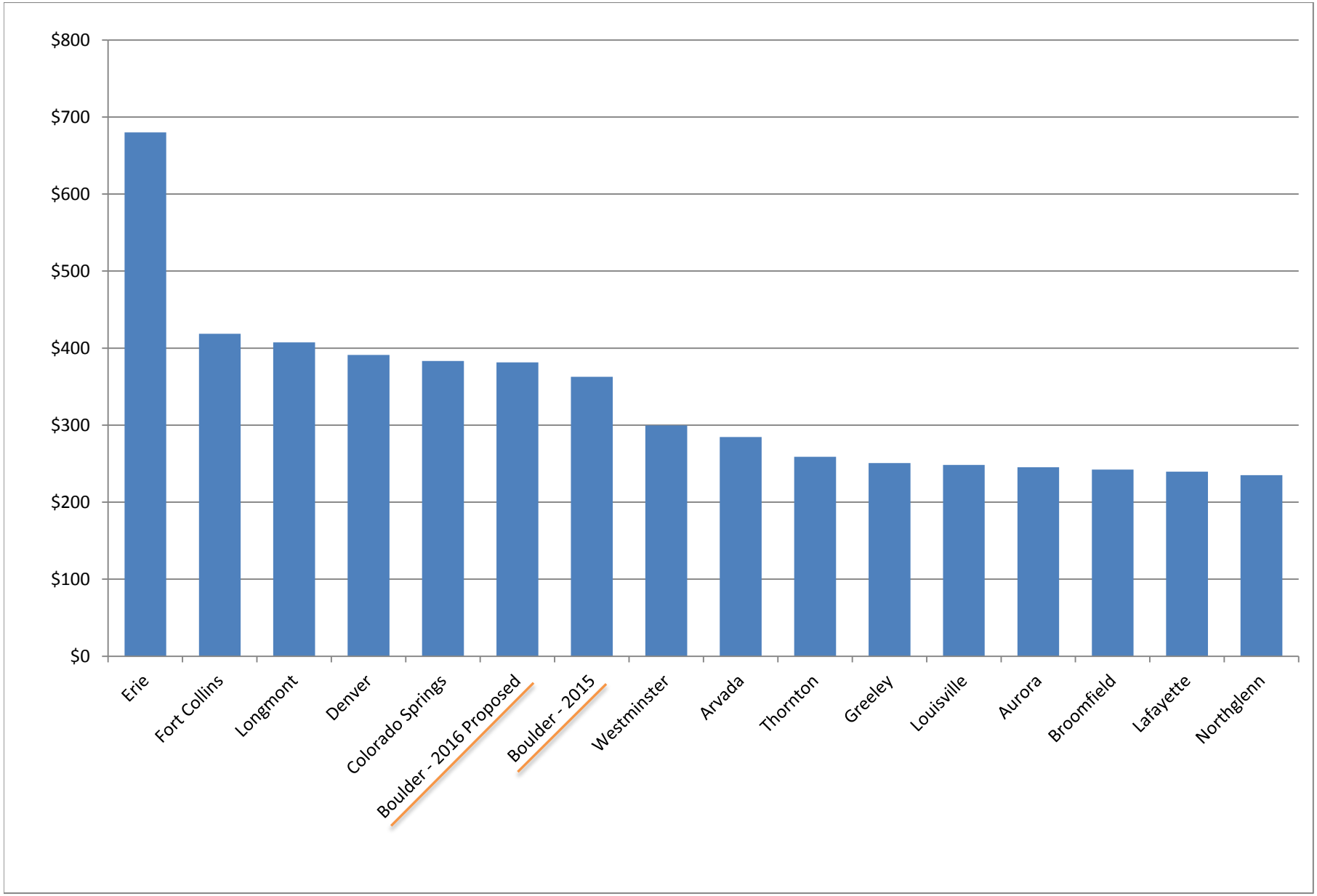
Attachment C

2015 Annual Residential Water Bills



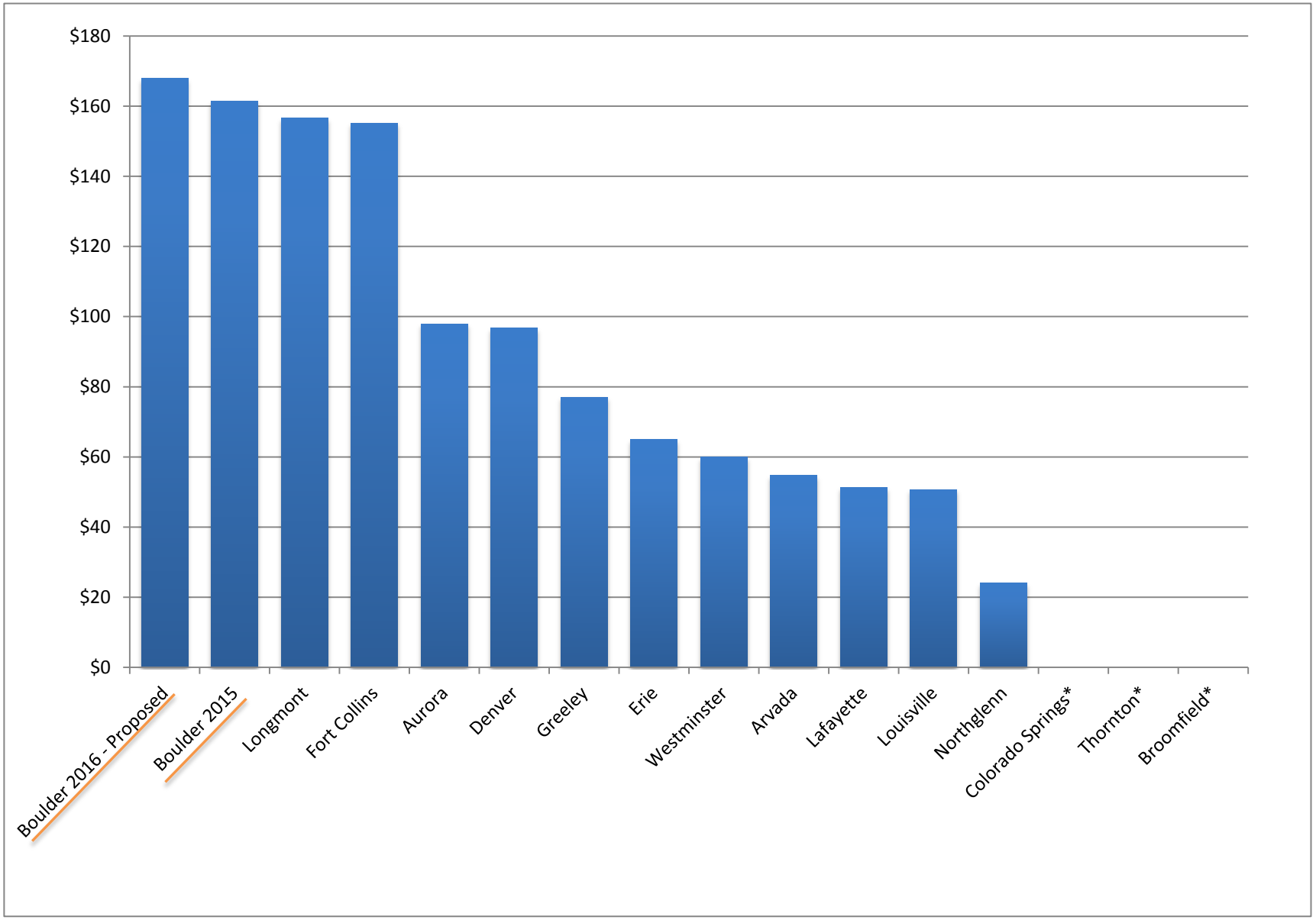
Attachment C

2015 Annual Residential Wastewater Bills



Attachment C

2015 Annual Residential Stormwater/Flood Bills



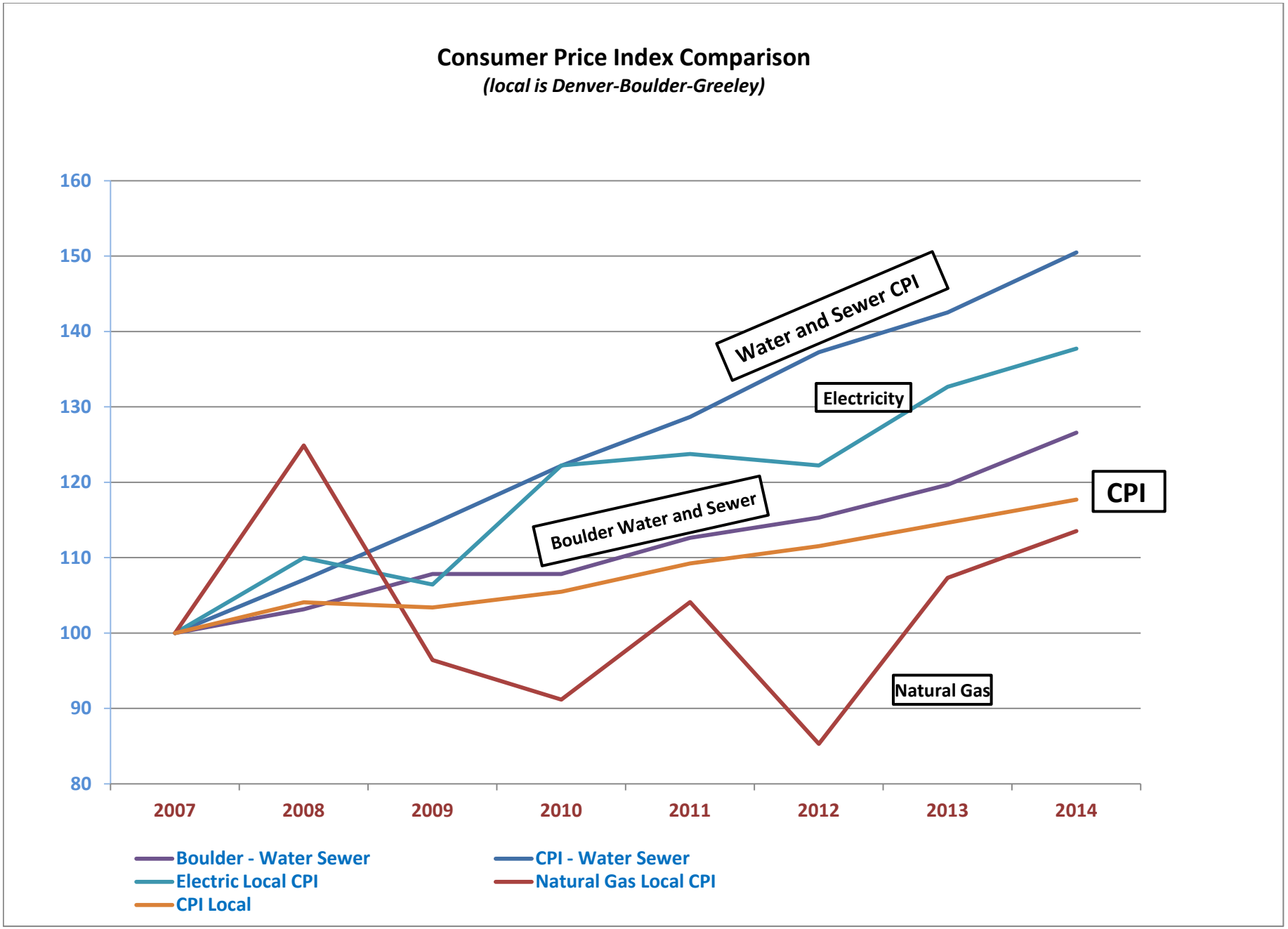
*Cities with no Stormwater Utility Fee

Attachment D

CITY OF BOULDER
UTILITIES REVENUE INCREASES

