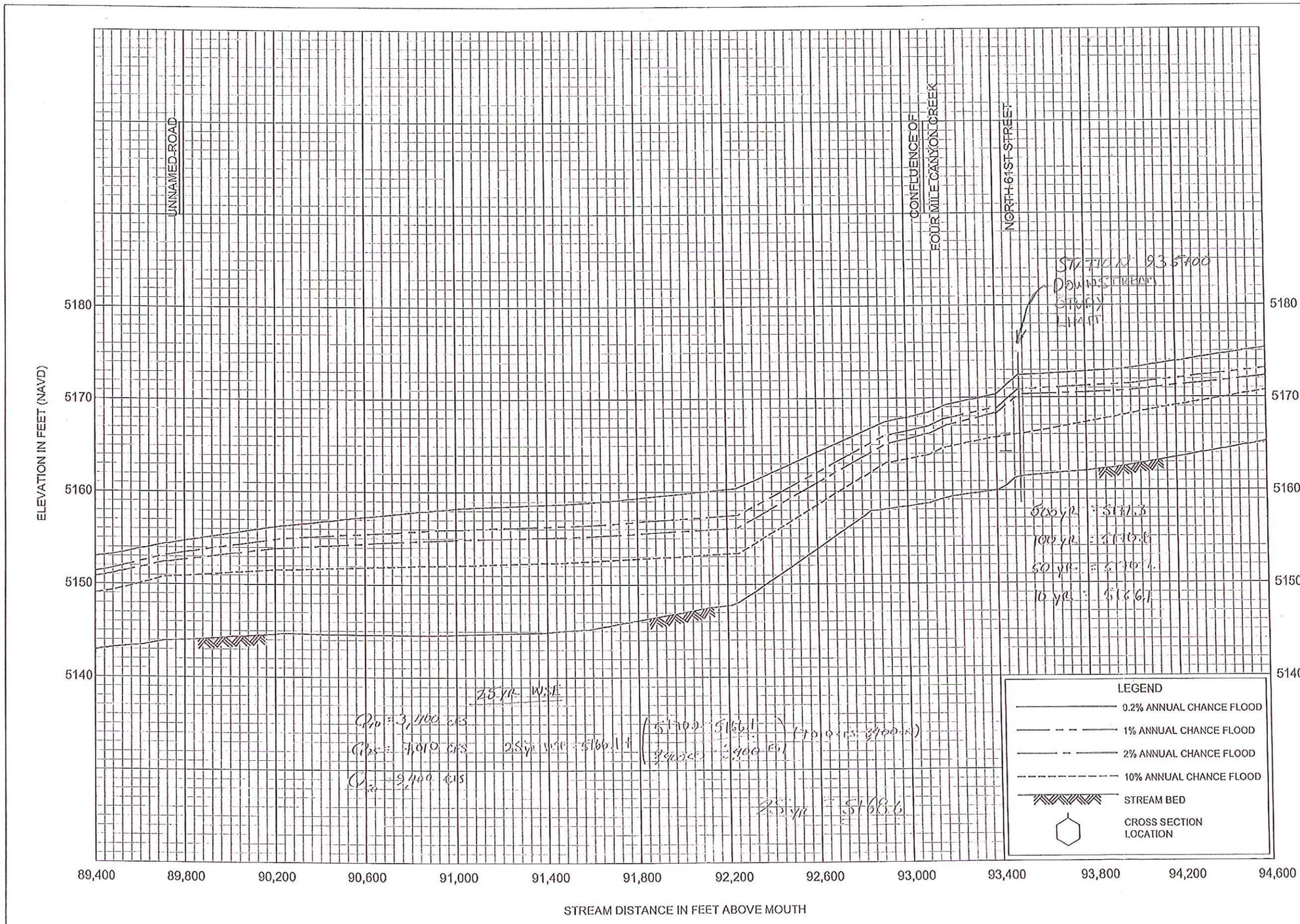
APPENDIX C

BOULDER CREEK STARTING WATER SURFACE ELEVATIONS, UPSTREAM TIE-IN INFORMATION, AND DISCHARGE CALCULATIONS FOR THE FLATIRON PARKWAY SPLIT

