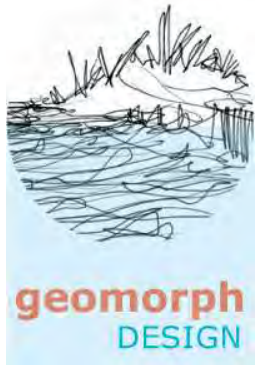


EVALUATION OF CHANNEL CAPACITY IMPROVEMENT OPTIONS

FIELD GEOMORPHOLOGY & HYDRAULIC MODELING

EAST CREEK & WEST CREEK
FLOOD ZONE 4

OCTOBER 2022



Matt Smeltzer, P.E.
Engineer/Geomorphologist
Geomorph Design Group

fluvialgeomorph@gmail.com
(510) 219-1064



WEST CK

EAST CK

Nugget Markets

Strawberry

1925 ft

Google Earth

W Knoll Rd

Stinson Rd

Reed Blvd

Belvedere Dr

Richardson Dr

Reed Blvd

Belvedere Dr

Bay Vista Dr

Thurston Blvd

Blackfield Dr

Karen Way

Karen Way

Unger Road

Los Altos

Via Santa Gertrudis

Paseo Mirasol

Blackfield Dr

Mercury Ave

Apollo Rd

Juno Rd

Trestle Glen Blvd

Timber Rock Ct

OUTLINE

HISTORICAL GEOMORPHIC ASSESSMENT

EXISTING CONDITIONS – WEST CREEK

EXISTING CONDITIONS – EAST CREEK

FINDINGS – WEST CREEK

FINDINGS – EAST CREEK

RECOMMENDATIONS

HISTORICAL ASSESSMENT

REVIEW HISTORICAL MAP INFORMATION – SALT MARSH OCCUPIED ENTIRE WIDTH OF VALLEY FLOOR, CREEKS ENTERED MARSH FROM STEPER, CONFINED “CANYON” REACHES

CONVERSION OF SALT MARSH TO RANCH LAND – CREEKS DITCHED TO FORM DRAINAGE CHANNELS ON EAST & WEST SIDES OF VALLEY

CONVERSION OF RANCH LAND TO RESIDENTIAL SUBDIVISIONS – RESIDENTIAL LOT DEVELOPMENT NARROWED THE DITCHES AND PINNED THEM TO EDGES OF VALLEY

OVERBANK FLOW PATTERNS MATCH ORIGINAL NATURAL CREEK FLOW DIRECTIONS – WEST CREEK TENDS TO OVERFLOW TO THE EAST AND EAST CREEK TENDS TO OVERFLOW TO THE WEST, BEGINNING WHERE THE CANYON REACHES ENTER THE VALLEY FLOOR



WEST CK

EAST CK

Nugget Markets

912 ft

Google Earth

MADERA

1897 MAP

Reed

alley
ion

EAST CK

1899 MAP



(Tamalpais)

Strawberry Pt.

RICHARDSON BAY

Cone Rock

Peninsula Pt.

Pt Tiburon

Stuart Pt.

RACCOON STRAIT

Chauncey F.

MADERA PENINSULA

TIBURON PENINSULA

SAN FRANCISCO & NORTH PACIFIC R.R.

N.P. COAST R.R.

1954 MAP

WEST CK

EAST CK

1947 MAP



1954 MAP

WEST CK

EAST CK

1959 MAP





WEST CK

EAST CK

EXISTING CONDITIONS – WEST CREEK

DITCHED ALONG WEST EDGE OF VALLEY FLOOR – MORE THAN ADEQUATE CHANNEL SLOPE, CECILIA WAY CULVERT FLOOR AT ELEVATION 2-3', CECILIA CULVERT OPENING SIZE IS ADEQUATE

PRONE TO OVERFLOW TO EAST – ALONG LENGTH OF BLACKFIELD DR AND PAMELA CT, BUT CHANNEL NEARLY CONTAINS THE 10-YR TO 25-YR FLOOD, MINOR TOP OF BANK OVERFLOW BARRIERS WOULD ADDRESS THIS

IMPROVEMENT OPTIONS – A NUMBER OF TREES AND MINOR CONSTRICTIONS COULD BE REMOVED TO INCREASE CHANNEL CAPACITY TO NEARLY 100-YR LEVEL BUT SOME TOP OF BANK OVERFLOW BARRIERS WOULD STILL BE NEEDED IN PLACES.

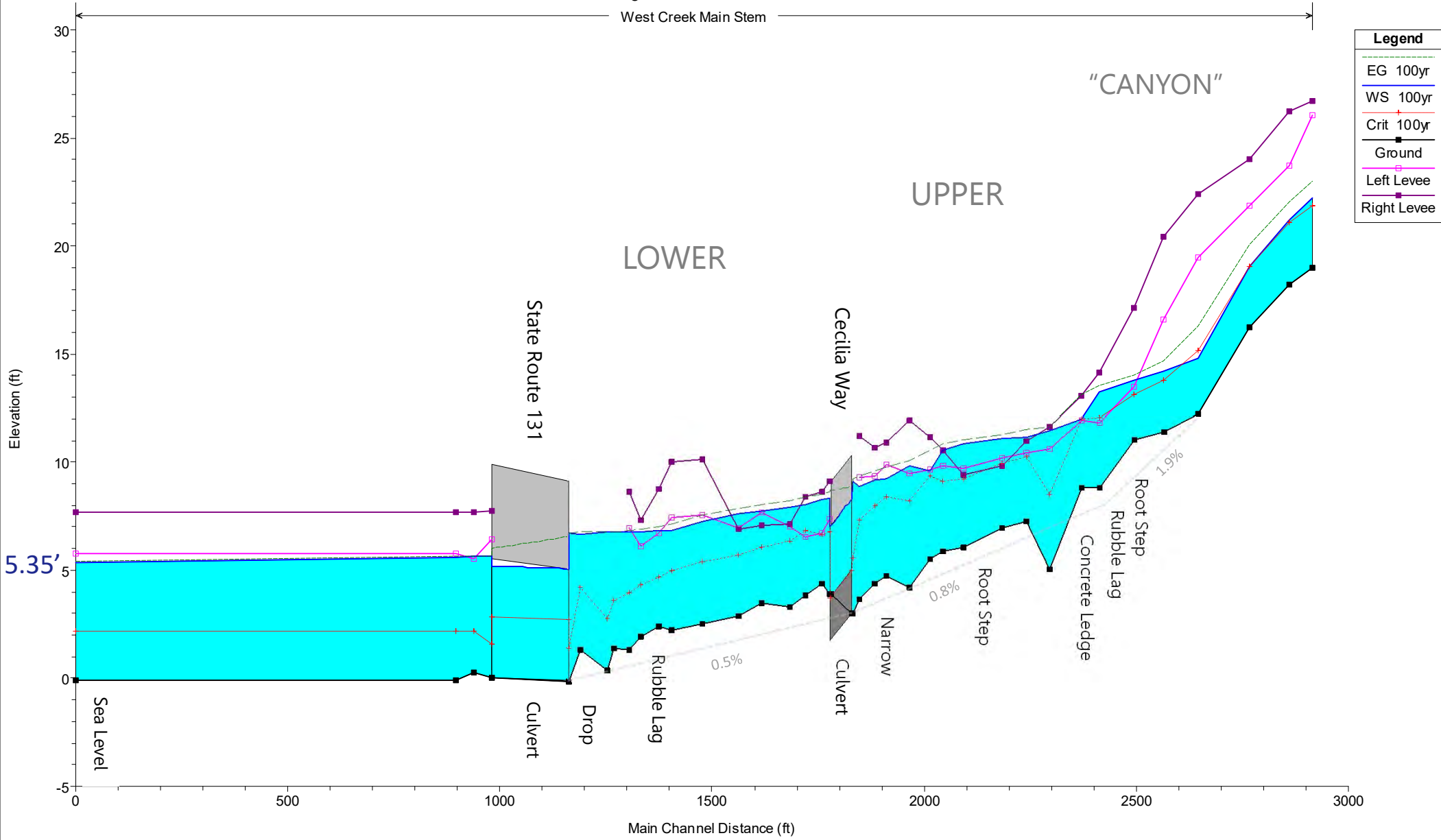
WEST CK AT CECILIA WAY



EXISTING CONDITIONS – WEST CREEK – “Baseline” – “BSLN-ncc”

