

# Appendix H

## City of Boulder Flood Notification Operational Guidelines

# City of Boulder CFS/Rainfall Thresholds

The following tables present threshold CFS/rainfall rates for the Fourmile Watershed, Boulder Creek and Fourmile Canyon Creek. When calculating risk, be sure to include baseline CFS levels in Boulder Creek at the time of the assessment and add the CFS to the expected flood level.

The thresholds are for inches of rainfall per hour estimate for a storm located over the entire burn area. The thresholds were based on the likely inundation resulting from the estimated peak flows from the burn area.

Table 1: City of Boulder Fourmile Canyon Creek Flood Notification Matrix

Location	Rainfall Threshold In/hr	Flow Rate CFS (cubic ft / sec)	Homes at Risk	Flood Affects Bridges & Roads Affected. Life Safety Risk	AHA System Alert Level	Public Warning Level
Fourmile Canyon Creek	1 - 1/4"	750	N/A	<ul style="list-style-type: none"> <li>Low lying area flooding and some street flooding.</li> <li>Life Safety risk is present.</li> <li>See Table 2 for road impacts</li> </ul>	COB Yellow	<ul style="list-style-type: none"> <li>City of Boulder Communications Center determines or is contacted by the EOC to page Police/Fire Chief and Shift Commander to call provided EOC phone number.</li> <li>Police/Fire Chief and Shift Commander authorize dispatch to launch an Everbridge FFW Advisory to affected areas along Fourmile Canyon Creek. City of Boulder operates public information systems to communicate the condition.</li> <li>Employees are notified through the employee alert system if authorized via dispatch.</li> <li>City of Boulder Communications Center launches an Everbridge FFW Advisory to affected areas of the City.</li> <li>NWS issues Flash Flood Warning for City of Boulder areas affected by flooding.</li> </ul>

Location	Rainfall Threshold In/hr	Flow Rate CFS (cubic ft / sec)	Homes at Risk	Flood Affects Bridges & Roads Affected. Life Safety Risk	AHA System Alert Level	Public Warning Level
Fourmile Canyon Creek	1.5"	1,000	N/A	<ul style="list-style-type: none"> <li>• Road access problems</li> <li>• North Boulder impacted by flooding.</li> <li>• Life Safety risk is high</li> <li>• <b>See Table 2 for road impacts</b></li> </ul>	COB Red	<p><b>Public Warning Level</b>  FFW- Flash flood warning  FMCC- Fourmile canyon creek  CMO- City Manager's Office</p> <ul style="list-style-type: none"> <li>• City of Boulder Communications Center determines or is contacted by the EOC to page Police/Fire Chief and Shift Commander to call provided EOC phone number.</li> <li>• Police/Fire Chief and Shift Commander authorize dispatch to launch an Everbridge FFW Advisory to affected areas along Fourmile Canyon Creek. City of Boulder operates public information systems to communicate the condition.</li> <li>• City of Boulder operates public information systems to communicate the condition.</li> <li>• Employees are notified through the employee alert system if authorized via dispatch.</li> <li>• City of Boulder Communications Center launches an Everbridge FFW Advisory to affected areas of the City.</li> <li>• NWS issues Flash Flood Warning for City of Boulder areas affected by flooding.</li> </ul>

**Table 2: Flow Rates by Event for Fourmile Canyon Creek**

Location	Rainfall Event (cfs)			
	2-yr	5-yr	10-yr	50-yr
Lee Hill Drive	36	287	715	2461
Broadway	58	316	794	1842
19 <sup>th</sup> Street	155	331	697	1194
28 <sup>th</sup> Street	172	360	732	1260
				100-yr
				3296
				1967
				1277
				1451

750 CFS is likely to result from 1.24" of rainfall in one hour over the entire Fourmile Burn area. This flow rate is approximately the 10-yr event along Fourmile Canyon Creek. The following impacts to roads would likely occur:

- Violet Ave overtopping of 18" or more
- Upland Ave overtopping of 18" or more
- 19<sup>th</sup> Street overtopping of 6" or less
- Topaz Drive overtopping of 18" or more
- 26<sup>th</sup> Street overtopping of 6" or more
- 47<sup>th</sup> Street overtopping of 18" or more

1,000 CFS is likely to result from 1.5" of rainfall in one hour over the entire Fourmile Burn area. This flow rate is between the 10-yr and 25-yr event along Fourmile Canyon Creek.