STARTING WATER SURFACE ELEVATIONS

DOWNSTREAM STARTING WATER SURFACE ELEVATION



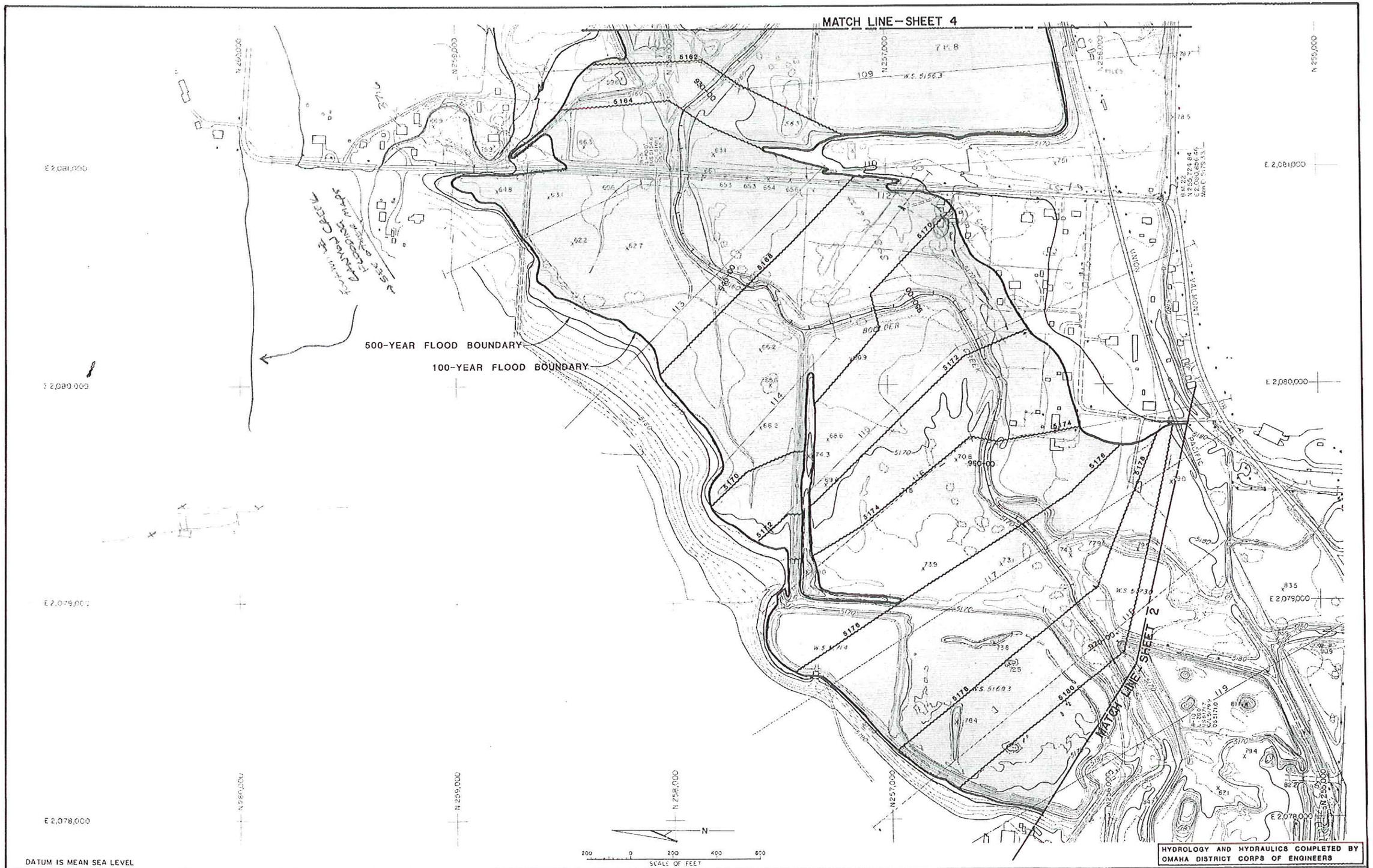
FLOOD PROFILES

BOULDER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOULDER COUNTY, CO

AND INCORPORATED AREAS



DATUM IS MEAN SEA LEVEL

HYDROLOGY AND HYDRAULICS COMPLETED BY OMAHA DISTRICT CORPS OF ENGINEERS

GROUND CONTROL SURVEY, AERIAL PHOTOGRAPHY, TOPOGRAPHIC MAPPING BY DELTA AERIAL SURVEYS, INC CONTOUR INTERVAL: 2 FEET DATE FLOWN 4/29/79	MULLER ENGINEERING COMPANY, INC. CONSULTING ENGINEERS 1410 VANCE ST., SUITE 203 LAKEWOOD, COLORADO 80215 (303) 232-5340	DESIGNED COE DATE DRAWN JHK, JDM DATE 1/83 CHECKED KGS, LAM DATE 1/83 REVISED DATE	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT COLORADO WATER CONSERVATION BOARD BOULDER COUNTY	FLOOD HAZARD AREA DELINEATION LOWER BOULDER CREEK	FLOODPLAIN MAP STA 972+10 TO 926+00	SHEET 3 OF 23 MEC JOB NO. 8218

FLOODING SOURCE			10-YEAR FLOODPLAIN DATA		50-YEAR FLOODPLAIN DATA		500-YEAR FLOODPLAIN DATA	
IDENTIFICATION	CROSS SECTION	STATION[1]	DISCHARGE	FLOOD ELEV. (MSL)	DISCHARGE	FLOOD ELEV. (MSL)	DISCHARGE	FLOOD ELEV. (MSL)
	97	856+10	3550	5131.6	9950	5134.0	29,300	5136.0
	98	864+50	3600	5133.1	10,000	5135.5	29,400	5137.9
	99	869+20	3600	5134.8	10,000	5136.9	29,400	5140.0
	100	874+00	3600	5138.1	10,050	5139.2	29,500	5141.3
	101	881+20	3600	5140.3	10,050	5142.0	29,500	5143.4
	102	885+75	3650	5141.0	10,100	5142.8	29,600	5145.1
	103	891+10	3650	5143.6	10,100	5145.6	29,600	5147.7
Fourmile Canyon Creek	104	897+10	3650	5147.5	10,100	5149.0	29,600	5151.0
	105	902+60	3400	5148.2	9400	5150.6	27,200	5153.1
	106	909+80	3400	5148.7	9400	5151.4	27,200	5154.8
	107	915+60	3400	5149.0	9400	5151.8	27,200	5155.4
	108	922+40	3400	5149.9	9400	5152.7	27,200	5156.9
	109	929+00	3400	5159.5	9400	5161.6	27,200	5164.0
	110	934+05	3400	5161.9	9400	5164.5	27,200	5166.6
North 66th Street	112	935+00	3400	5162.2	9400	5166.4	27,200	5168.6
	113	939+60	3400	5164.2	9400	5166.8	27,200	5169.2
	114	946+20	3400	5166.9	9400	5168.5	27,200	5171.6
	115	954+06	3400	5169.8	9400	5171.1	27,200	5173.7
	116	959+00	3500	5172.0	9400	5173.4	27,200	5175.9
	117	965+00	3500	5174.7	9400	5176.0	27,200	5178.4
South Boulder Creek	118	970+00	3500	5177.5	9400	5178.9	27,200	5181.3
	119	974+90	3450	5179.5	(4450)	5180.7	(5,400)	5182.9
	120	983+60	3450	5182.2	(4450)	5182.5	(5,400)	5183.6
	121	990+30	3450	5186.5	(4450)	5187.2	(5,400)	5188.0
	122	993+00	3450	5189.7	(4450)	5190.9	(5,400)	5191.8
Valmont Drive	124	994+50	3450	5191.7	(4450)	5194.5	(5,400)	5196.8
	125	996+90	3450	5191.9	(3550)	5194.6	(1,200)	5196.9
Union Pacific Railroad	127	998+90	3450	5192.2	(3550)	5194.7	(1,200)	5196.9
	128	1005+20	3450	5193.2	8400	5196.0	18,600	5197.9
Valley View Road Upstream Study Limit	129	1010+50	3450	5197.1	8400	5198.7	18,600	5200.7