Year	Fund	Increase
2003	Water	3.0%
	Wastewater	12.0%
	Storm/Flood	6.0%
2004	Water	0.0%
	Wastewater	6.0%
	Storm/Flood	3.0%
2005	Water	3.0%
	Wastewater	20.0%
	Storm/Flood	3.0%
2006	Water	3.0%
	Wastewater	20.0%
	Storm/Flood	3.0%
2007	Water	4.0%
	Wastewater	6.0%
	Storm/Flood	3.0%
2008	Water	4.0%
	Wastewater	3.0%
	Storm/Flood	3.0%
2009	Water	8.0%
	Wastewater	5.0%
	Storm/Flood	3.0%
2010	Water	0.0%
	Wastewater	0.0%
	Storm/Flood	0.0%
2011	Water	3.0%
	Wastewater	3.0%
	Storm/Flood	0.0%
2012	Water	3.0%
	Wastewater	3.0%
	Storm/Flood	3.0%
2013	Water	3.0%
	Wastewater	5.0%
	Storm/Flood	3.0%
2014	Water	4.0%
	Wastewater	5.0%
	Storm/Flood	3.0%
2015	Water	5.0%
	Wastewater	30.0%
	Storm/Flood	75.0%
2016	Water	8.0%
proposed	Wastewater	5.0%
	Storm/Flood	4.0%

Attachment E



Attachment F

Annual Single Family Bill History