- Violet Ave overtopping of 18" or more
- Upland Ave overtopping of 18" or more
- 19<sup>th</sup> Street overtopping of 6" or less
- Topaz Drive overtopping of 18" or more
- 26<sup>th</sup> Street overtopping of 6"-18"
- 47<sup>th</sup> Street overtopping of 18" or more



Table 3: City of Boulder Fourmile Creek Watershed / Boulder Creek Flood Notification Matrix

Cubic Feet Per Second ( CFS) in Boulder Creek	Structures at Risk	Flood Affects Bridges & Roads Affected. Life Safety Risk	AHA System Alert Level	Public Warning Level FFW- Flash flood warning FMCC- Fourmile canyon creek CMO- City Manager's Office
800	No	<ul style="list-style-type: none"> <li>Trail crossings only</li> </ul>	City of Boulder & CU AHA recommended Alert Level Green	<ul style="list-style-type: none"> <li>City of Boulder operates public information systems to communicate the condition.</li> <li>Employees are notified through the employee alert system if authorized by the CMO, Police or Fire through the Boulder Dispatch Center..</li> </ul>
2200	No	<ul style="list-style-type: none"> <li>Trail crossings only</li> </ul>	City of Boulder & CU AHA recommended Alert Level Yellow	<ul style="list-style-type: none"> <li>City of Boulder operates public information systems to communicate the condition. Employees are notified through the employee alert system if authorized.</li> <li>If there is a possible additional risk or CFS increase the AHA system should be elevated to a condition Yellow.</li> <li>The City Manager's Office authorizes the AHA system change. Employees are notified through the employee alert system if authorized through the Boulder Dispatch Center.</li> <li>NWS may be a flood advisory along Boulder Creek.</li> </ul>
2900	Yes	<ul style="list-style-type: none"> <li>Flooding along Boulder Creek trails.</li> <li>City Campus flooding</li> <li>CU Parking West of Folsom</li> <li>Preschool at 1345 28<sup>th</sup> Street</li> <li>Business parking lots east of Foothills on the North side of the creek</li> <li>Industrial buildings North of Arapaho ( Boulder Industrial park)</li> </ul>	City of Boulder & CU AHA recommended Alert Level Red	<ul style="list-style-type: none"> <li>City of Boulder Communications Center is contacted by the EOC to page Police/Fire Chief and Shift Commander to call provided EOC phone number.</li> <li>Police/Fire Chief and Shift Commander authorize dispatch to launch an Everbridge FFW Advisory to affected areas along Boulder Creek and CU advising of hazard and siren activation.</li> <li>City of Boulder operates public information systems to communicate the condition.</li> <li>Employees are notified through the employee alert system if authorized via dispatch.</li> <li>NWS issues Flash Flood Warning for Boulder Creek.</li> </ul>
5600	Yes	<ul style="list-style-type: none"> <li>Library</li> <li>City campus flooding</li> <li>CU Parking West of Folsom</li> <li>Flooding along Boulder Creek between Folsom to 28<sup>th</sup> street.</li> <li>Industrial park north of Arapahoe</li> </ul>	City of Boulder & CU AHA recommended Alert Level Red	<ul style="list-style-type: none"> <li>City of Boulder Communications Center is contacted by the EOC to page Police/Fire Chief and Shift Commander to call provided EOC phone number.</li> <li>Police/Fire Chief and Shift Commander authorize dispatch to launch an Everbridge FFW Advisory to affected areas along Boulder Creek and CU advising of hazard and siren activation.</li> <li>CU Communications advised of FFW and siren activation if necessary.</li> <li>NWS issues Flash Flood Warning for Boulder Creek.</li> </ul>