[1]Distance in feet above mouth

( ) Discharge represents estimated flow in Cross Section. For total discharge refer to Figure 3 "Discharge Probability Profiles"

Hydrology and Hydraulics completed by Omaha District Corps of Engineers.

MULLER ENGINEERING COMPANY, INC.
CONSULTING ENGINEERS
1410 VANCE ST., SUITE 203
LAKEWOOD, COLORADO 80215
(303) 232-9340

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
COLORADO WATER CONSERVATION BOARD
BOULDER COUNTY

FLOODPLAIN REFERENCE DATA
LOWER BOULDER CREEK

TABLE III CONT.

FLOODING SOURCE				100-YEAR FLOODPLAIN DATA			FLOODWAY DATA			
IDENTIFICATION	CROSS SECTION	STATION [1]	100yr. DISCHARGE (CFS)	THALWEG ELEV. (MSL)	FLOOD ELEV. (MSL)	FLOODPLAIN WIDTH (FT)	FLOODWAY WIDTH [2] LEFT (FT)	RIGHT (FT)	TOTAL (FT)	FLOODWAY ELEV. (MSL)
	97	856+10	14,200	5125.3	5135.1	3850 *	180	360	540	5135.6
	98	864+50	14,300	5128.9	5136.6	3850 *	600	40	640	5137.0
	99	869+20	14,300	5131.9	5137.9	3440 *	735	45	780	5138.4
	100	874+00	14,350	5133.6	5139.9	2975 *#	960	100	1060	5140.3
	101	881+20	14,350	5137.3	5142.6	3570 *#	1450	80	1530	5143.1
	102	885+75	14,400	5138.3	5143.6	2670 #	1400	90	1490	5144.5
	103	891+10	14,400	5138.8	5146.1	1775 #	1280	50	1330	5146.9
Fourmile Canyon Creek	104	897+10	14,400	5140.5	5149.8	2040 *	350	138	488	5150.1
	105	902+60	13,300	5141.3	5151.6	1045	530	80	610	5152.2
	106	909+80	13,300	5141.2	5152.6	1255	1140	86	1226	5153.0
	107	915+60	13,300	5141.8	5153.0	1260 *	1210	30	1240	5153.4
	108	922+40	13,300	5144.5	5154.0	1965 *	838	10	848	5154.2
	109	929+00	13,300	5154.6	5162.5	2240	450	250	700	5162.6
	110	934+05	13,300	5156.2	5165.2	1250	260	540	800	5165.4
North 66th Street	112	935+00	13,300	5157.7	5167.1	2040	320	630	950	5167.4
	113	939+60	13,300	5158.6	5167.6	1140	320	560	880	5168.0
	114	946+20	13,300	5161.4	5169.3	1610	250	650	900	5169.6
	115	954+06	13,300	5165.2	5171.8	1540 *#	750	150	900	5172.8
	116	959+00	13,300	5167.9	5174.1	1700 *	735	135	870	5174.6
	117	965+00	13,300	5169.8	5176.7	2190	460	280	740	5177.4
South Boulder Creek	118	970+00	13,300	5172.6	5179.5	2140	310	620	930	5180.4
	119	974+90	(4,800)	5173.7	5181.2	1850 *#	80	360 800 1060**	700	5182.0
	120	983+60	(4,800)	5177.1	5182.8	1290 #	20	295	315	5183.8
	121	990+30	(4,800)	5179.9	5187.5	940 *#	30	20	50	5188.3
	122	993+00	(4,800)	5180.9	5191.2	2250 *	20	28 1365 1620**	303	5192.1
Valmont Drive	124	994+50	(4,800)	5181.9	5195.4	2990	85	60 1140 1565**	570	5196.0
	125	996+90	(2,800)	5183.9	5195.5	1370 #	400	46	446	5196.1
Union Pacific R.R.	127	998+90	(2,800)	5184.9	5195.6	2675 #	700	63 450 1480**	1793	5196.2
	128	1005+20	(11,000)	5187.2	5196.5	2600 *#+	370	910	1280	5197.0
Valley View Road Upstream Study Limit	129	1010+50	(11,000)	5189.1	5199.5	2750 *#°	680 ++	51	731	5199.9