Model-Computed 100-year Water Surface Elevation Profile

West Creek Aug 2022 Plan: BSLN-ncc 8/25/2022



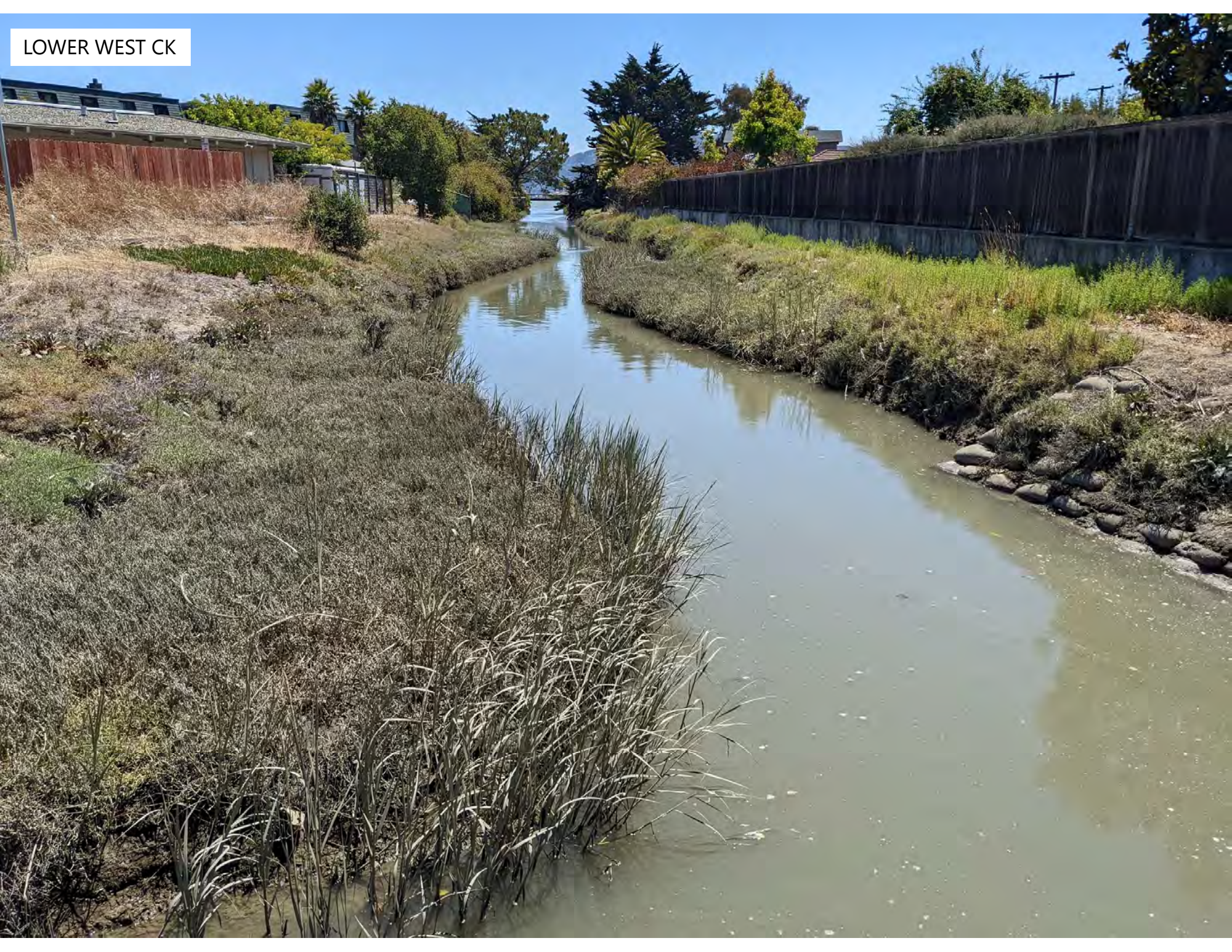
LOWER WEST CK



178 ft

Google Earth

LOWER WEST CK



LOWER WEST CK



LOWER WEST CK



LOWER WEST CK



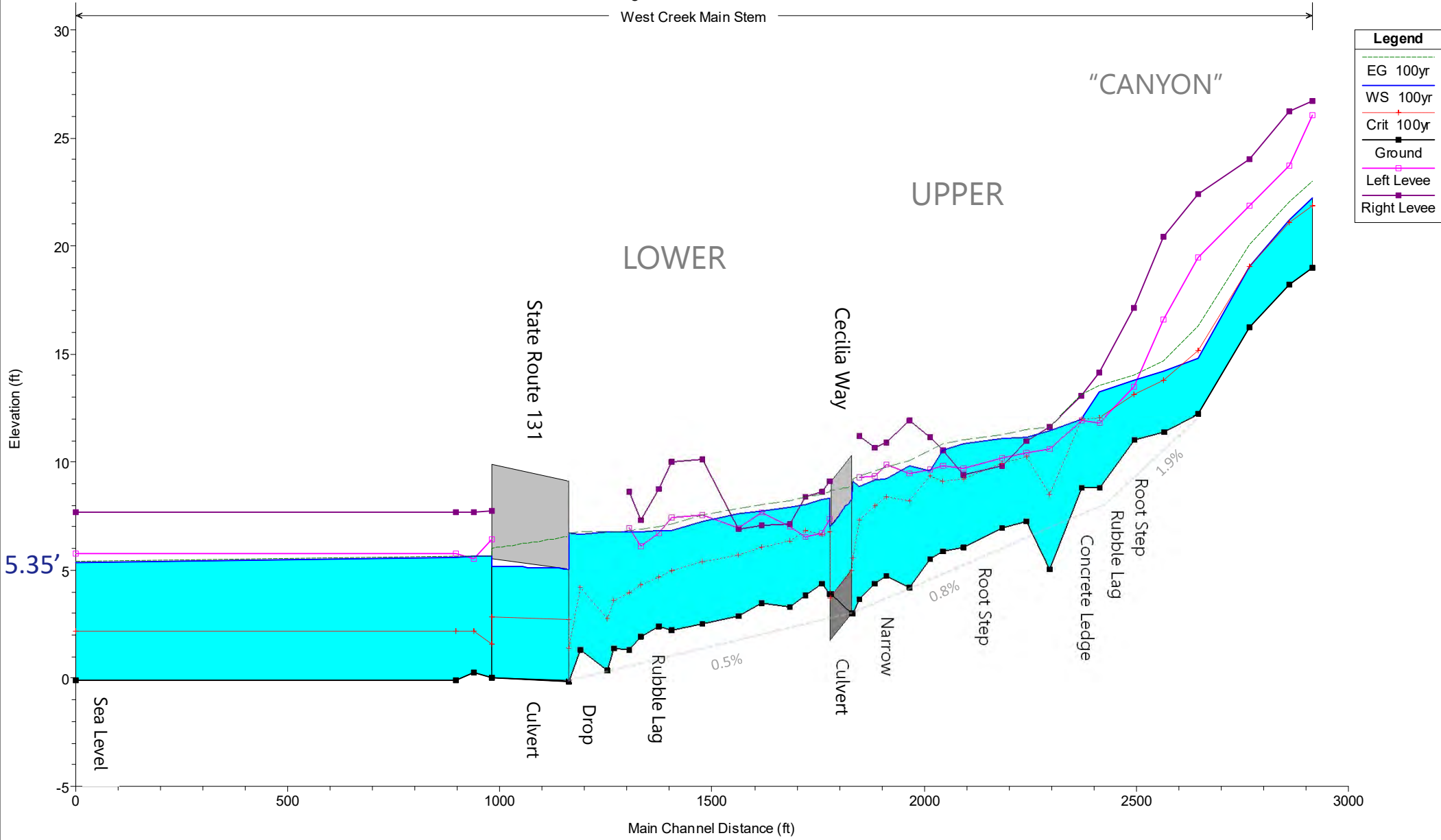
LOWER WEST CK



EXISTING CONDITIONS – WEST CREEK – “Baseline” – “BSLN-ncc”