Table 4: City of Boulder - Boulder Creek Flood Notification Matrix

Rainfall Rate Over Entire Burn Area (in/hr)	USGS Gage in Burn Area <sup>1</sup> (cfs)	Boulder Creek Flows (no base flow) <sup>2</sup>		
		6th Street (cfs)	Broadway (cfs)	28th Street (cfs)
1"	870	825	800	460
1.5"	2250	2200	2180	1850
1.7"	3090	2990	2940	2579
2.4"	6000	5760	5640	5100

<sup>2</sup> Must add base flow in Boulder Creek to these flows for total flow

Table 5: Regulatory Peak Flows for Boulder Creek and Fourmile Canyon Creek

Event	Peak Flow (CFS)
<b>Boulder Creek at Eben Fine Park</b>	
2-yr	-
10-yr	2,000
25-yr	5,580
100-yr	11,650
<b>Fourmile Canyon Creek at Lee Hill Drive</b>	
2-yr	36
5-yr	375
10-yr	715
25-yr	1,600
100-yr	3,296

Table 6: Flood Effects on Bridges and Roads in Boulder County

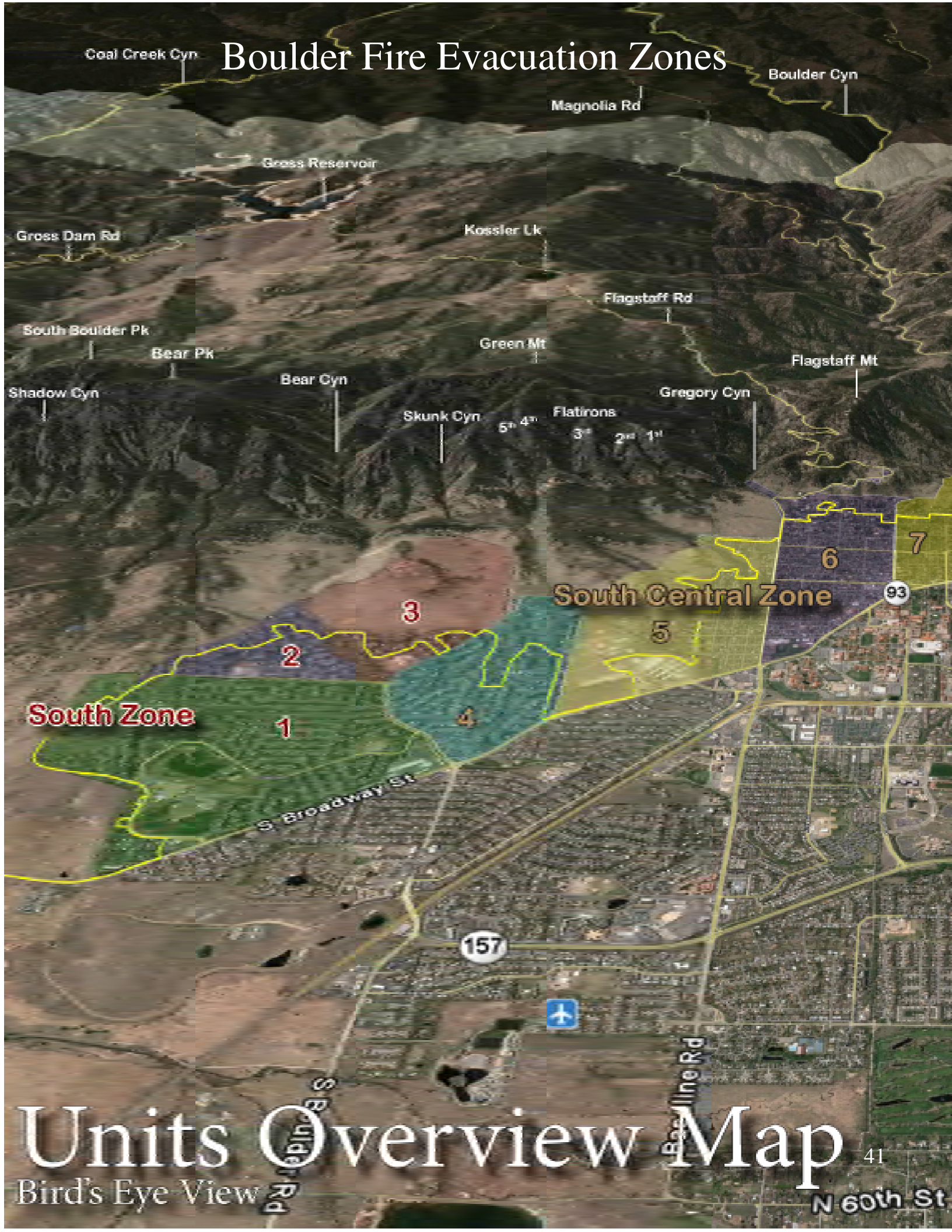
Bridge and Road Impacts	Est. Capacity – CFS (Assumes no debris blockage)	Precip. Event of Concern (Inch per Hour)
SH119 (Boulder Canyon)	1,700	1 <sup>1/2</sup>
Private upstream of SH119	500	3/4
Logan Mill Road	1,500	1 <sup>1/4</sup> - 1 <sup>1/2</sup>
Crisman Road Bridge	1,200	1 <sup>1/4</sup>
Private Drive Upstream of Logan Mill Road	2,000	1 <sup>1/2</sup>
Most Small Residential Bridges	100 – 500 (approx.)	1/2 - 3/4