[1] Distance in feet above mouth
[2] From center of channel looking downstream
* Width includes island area(s) and/or other high ground between outer floodplain boundaries
\# Cross Section does not extend to high ground
\+ Width measured to ℄ of South Boulder Creek channel
° Width does not include South Boulder Creek channel

** Split floodway; Area between 1st and 2nd numbers not included in floodway
++ Floodway limit located 130 feet past end of Cross Section
( ) Discharge represents estimated flow in Cross Section. For total discharge refer to Figure 3 "Discharge Probability Profiles"

Hydrology and Hydraulics completed by Omaha District Corps of Engineers.

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URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
COLORADO WATER CONSERVATION BOARD
BOULDER COUNTY

100-YEAR FLOODPLAIN AND FLOODWAY REFERENCE DATA
LOWER BOULDER CREEK

TABLE IV CONT.

ANDERSON CONSULTING ENGINEERS, INC *Civil • Water Resources • Environmental*	Project Number COBLDR02	Page 1 Of 2
Owner-Project BOULDER CREEK	By BJK	Date 7/2/2009
Subject STARTING WATER SURFACE ELEVATIONS	Checked By	Date

- ACE CROSS SECTION 112 (D/S LIMIT OF STUDY) IS LOCATED BETWEEN MULLER CROSS SECTIONS 103 AND 104.
- MULLER CROSS SECTIONS 103 AND 104 ARE LOCATED AT MULLER STATIONS 891+10 AND 897+10, RESPECTIVELY.
- ACE CROSS SECTION 112 IS LOCATED AT MULLER STATION 895+05

CROSS SECTION	WATER SURFACE ELEVATION (FT, NGVD)			
	10-YR	50-YR	100-YR	500-YR
MULLER 103[a]	5143.6	5145.6	5146.1	5147.7
MULLER 104[a]	5147.5	5149.0	5149.8	5151.0
ACE 112[b]	5146.2	5147.8	5148.5	5149.9
ACE 112 (FT, NAVD)[c]	5149.2	5150.8	5151.5	5152.9

[a] FROM "LOWER BOULDER CREEK FLOOD HAZARD AREA DELINEATION," MULLER ENGINEERING COMPANY, MARCH 1983

[b] COMPUTED BY LINEAR INTERPOLATION

[c] DETERMINED BY APPLYING +3.0 FT CONVERSION FROM NGVD TO NAVD, (CONVERSION FROM CITY OF BOULDER AT BM R-2-3 AT D/S LIMIT OF STUDY)

25-YR WSEL

$Q_{10} = 3,650$ CFS

$Q_{50} = 10,100$ CFS

$Q_{25} = 7,010$ CFS

ESTIMATE 25-YR WSEL BY LINEAR INTERPOLATION:

$$WSEL_{25} = 5149.2 + \left(\frac{5150.8 - 5149.2}{10,100 - 3,650}\right)(7,010 - 3,650)$$

$$\therefore WSEL_{25} = 5150.0 \text{ FT, NAVD}$$

THIS INFORMATION WAS SUPERSEDED OCTOBER 2012. WSEL TIE-INS ARE NOW BASED ON FLOOD PROFILES PUBLISHED IN THE DECEMBER 2012 FIS (SEE PRECEDING PAGES).