Model-Computed 100-year Water Surface Elevation Profile

West Creek Aug 2022 Plan: BSLN-ncc 8/25/2022



LOWER WEST CK



LOWER WEST CK



LOWER WEST CK



LOWER WEST CK



LOWER WEST CK



LOWER WEST CK



LOWER WEST CK



LOWER WEST CK



LOWER WEST CK

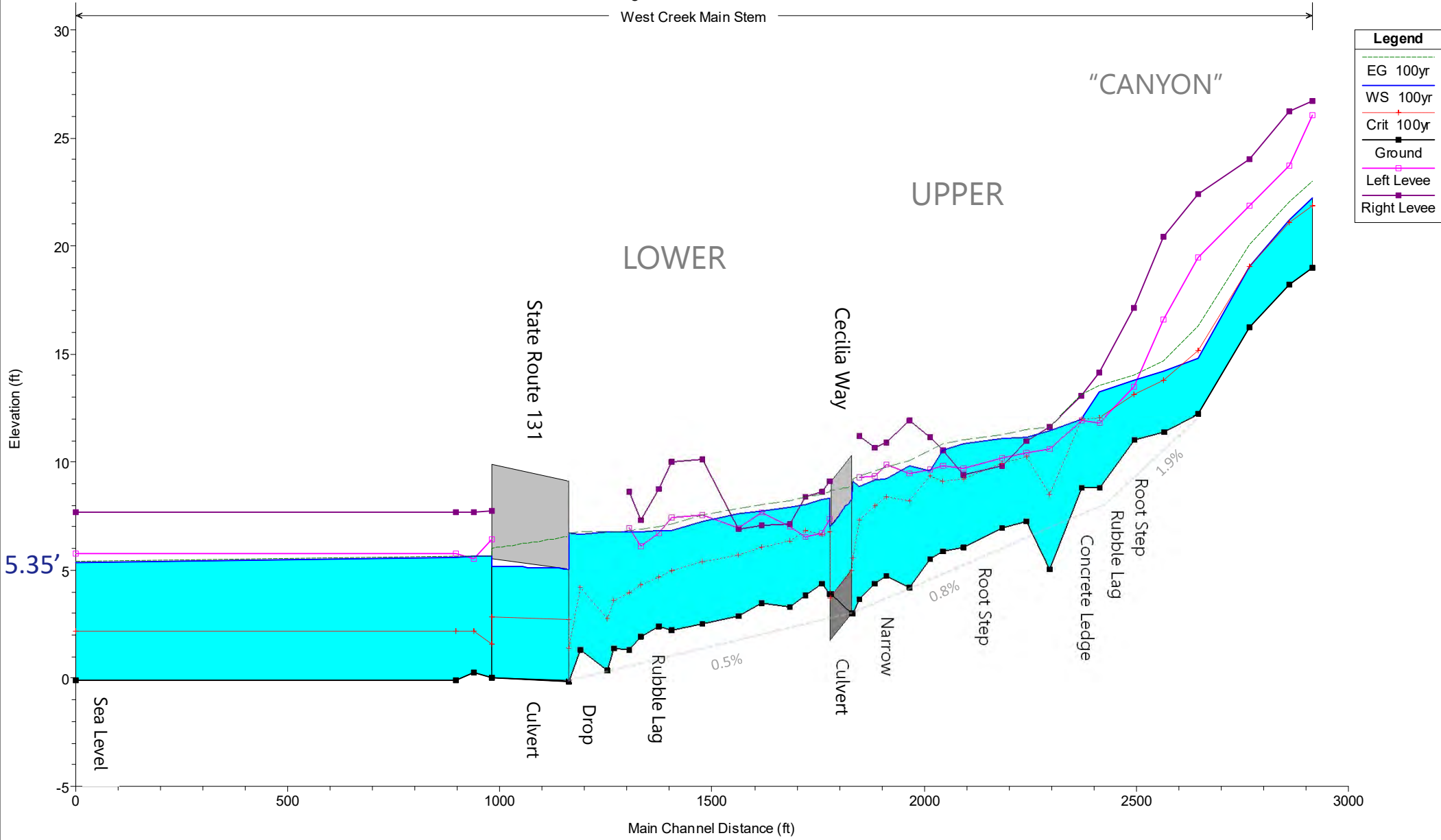


LOWER WEST CK



EXISTING CONDITIONS – WEST CREEK – “Baseline” – “BSLN-ncc” Model-Computed 100-year Water Surface Elevation Profile

West Creek Aug 2022 Plan: BSLN-ncc 8/25/2022



UPPER WEST CK



190

167

180

161

170

155

Cypress Hollow Dr

160

149

Rancho Dr

150

143

140

137

130

131

120

125

110

119

110

113

107

101

Blackfield Dr

Blackfield Dr

Claire Way

Claire Way

Claire Way

Karen Way

Cecilia Way x 12'

x 10'