# Appendix I

## Boulder Fire Evacuation Zone Map

# Boulder Fire Evacuation Zones



# Units Overview Map

Bird's Eye View



# Boulder Fire Evacuation Zones

Sugarloaf Rd

Lefthand Cyn

Fourmile Cyn Dr

Sunshine Cyn Dr

Boulder Heights

Mt. Sanitas

Pinebrook Hills

North Zone

119

8

9

10

11

12

13

7

North Central Zone

36

Footfalls Pkwy

Diagonal Hwy

Arapahoe Ave



Valmont Rd





# Appendix J

## Flood Inundation Maps

### Boulder Creek & Fourmile Canyon Creek






Impacts to Structures	
Address	Inundation Depth
1101 Arapahoe Ave (New Britain)	<1ft
1739 Broadway (Park Central)	<1ft


**Legend**

- No Inundation
- <6" of water
- 6-18" of water
- >18" of water
- ▽ Red Alert Floodplain
- ▴ Flood Depth
- ▾ Flood Depth (Main Channel)
- ~ Creek

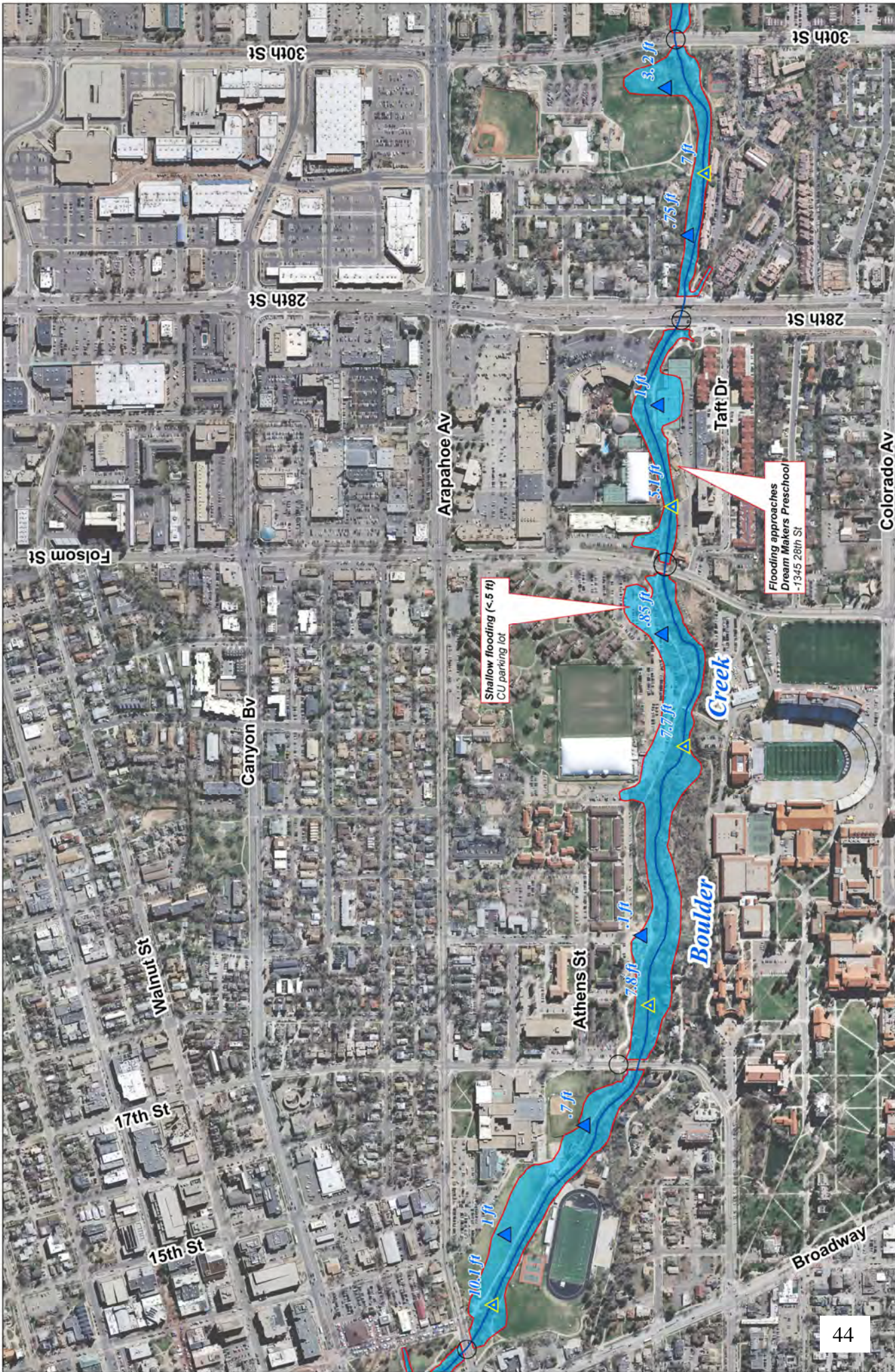
\*Red Alert- 1.7" over entire burn area in one hr (2,900 cfs)  
 Regulatory 10-yr event (2,000 cfs)  
 Regulatory 25-yr event (5,580 cfs)  
 \*\*Add base flow to this cfs for total flow in Boulder Creek

  
 City of Boulder  
 Utilities Division

This information depicted on this map is provided as graphical information only and is not intended to be used for engineering purposes. The information is provided as is, without warranty, and the City of Boulder does not assume any liability for the accuracy and/or completeness of the information contained herein.

  
 0 250 500 1,000 1,500 2,000 Feet  
 1:2,000





# Boulder Creek Red Alert Threshold & Roadway Inundation



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\*Red Alert: 1.7" over entire burn area in one hr (2,900 cfs)  
 Regulatory 10-yr event (2,000 cfs)  
 Regulatory 25-yr event (5,580 cfs)  
 \*Add base flow to this cfs for total flow in Boulder Creek

- No Inundation
- <6" of water
- 6-18" of water
- >18" of water
- Red Alert Floodplain
- ▲ Flood Depth
- ▲ Flood Depth (Main Channel)
- ~ Creek



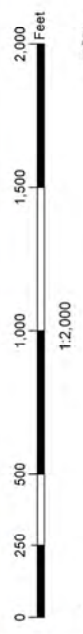


Shallow flooding (<1ft)  
 Pearl East Business Park  
 Parking Lot  
 -4754 Walnut St

Address	Inundation Depth
1835 Range St	1-2ft
1845 Range St	1-2ft
1800 Commerce St	1-2ft
1840 Commerce St	1-2ft

# Boulder Creek

## Red Alert Threshold & Roadway Inundation



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- Legend**
- No Inundation
  - Roadway Inundation
  - <6" of water
  - 6-18" of water
  - >18" of water
  - ▴ Red Alert Floodplain
  - ▴ Flood Depth
  - ▴ Flood Depth (Main Channel)
  - ~ Creek
- \*Red Alert- 1.7' over entire burn area in one hr (2,900 cfs)  
 Regulatory 10-yr event (2,000 cfs)  
 Regulatory 25-yr event (5,580 cfs)  
 \*\*Add base flow to this cfs for total flow in Boulder Creek





March 2013  
 Recent information indicates the potential water spread may be a larger area than indicated here.