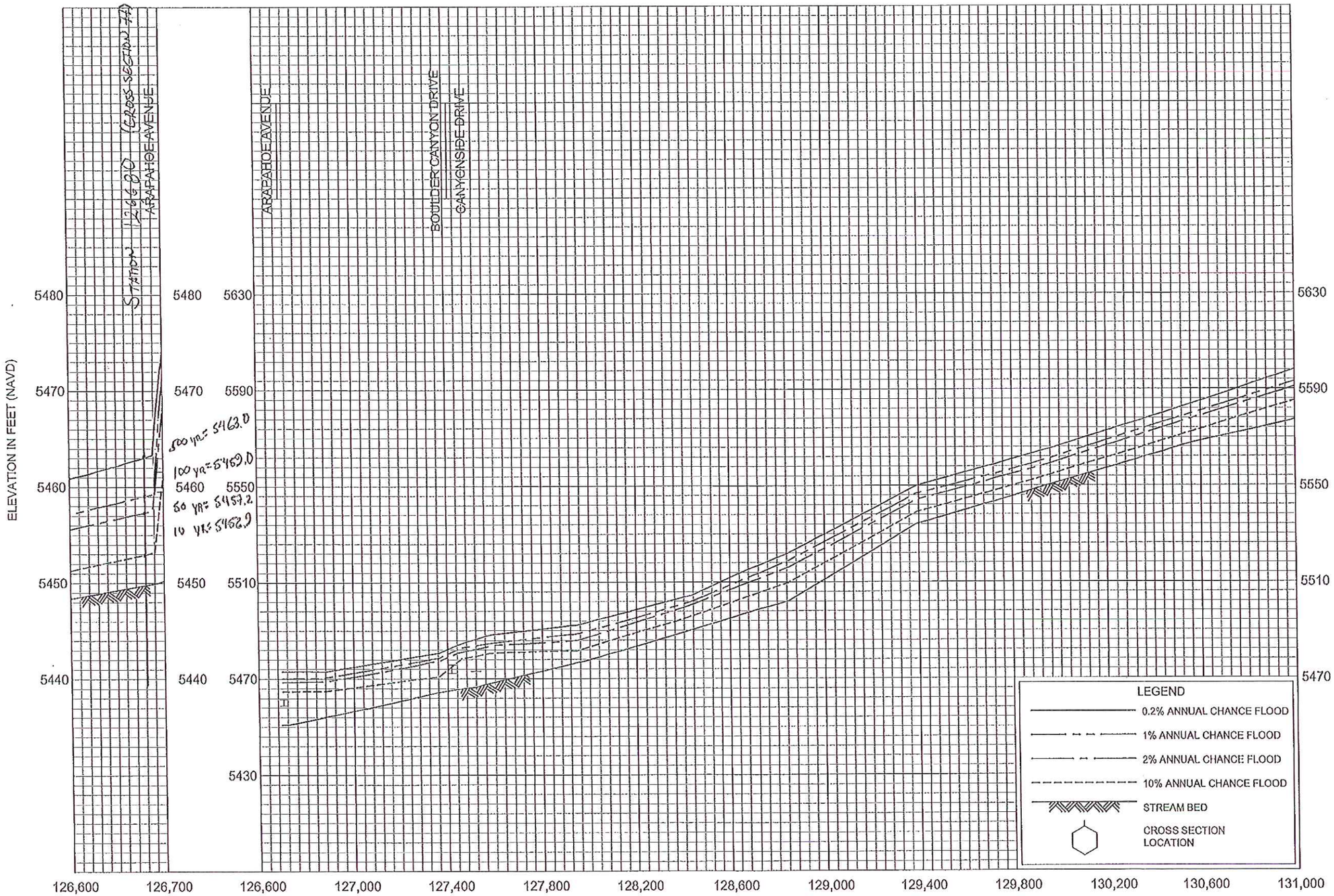
ANDERSON CONSULTING ENGINEERS, INC *Civil • Water Resources • Environmental*	Project Number COBLDR42	Page 2 Of 2
Owner-Project BOULDER CREEK	By GJK	Date 10/6/2009
Subject UPSTREAM WATER SURFACE PROFILE TIE-IN	Checked By	Date

- ACE CROSS SECTION 37003 (U/S LIMIT OF STUDY) IS LOCATED VIRTUALLY AT MULLER CROSS SECTION 76.2 (MULLER STATION 1264+80)
- 100-YEAR WATER SURFACE ELEVATION AT MULLER CROSS SECTION 76.2 IS 5451.0 FT, NGVD (FROM "BOULDER CREEK FLOOD HAZARD AREA DELINEATION," MULLER ENGINEERING COMPANY, JANUARY 1983
- CONVERSION FROM NGVD TO NAVD IS +3.25 FT (CONVERSION DATA FROM CITY OF BOULDER AT BM B-3N-1 AT U/S STUDY LIMIT)
- $\text{MULLER WSEL}|_{100\ @\ XS\ 76.2} = 5451.0 + 3.25 = 5454.25$ FT, NAVD
- $\text{ACE WSEL}|_{100\ @\ 37003} = 5454.62$ FT, NAVD
- Δ = ACE WSEL − MULLER WSEL
  = 5454.62 − 5454.25 = 0.37 FT < 0.5 FT OK

THIS INFORMATION WAS SUPERSEDED OCTOBER 2012. WSEL TIE-INS ARE NOW BASED ON FLOOD PROFILES PUBLISHED IN THE DECEMBER 2012 FIS (SEE PRECEDING PAGES).