205 ft

98

Google Earth

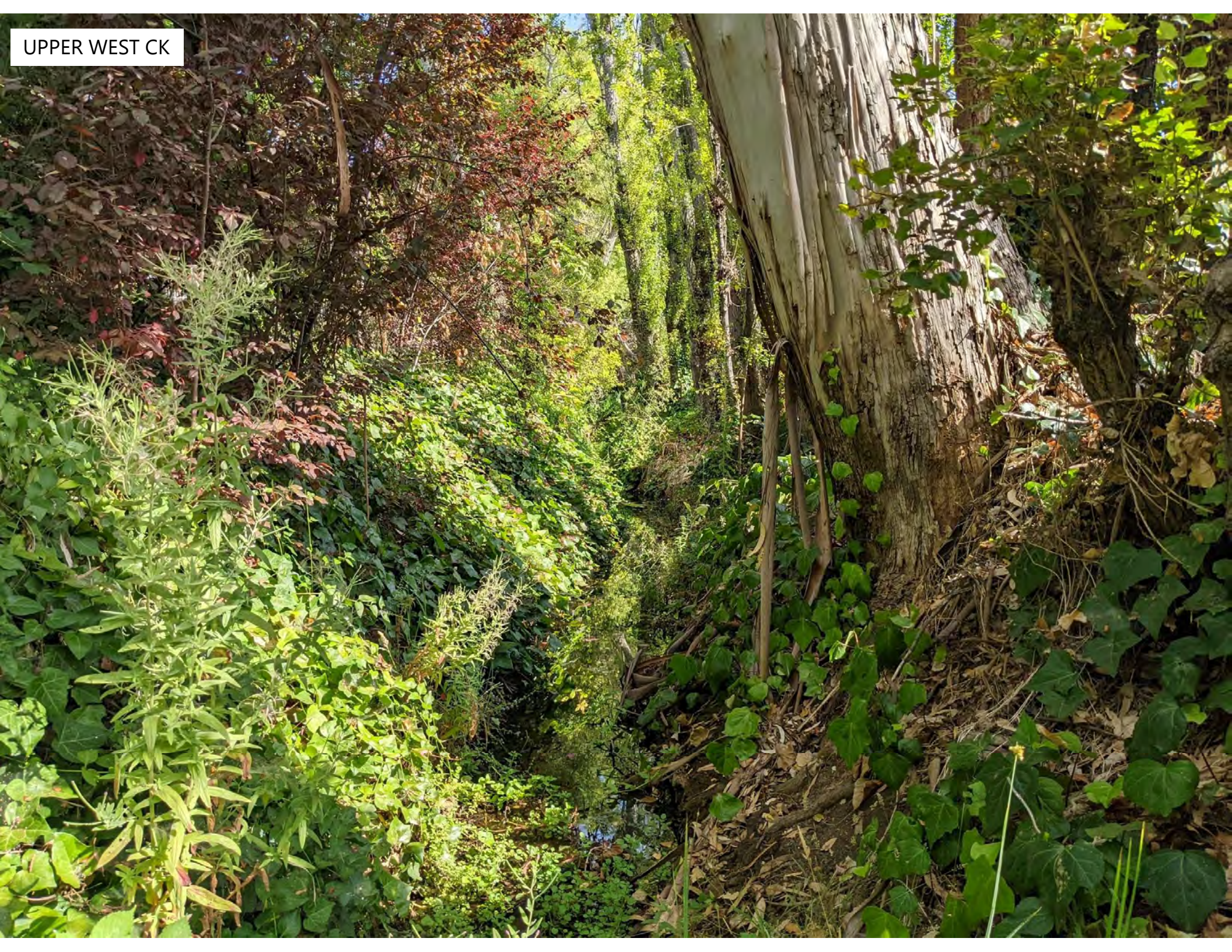
UPPER WEST CK



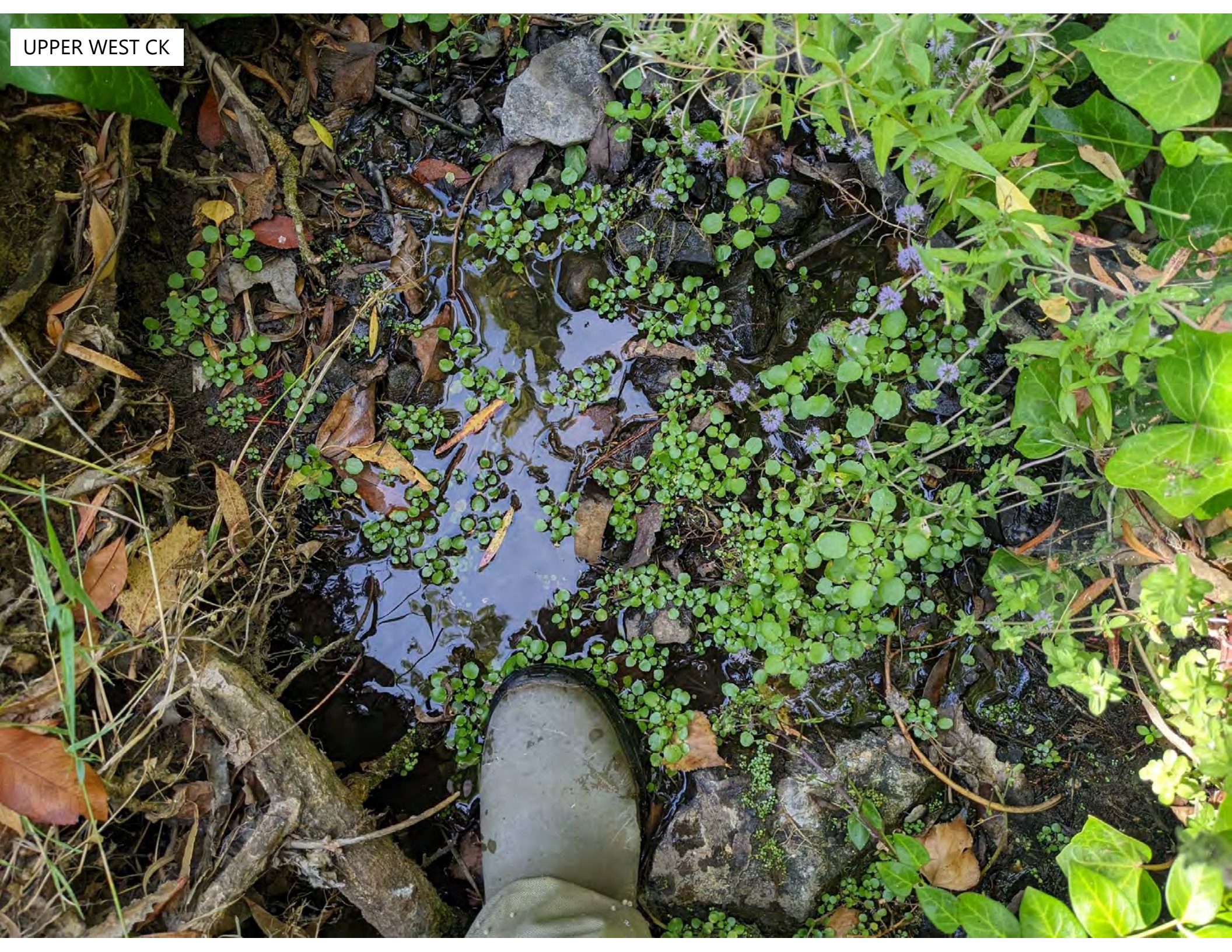
UPPER WEST CK



UPPER WEST CK



UPPER WEST CK



UPPER WEST CK



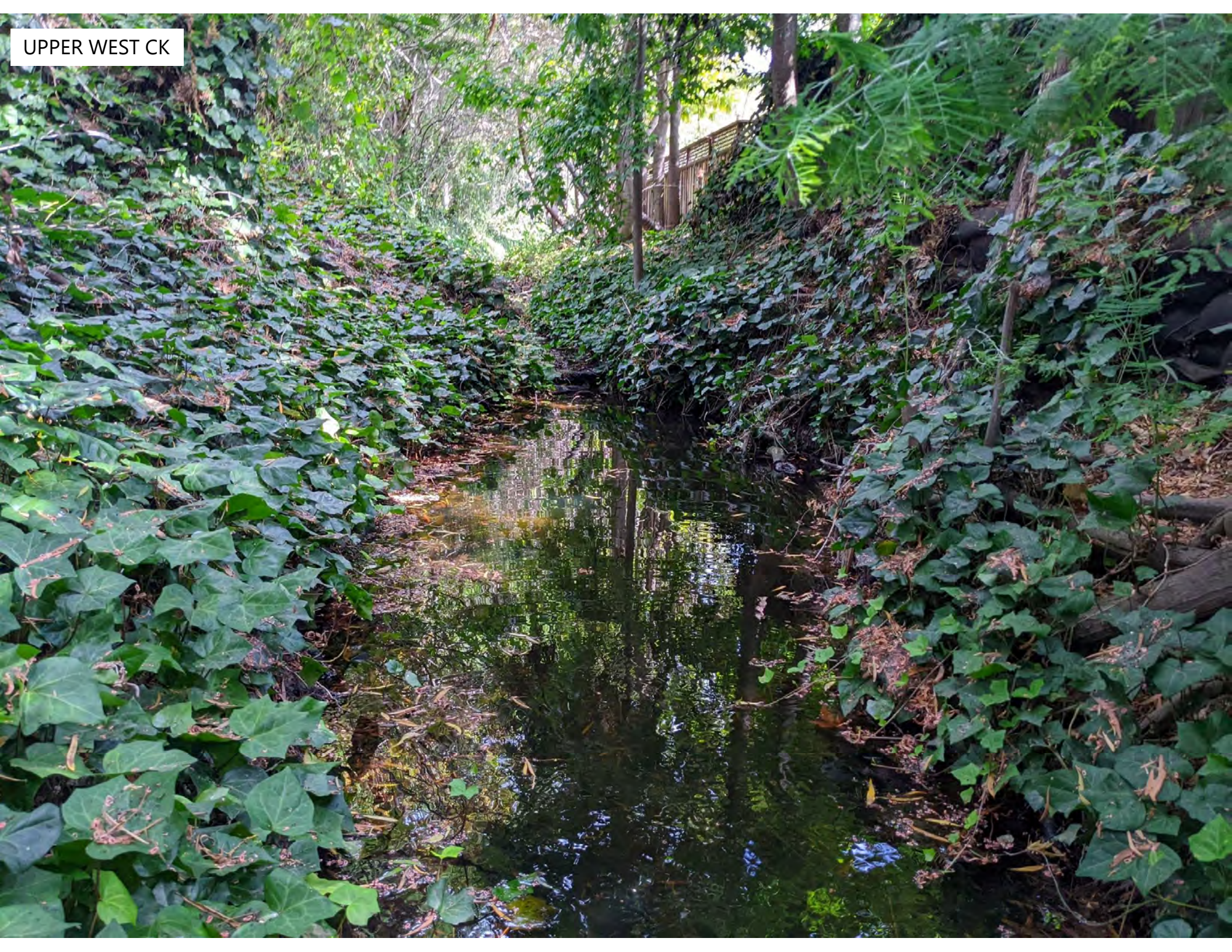
UPPER WEST CK



UPPER WEST CK



UPPER WEST CK



UPPER WEST CK



UPPER WEST CK



UPPER WEST CK



EXISTING CONDITIONS – EAST CREEK

DITCHED ALONG EAST EDGE OF VALLEY FLOOR – UPPER PART OF CREEK HAS BARELY ADEQUATE CHANNEL SLOPE, CECILIA WAY CULVERT FLOOR AT ELEVATION 6-7', CECILIA CULVERT OPENING SIZE IS ADEQUATE, LOWER PART OF CREEK IS STEEP

PRONE TO OVERFLOW TO WEST – ALONG LENGTH OF LELAND WAY AND ESPECIALLY NEAR CECILIA WAY, NEARLY CONTAINS THE 5-YR TO 10-YR FLOOD – MINOR TOP OF BANK OVERFLOW BARRIERS WOULD ADDRESS THIS

IMPROVEMENT OPTIONS – A NUMBER OF MINOR CONSTRICTIONS COULD BE RELIEVED TO INCREASE CHANNEL CAPACITY TO NEARLY 100-YR LEVEL BUT TOP OF BANK OVERFLOW BARRIERS WOULD STILL BE NEEDED IN PLACES.