Structure	Inundation Depth
Rosewood Ave	< 5ft
Broadway	< 5ft
Broadway	< 5ft
Broadway	< 5ft
Upland Ave	< 5ft
19th St	< 5ft
Upland Ave	< 5ft
Tamarack Ave	< 5ft
Tamarack Ave	< 5ft
Tamarack Ave	< 5ft

- Inundation
- Red Alert Floodplain
- Flood Depth
- Flood Depth (Main Channel)
- Creek
- Red Alert - 1.25" over, entire burn area in one hr (750 cfs)
- Regulatory 10-yr event (715 cfs)
- Regulatory 25-yr event (1,600 cfs)

0 300 600 1,200 1,800 2,400 Feet

1:2,400

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# Fourmile Canyon Creek

## Red Alert Threshold & Roadway Inundation





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**Impacts to Structures**

Address	Inundation Depth
4270 19th St	<5ft
4306 19th St	<5ft
2020 Upland Ave	<5ft
2130 Tamarack Ave	<5ft
2140 Tamarack Ave	<5ft
2150 Tamarack Ave	<5ft
2455 Sumac Ave	1-3ft
2435 Topaz Dr	<5ft
4450 Ruby St	1ft
2400 Topaz Dr	1ft
4097 26th St	1ft
2590 Agate Rd	<5ft
4066 26th St	1ft

**Legend**

- Roadway Inundation
- No Inundation
- <6" of water
- 6-18" of water
- >18" of water
- Red Alert Floodplain
- Flood Depth
- Flood Depth (Main Channel)
- Creek

**Red Alert - 1.25" over entire burn area in one hr (750 cfs)**  
**Regulatory 10-yr event (715 cfs)**  
**Regulatory 25-yr event (1,600 cfs)**

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0 300 600 1,200 1,800 2,400 Feet