UPSTREAM TIE-IN INFORMATION

UPSTREAM WATER SURFACE ELEVATION TIE-IN



FLOOD PROFILES

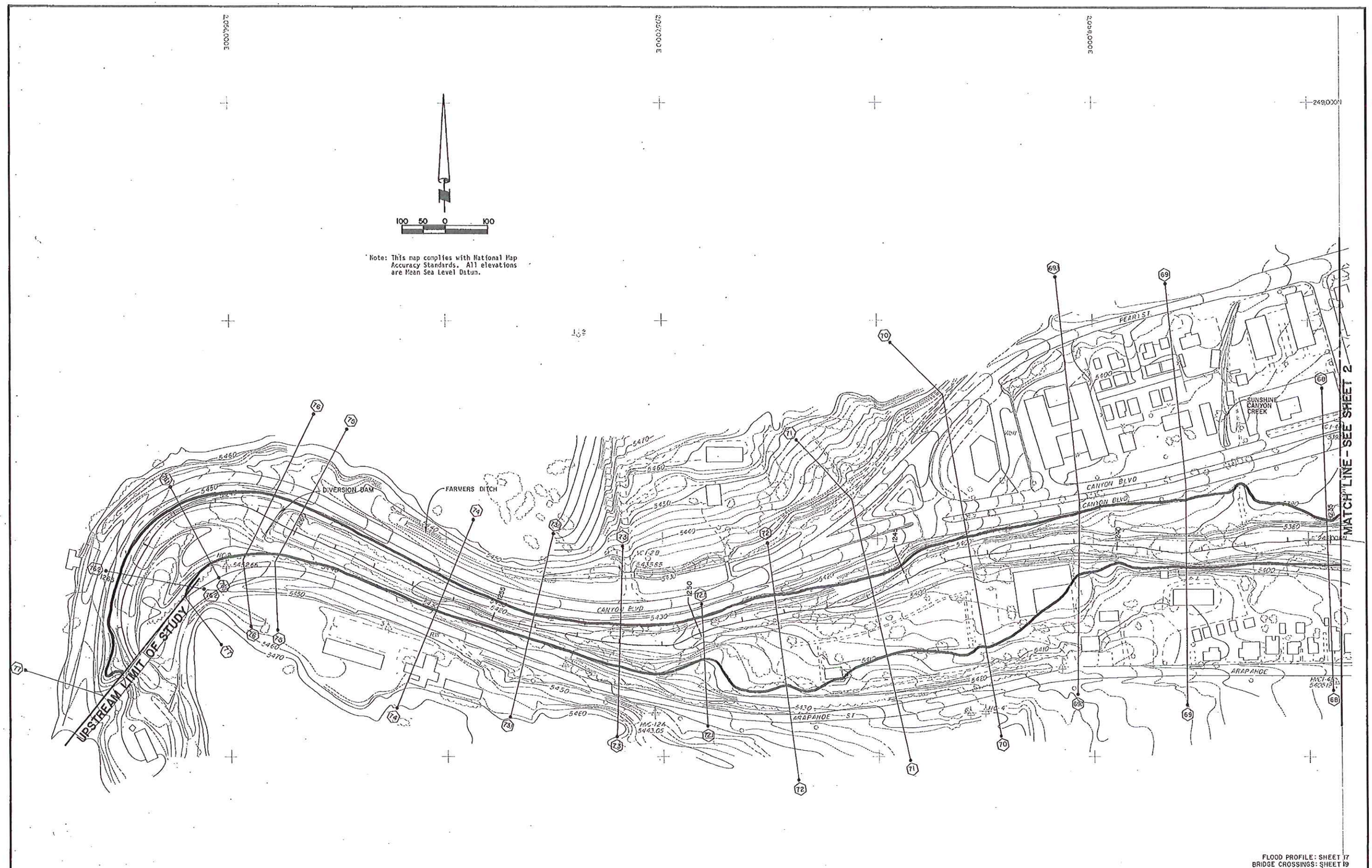
BOULDER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

BOULDER COUNTY, CO

AND INCORPORATED AREAS

57P



GROUND CONTROL SURVEY BY: MILLER & ERNSTSEN ASSOC AERIAL PHOTOGRAPHY BY: SCHARF AND ASSOC. INC. TOPOGRAPHIC MAPPING BY: REDS AERIAL MAPPING CONTOUR INTERVAL: 2' DATE FLOWN: 4-23-81	MULLER ENGINEERING COMPANY, INC. CONSULTING ENGINEERS 1410 VANCE ST., SUITE 203 LAKEWOOD, COLORADO 80215 (303) 232-9360	DESIGNED KGS, BLE DATE DRAWN JHK, JDM DATE 7/82 CHECKED LAM DATE 12/82 REVISED DATE	URBAN DRAINAGE AND FLOOD CONTROL DISTRICT CITY OF BOULDER	FLOOD HAZARD AREA DELINEATION BOULDER CREEK	BOULDER CREEK FLOOD PLAIN: 1266+80 TO 1234+80	SHEET 1 OF 19 MEC JOB NO. 8130

FLOODING SOURCE				FLOODPLAIN DATA			FLOODWAY DATA			
IDENTIFICATION	CROSS SECTION	STATION[1]	100 yr. DISCHARGE (CFS)	THALWEG ELEV (MSL)	100yr. FLOOD ELEV. (MSL)	100yr. FLOODPLAIN WIDTH (FT)	FLOODWAY WIDTH[2] LEFT (FT)	RIGHT (FT)	TOTAL (FT)	FLOODWAY ELEV. (MSL)
	74	1256+25	11,650	5419.6	5433.7	84				
	75	1260+10	11,650	5426.1	5441.0	128				
	76	1260+80	11,650	5431.2	5441.2	152				
	76.1	1262+80	11,650	5435.7	5445.5	147				
	76.2	1264+80	11,650	5441.2	5451.0	160				
Arapahoe Ave. (Canyon Mouth)	77	1266+80	11,650	5444.1	5455.6	220	FLOODWAY DATA WILL BE PUBLISHED AT A LATER DATE. CONTACT: URBAN DRAINAGE & FLOOD CONTROL DISTRICT OR CITY OF BOULDER FOR DETAILS.			

1. Distance in feet above mouth.
2. From center of channel looking downstream.

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FLOODPLAIN AND FLOODWAY REFERENCE DATA

BOULDER CREEK

URBAN DRAINAGE & FLOOD CONTROL DISTRICT

FLOOD HAZARD AREA DELINEATION

CITY OF BOULDER

TABLE II CONT.

DISCHARGE CALCULATIONS FOR
THE FLATIRON PARKWAY SPLIT

ANDERSON CONSULTING ENGINEERS, INC *Civil • Water Resources • Environmental*	Project Number COBLDR02	Page 1 Of 7
Owner-Project BOULDER CREEK	By JMA	Date
Subject FLATIRON SPLIT	Checked By GTL	Date

TO DETERMINE THE DISCHARGE FOR THE FLATIRON SPLIT 2 CROSSSECTIONS WERE CUT IN AREAS THAT WERE CHOKE POINTS AND WOULD CONTROL THE AMOUNT OF WATER GETTING TO THE FLATIRON SPLIT FROM PATH. XSEC LOCATIONS CAN BE SEEN IN ATTACHED FIGURE EXTRACTED FROM THE BOULDER CK WORKMAP.