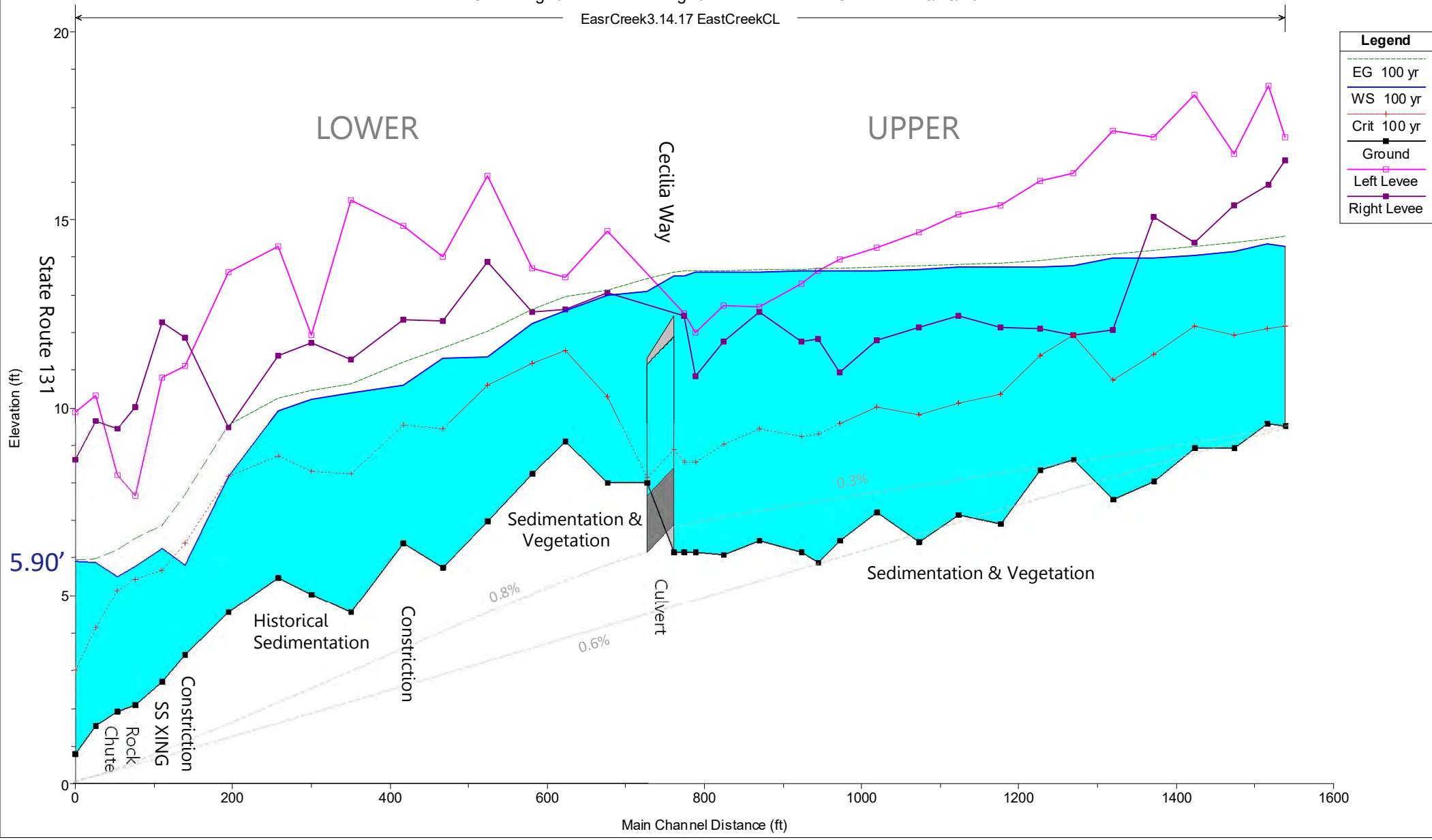
EAST CK AT CECILIA WAY



EXISTING CONDITIONS – EAST CREEK – “Aug2022 Baseline”

Model-Computed 100-year Water Surface Elevation Profile

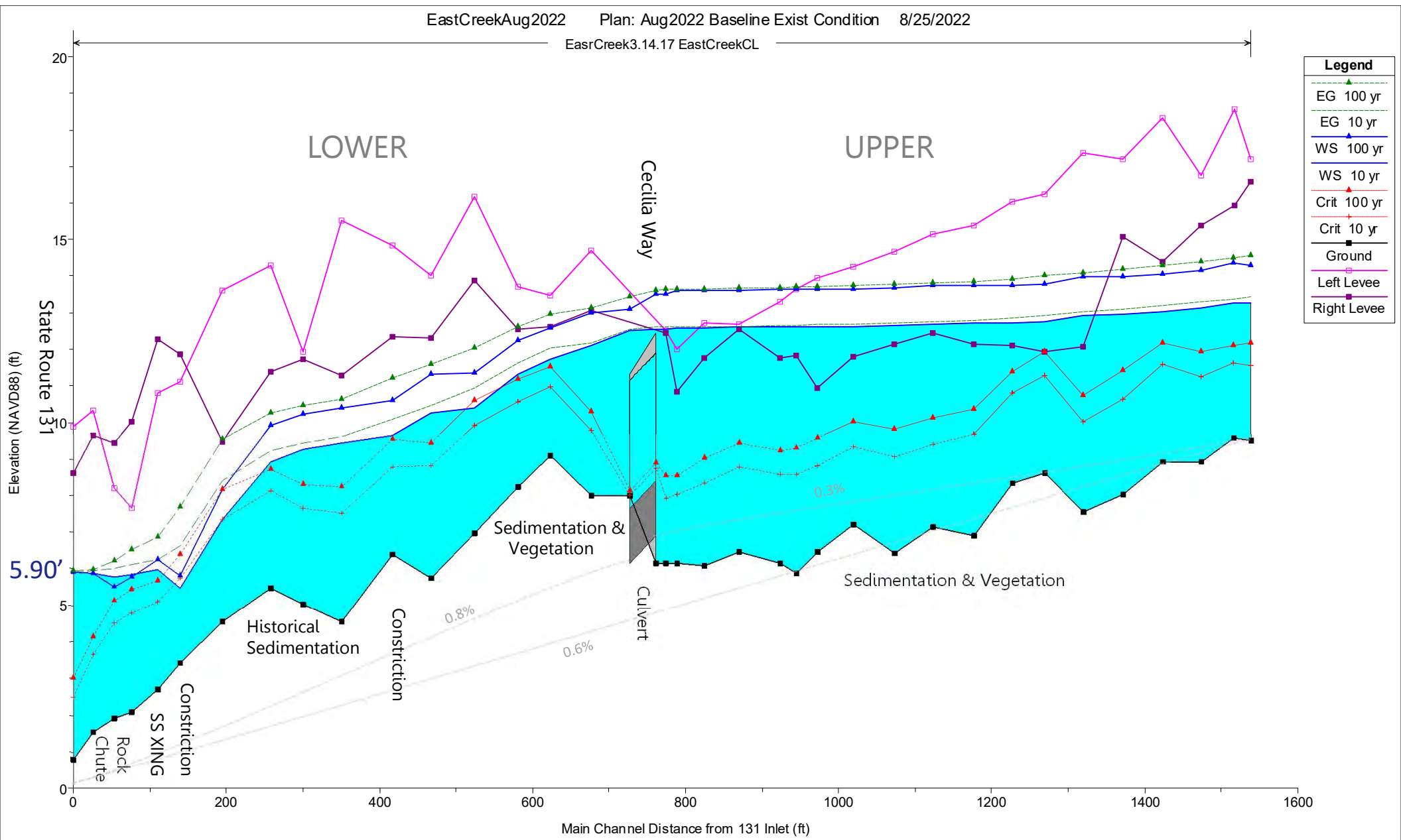
EastCreekAug2022 Plan: Aug2022 Baseline Exist Condition 8/23/2022
 EastCreek3.14.17 EastCreekCL