1:2,400

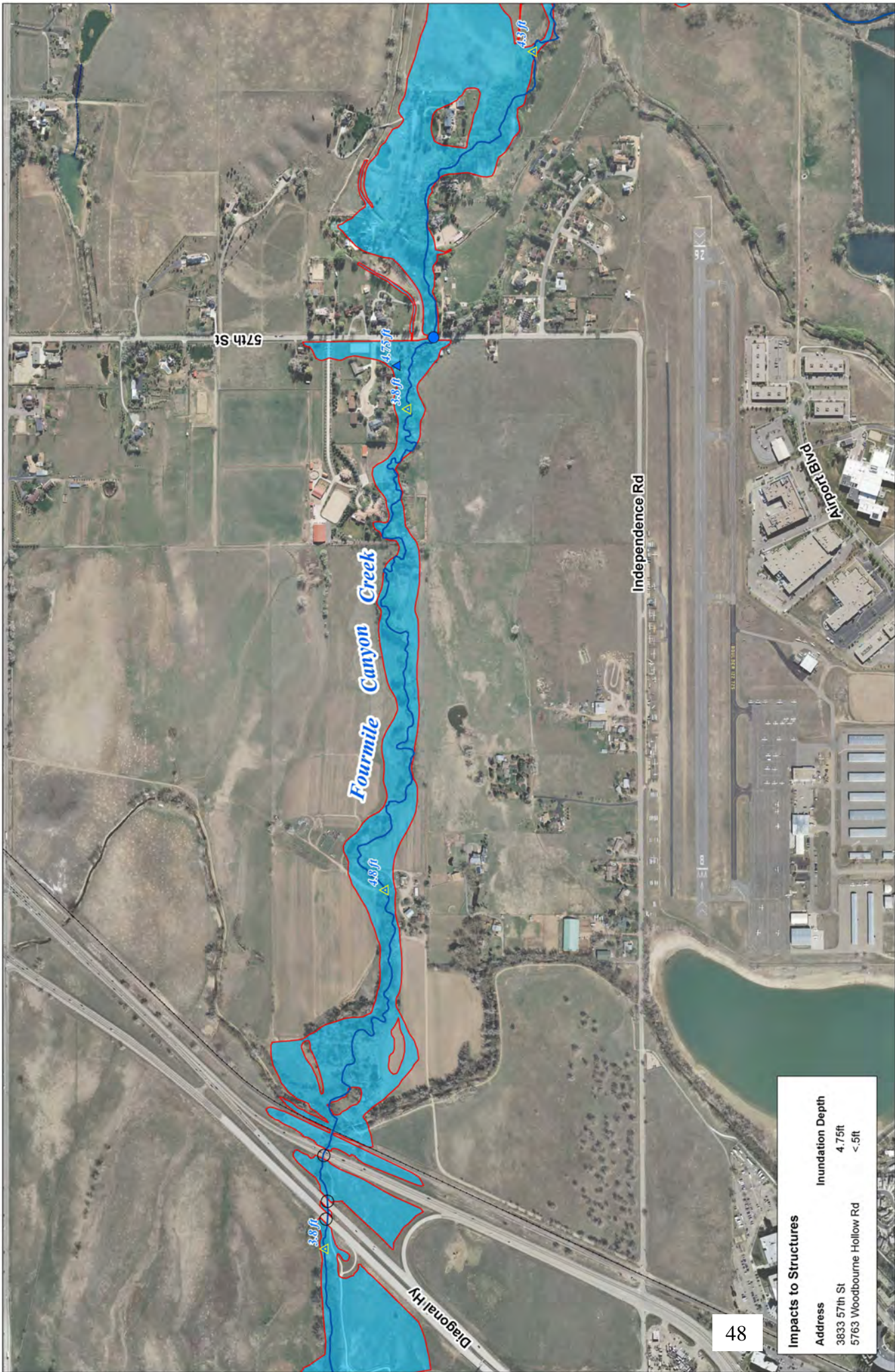
North Arrow

# Fourmile Canyon Creek

## Red Alert Threshold & Roadway Inundation

Map 2 of 4





**Impacts to Structures**

Address	Inundation Depth
3833 57th St	4.75ft