- THE US CROSS SECTION WAS CUT AND INPUT INTO FLOWMASTER AND THE DISCHARGE WAS CALCULATED BY INSERTING AN INTERPOLATED WATER SERVICE* AND THE DS CHANNEL SLOPE

- TO DETERMINE IF THE DS CROSS SECTION IS CAUSING BACKWATER AT THE US CROSS SECTION THE CALCULATED DISCHARGE WAS INPUT INTO FLOWMASTER ALONG WITH THE DS CROSS SECTION GEOMETRY AND DS CHANNEL SLOPE AND THE WATER SURFACE ELEVATION WAS CALCULATED

- DISCHARGE CALCULATED AT US CROSS SECTION

$Q_{100} = \underline{206.9 \text{ CFS}}$ $Q_{50} = \underline{142.6 \text{ CFS}}$

- WATER SURFACE ELEVATION AT DS CROSS SECTION

$WSE_{100} = 5213.41$ $WSE_{50} = 5213.24$

WSE'S OF 5213.41 AND 5213.24 WILL NOT CAUSE BACKWATER AT THE US CROSS SECTION THEREFORE THE FLATIRON SPLIT DISCHARGE IS <u>207 CFS</u> FOR 100YR MODEL AND <u>142.6 CFS</u> FOR THE 50YR MODEL

* INTERPOLATED WATER SURFACE ELEVATION FOR US CROSS SECTION IS FOUND ON FOLLOWING SHEET

ANDERSON CONSULTING ENGINEERS, INC *Civil • Water Resources • Environmental*	Project Number COBLDR02	Page 2 Of 7
Owner-Project BOULDER CREEK	By JAA	Date
Subject FLATIRON SPLIT INTERPOLATED WSE	Checked By	Date

WATER SURFACE FOR DETERMINATION US SECTION

100yr

- WSE @ XSEC 14143 = 5214.58
- WSE @ XSEC 13918 = 5211.55

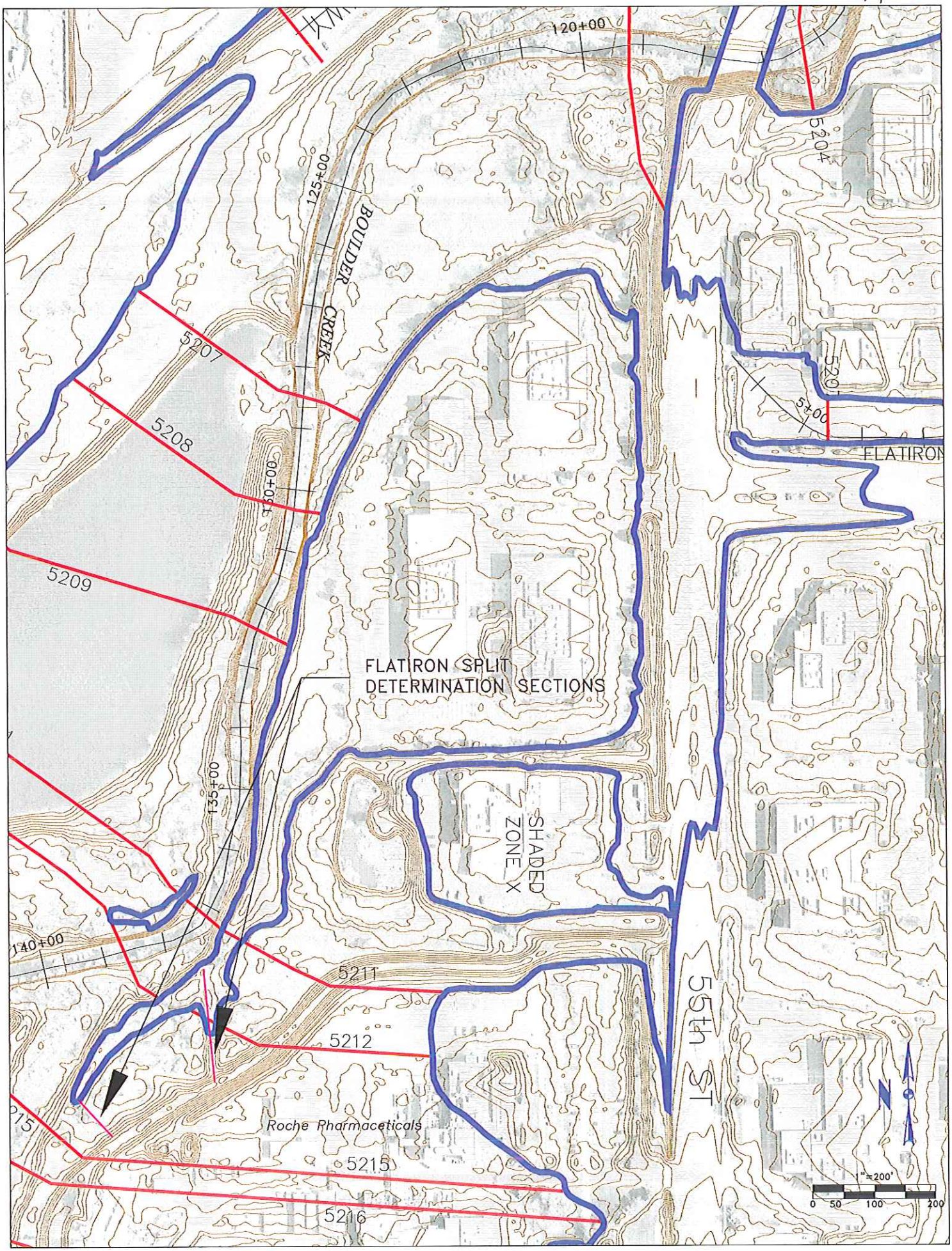
DISTANCE TO DETERMINATION XSEC = 55 FT (DS FROM 14143)