EXISTING CONDITIONS – EAST CREEK – “Aug2022 Baseline”

Model-Computed 10-year Water Surface Elevation Profile

EastCreekAug2022 Plan: Aug2022 Baseline Exist Condition 8/25/2022
 EastCreek3.14.17 EastCreekCL



LOWER EAST CK



100

294

300

80

50

Tiburon Blvd

179 ft

Google Earth

LOWER EAST CK



LOWER EAST CK



LOWER EAST CK



LOWER EAST CK



LOWER EAST CK



LOWER EAST CK



LOWER EAST CK



LOWER EAST CK



LOWER EAST CK



LOWER EAST CK



LOWER EAST CK



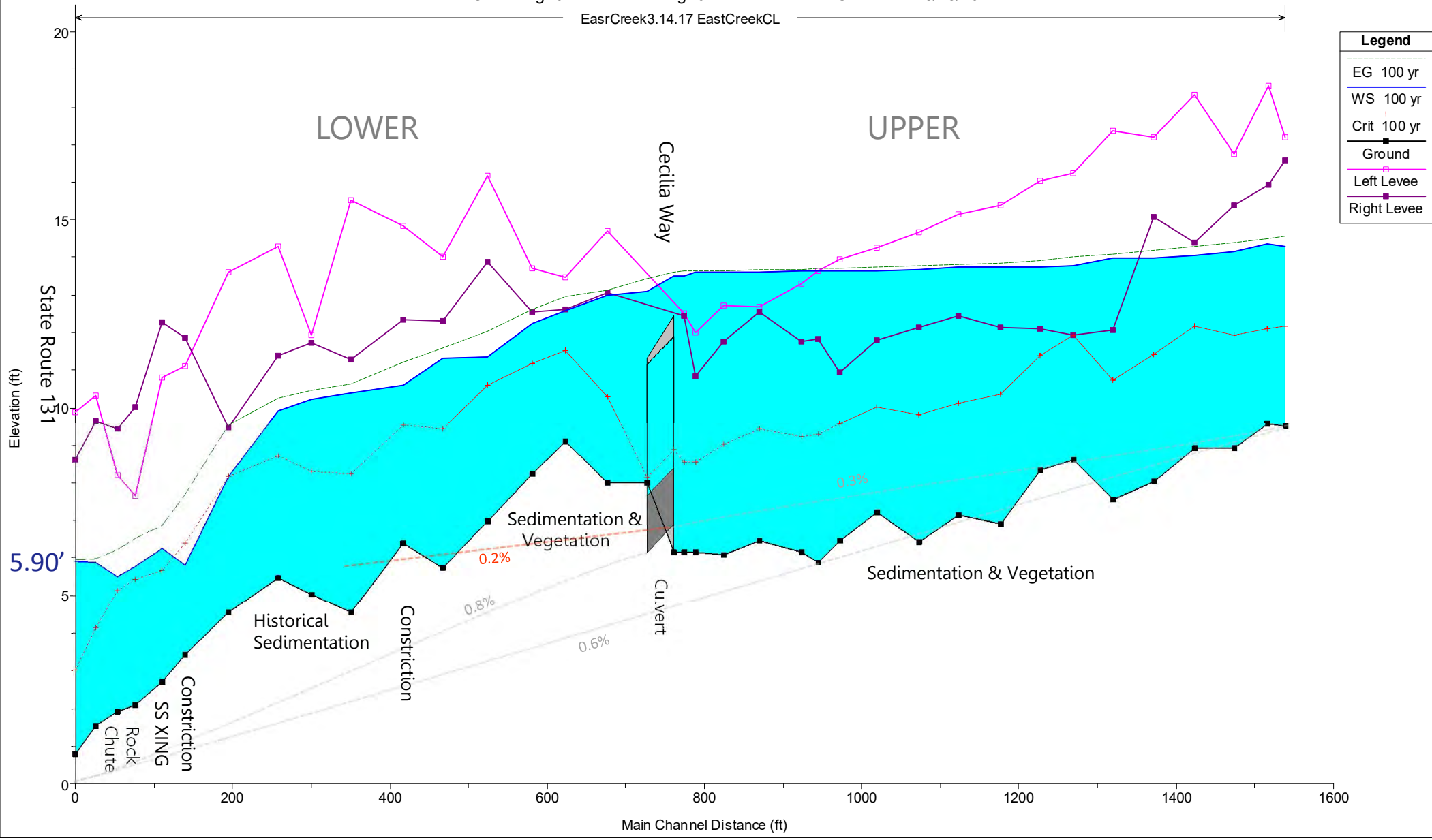
LOWER EAST CK



EXISTING CONDITIONS – EAST CREEK – “Aug2022 Baseline”

Model-Computed 100-year Water Surface Elevation Profile

EastCreekAug2022 Plan: Aug2022 Baseline Exist Condition 8/23/2022
 EastCreek3.14.17 EastCreekCL



Legend	
EG 100 yr	(Dashed Green Line)
WS 100 yr	(Solid Blue Line)
Crit 100 yr	(Dotted Red Line)
Ground	(Solid Black Line with Square)
Left Levee	(Magenta Line with Square)
Right Levee	(Dark Purple Line with Square)