5763 Woodbourne Hollow Rd	<.5ft

# Fourmile Canyon Creek

## Red Alert Threshold & Roadway Inundation

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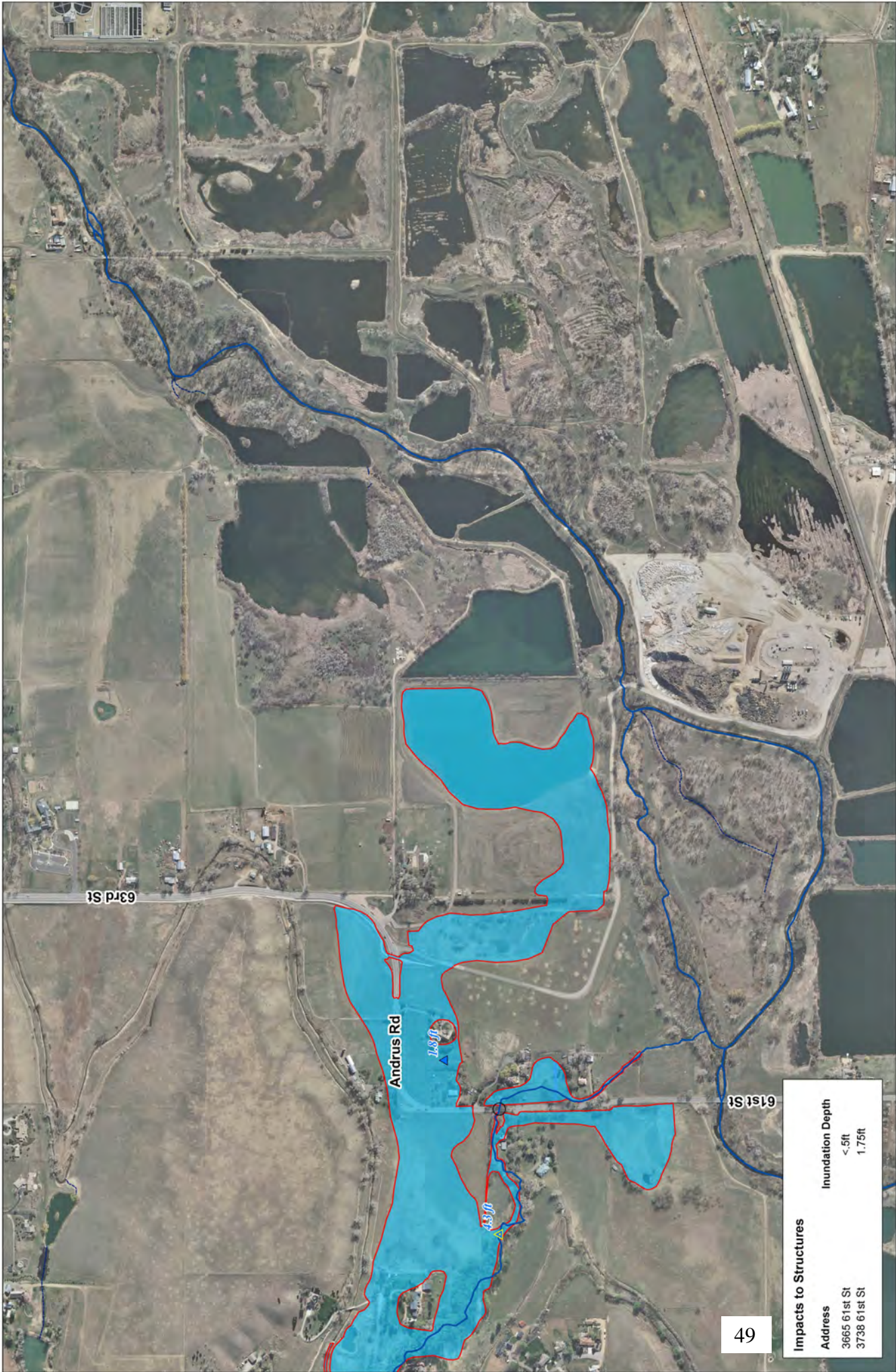
0 300 600 1,200 1,800 2,400 Feet