100yr INTERPOLATED WSE ⇒ 5214.07

50yr

- WSE @ XSEC 14143 = 5213.67
- WSE @ XSEC 13918 = 5210.00

50yr INTERPOLATED WSE ⇒ 5213.05


120+00
125+00
130+00
135+00
140+00
BOULDER CREEK
5204
5201
5+00
FLATIRON
5207
5208
5209
FLATIRON SPLIT
DETERMINATION SECTIONS
SHADED
ZONE X
5211
5212
5215
5216
55th ST
Roche Pharmaceticals
N
1" = 200'
0 50 100 200

100 yr

4/7

Worksheet

Worksheet for Irregular Channel

US XSEC

Project Description	
Worksheet	New Topo ROB Flatiron Split
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	002700	ft/ft
Water Surface Elev	,214.05	ft

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.065	
Elevation Range	12.00 to 5,216.00	
Discharge	206.89	cfs
Flow Area	122.9	ft²
Wetted Perimete	72.88	ft
Top Width	72.52	ft
Actual Depth	2.05	ft
Critical Elevation	5,212.83	ft
Critical Slope	0.068476	ft/ft
Velocity	1.68	ft/s
Velocity Head	0.04	ft
Specific Energy	5,214.09	ft
Froude Number	0.23	
Flow Type	Subcritical	

Calculation Messages:
Water elevation exceeds lowest end station by 0.05 ft.

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	0+81.0	0.065

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.0	5,214.00
0+06.6	5,213.00
0+12.9	5,212.00
0+57.4	5,212.00
0+67.5	5,213.00
0+72.3	5,214.00
0+76.6	5,215.00
0+81.0	5,216.00

100 YR

Worksheet

Worksheet for Irregular Channel

DS XSEC

5/7

Project Description	
Worksheet	New Topo Flatiron Spill (1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Sl(	333000	ft/ft
Discharge	206.90	cfs

Options	
Current Roughness Meth(	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin(	Horton's Method

Results		
Mannings Coefficie	0.065	
Water Surface Elev	5,213.41	ft ←
Elevation Range	12.00 to 5,217.00	
Flow Area	25.4	ft²
Wetted Perimeter	52.36	ft
Top Width	52.13	ft
Actual Depth	1.41	ft
Critical Elevation	5,213.75	ft
Critical Slope	0.073886	ft/ft
Velocity	8.15	ft/s
Velocity Head	1.03	ft
Specific Energy	5,214.45	ft
Froude Number	2.06	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	1+84.2	0.065

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.0	5,214.00
0+65.2	5,214.00
1+03.1	5,213.00
1+07.4	5,212.00
1+14.1	5,212.00
1+19.0	5,213.00
1+68.5	5,214.00
1+75.7	5,215.00
1+79.6	5,216.00
1+84.2	5,217.00

50-yr

6/7

Worksheet

Worksheet for Irregular Channel

US XSEC

Project Description	
Worksheet	New Topo ROB Flatiron Split
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Channel Slope	002700	ft/ft
Water Surface Elev	,213.67	ft

Options	
Current Roughness Metho	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coeffic	0.065	
Elevation Range	12.00 to 5,216.00	
Discharge	142.57	cfs
Flow Area	96.1	ft²
Wetted Perimeter	68.79	ft
Top Width	68.54	ft
Actual Depth	1.67	ft
Critical Elevation	5,212.66	ft
Critical Slope	0.073396	ft/ft
Velocity	1.48	ft/s
Velocity Head	0.03	ft
Specific Energy	5,213.70	ft
Froude Number	0.22	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	0+81.0	0.065

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.0	5,214.00
0+06.6	5,213.00
0+12.9	5,212.00
0+57.4	5,212.00
0+67.5	5,213.00
0+72.3	5,214.00
0+76.6	5,215.00
0+81.0	5,216.00

50 YR

7/7

Worksheet

Worksheet for Irregular Channel

DS XSEC

Project Description	
Worksheet	New Topo Flatiron Spill (1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Channel Sl	333000	ft/ft
Discharge	142.60	cfs

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.065	
Water Surface Elev	5,213.24	ft ←
Elevation Range	12.00 to 5,217.00	
Flow Area	17.8	ft²
Wetted Perimeter	37.39	ft
Top Width	37.17	ft
Actual Depth	1.24	ft
Critical Elevation	5,213.57	ft
Critical Slope	0.076602	ft/ft
Velocity	8.03	ft/s
Velocity Head	1.00	ft
Specific Energy	5,214.25	ft
Froude Number	2.05	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00.0	1+84.2	0.065

Natural Channel Points

Station (ft)	Elevation (ft)
0+00.0	5,214.00
0+65.2	5,214.00
1+03.1	5,213.00
1+07.4	5,212.00
1+14.1	5,212.00
1+19.0	5,213.00
1+68.5	5,214.00
1+75.7	5,215.00
1+79.6	5,216.00
1+84.2	5,217.00