LOWER EAST CK



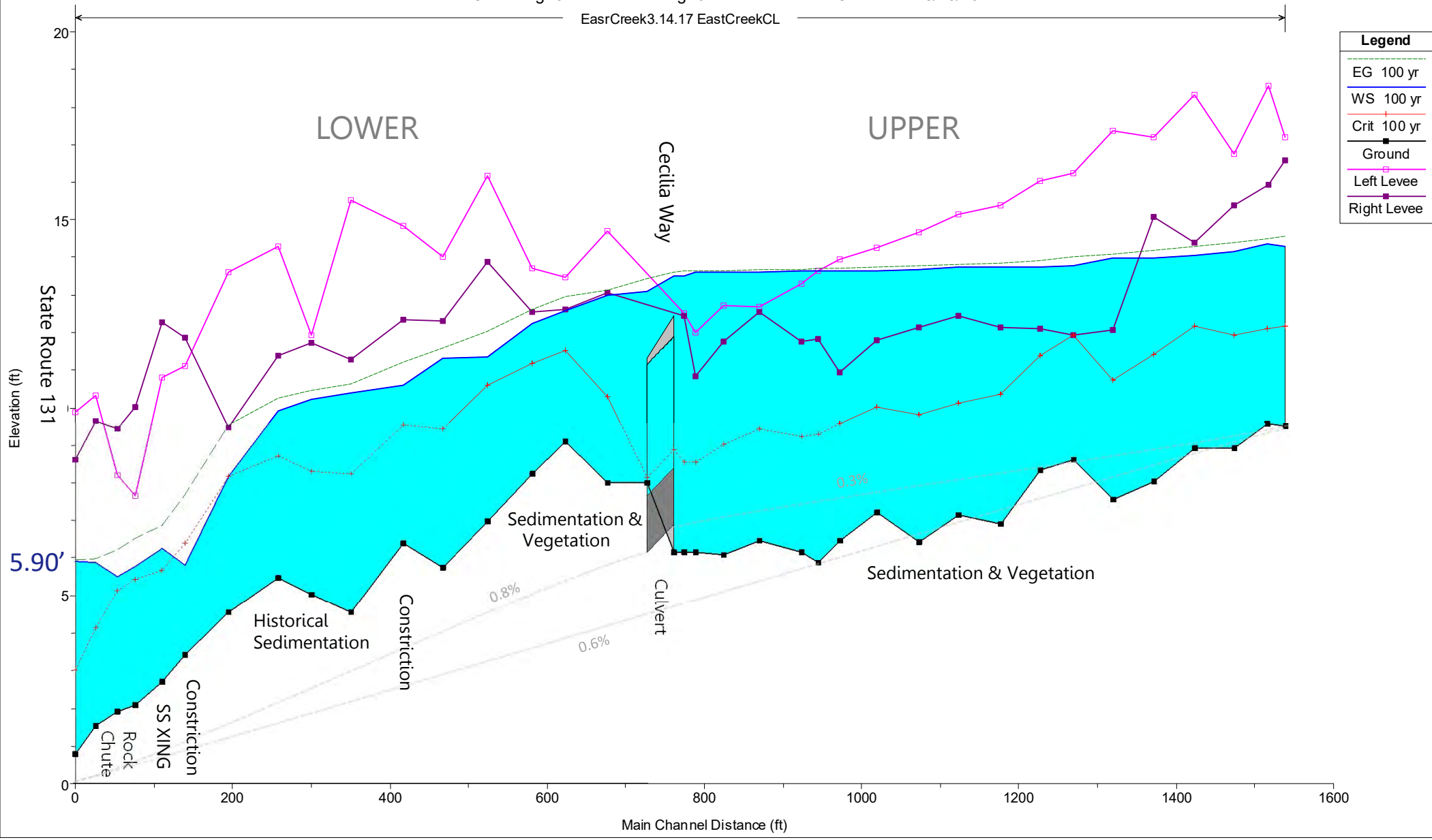
LOWER EAST CK



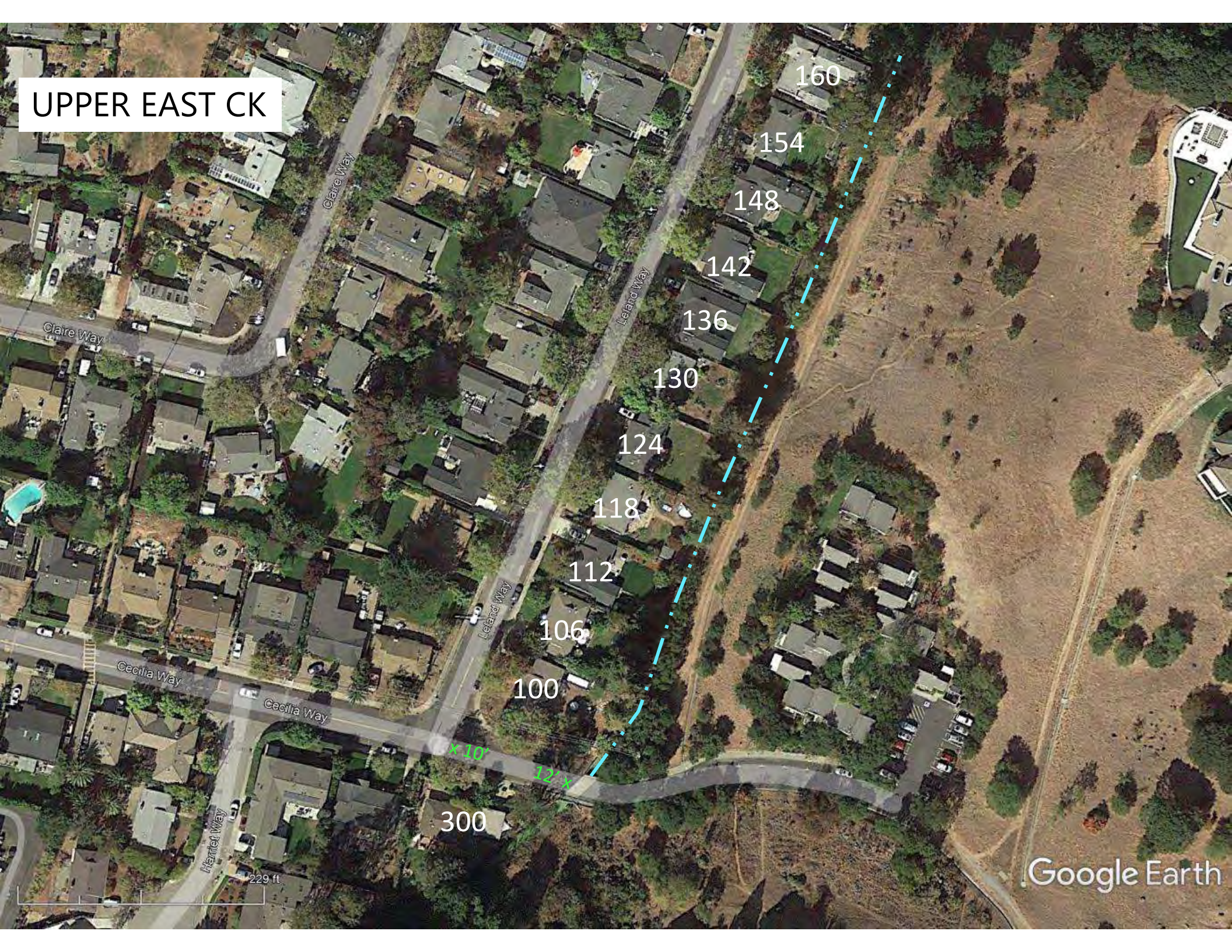
EXISTING CONDITIONS – EAST CREEK – “Aug2022 Baseline”

Model-Computed 100-year Water Surface Elevation Profile

EastCreekAug2022 Plan: Aug2022 Baseline Exist Condition 8/23/2022
 EastCreek3.14.17 EastCreekCL



UPPER EAST CK



Clare Way

Clare Way

Leland Way

Leland Way

Cecilia Way

Cecilia Way

Harriet Way

160

154

148

142

136

130

124

118

112

106

100

300

x 10'