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**Legend**

	Red Alert - 1.25" over entire burn area in one hr (750 cfs)
	Regulatory 10-yr event (715 cfs)
	Regulatory 25-yr event (1,600 cfs)
	Roadway Inundation
	No Inundation
	6-18" of water
	6-18" of water
	>18" of water
	Red Alert Floodplain
	Flood Depth
	Flood Depth (Main Channel)
	Creek



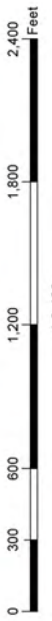


# Fourmile Canyon Creek

## Red Alert Threshold & Roadway Inundation



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**Impacts to Structures**

Address	Inundation Depth
3665 61st St	<.5ft
3738 61st St	1.75ft

49

- Legend**
- Red Alert - 1.25" over entire burn area in one hr (750 cfs)
  - Regulatory 10-yr event (715 cfs)
  - Regulatory 25-yr event (1,600 cfs)
  - No Inundation
  - 6-18" of water
  - >18" of water
  - Red Alert Floodplain
  - Flood Depth
  - Flood Depth (Main Channel)
  - Creek





# Appendix K

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
Structure Protection Plan

# EVACUATION APPENDIX

City of Boulder



## MAP LEGEND

-  Urban Interface Zone Area 1 (Area 1 Evacuations)
-  Area 2 Evacuations
-  Units 1-13
-  Urban Interface Zone (Outside Boulder city limits)



Structure Protection Plan  
**EVACUATION**  
**APPENDIX**

City of Boulder, Colorado

Version 2012.2





# Acknowledgments

CREATED BY	<b>Dave Zader</b>	Wildland Fire Management Coordinator, Boulder Wildland Division
SPECIAL THANKS TO	<b>Brian Oliver</b>	Fuels Management Supervisor, Boulder Wildland Division
	<b>Mat Wood</b>	Crew Supervisor, Boulder Wildland Division
	<b>Troy Spahn</b>	Asst. Crew Supervisor, Boulder Wildland Division
	<b>Kip White</b>	GIS, City of Boulder
	<b>Edward McEldowney</b>	Communications Manager, Boulder Police Department
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