12' x

229 ft

UPPER EAST CK



UPPER EAST CK



UPPER EAST CK



UPPER EAST CK



UPPER EAST CK



UPPER EAST CK



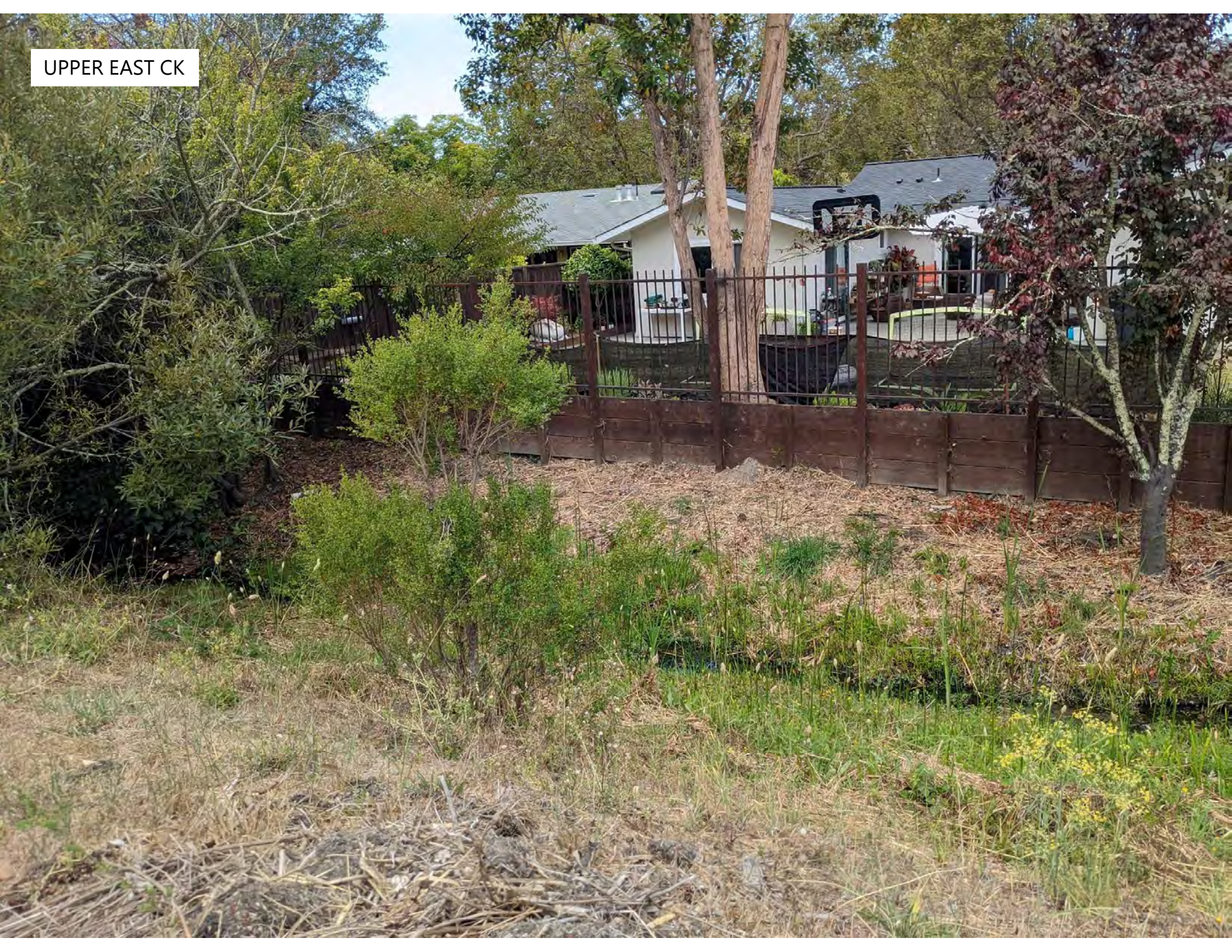
UPPER EAST CK



UPPER EAST CK



UPPER EAST CK



UPPER EAST CK



UPPER EAST CK



FINDINGS – WEST CREEK

1. REMOVING SEDIMENT ONLY FROM WITHIN THE CECILIA WAY RIGHT-OF-WAY HAS A MINIMAL, TEMPORARY BENEFIT
2. A “COMPLETE DREDGE” BETWEEN CECILIA WAY AND SR 131 HAS MORE PERMANENT BENEFIT, BUT SR 131 CULVERTS RESTRICT FLOW
3. COMBINING A COMPLETE DREDGE WITH REPLACEMENT SR 131 CULVERT WOULD REDUCE 100-YR WATER SURFACE ELEVATIONS BY ABOUT 0.7-0.9’
4. CECILIA WAY CULVERT APPEARS ADEQUATELY CONFIGURED – PERFORMANCE DEPENDS ON DOWNSTREAM AND UPSTREAM CONDITIONS
5. COMBINATIONS OF TREE REMOVAL, SELECTIVE CHANNEL BED LOWERING AND WIDENING, AND TOP OF BANK BARRIERS WOULD ELIMINATE OVERFLOWS ALONG UPPER WEST CREEK.

FINDINGS – WEST CREEK

Model-Computed 100-year Water Surface Elevation Profiles

West Creek Aug 2022 Plan: 1) ncc+1 Ltd ROW Dredge 8/25/2022 2) BSLN-ncc 8/25/2022

West Creek Main Stem

"LIMITED R.O.W. DREDGE"

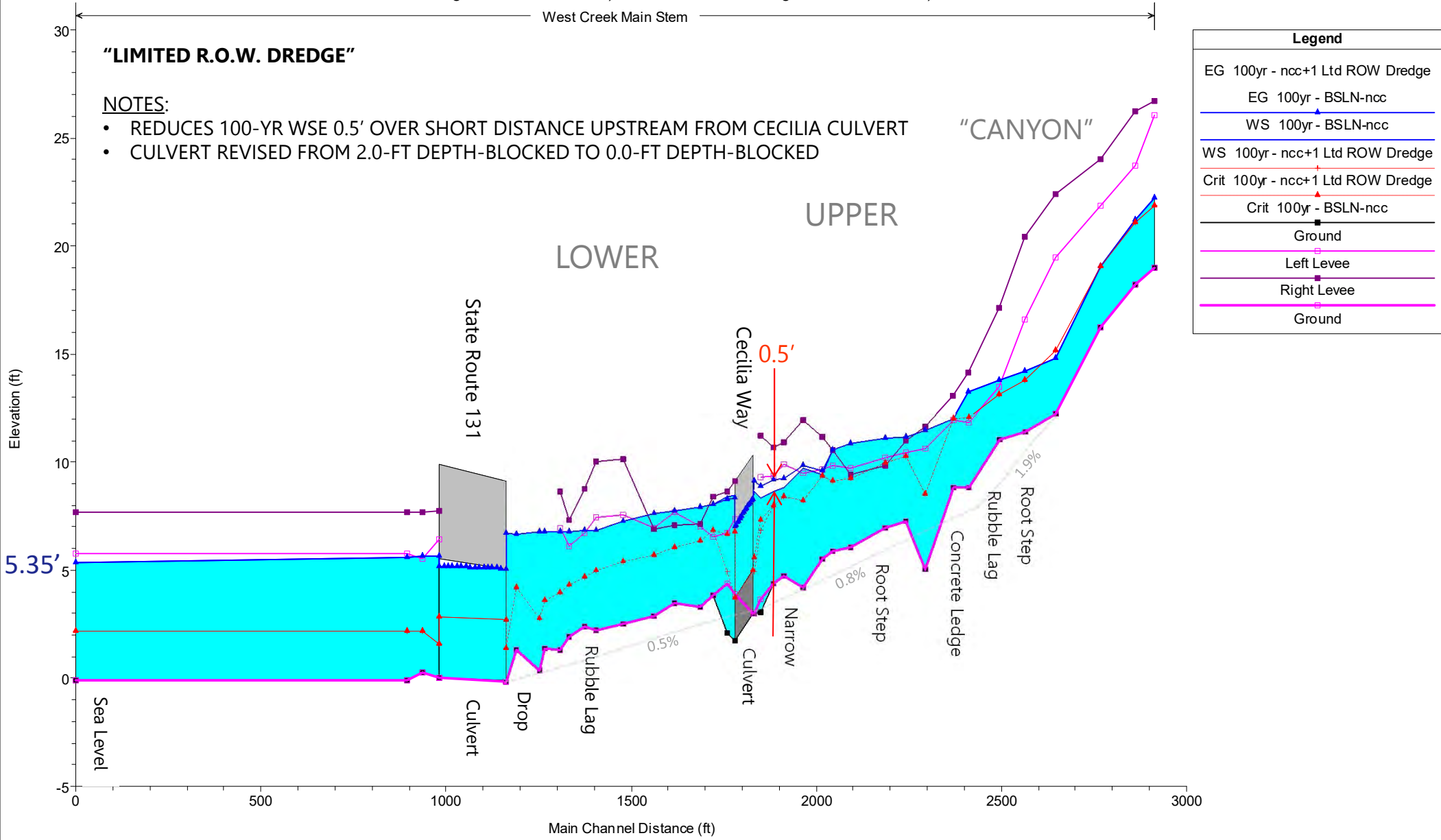
NOTES:

- REDUCES 100-YR WSE 0.5' OVER SHORT DISTANCE UPSTREAM FROM CECILIA CULVERT
- CULVERT REVISED FROM 2.0-FT DEPTH-BLOCKED TO 0.0-FT DEPTH-BLOCKED

"CANYON"

UPPER

LOWER



Legend	
EG 100yr - ncc+1 Ltd ROW Dredge	(Blue line with triangles)
EG 100yr - BSLN-ncc	(Red line with triangles)
WS 100yr - BSLN-ncc	(Cyan shaded area)
WS 100yr - ncc+1 Ltd ROW Dredge	(Cyan shaded area)
Crit 100yr - ncc+1 Ltd ROW Dredge	(Red line with triangles)
Crit 100yr - BSLN-ncc	(Blue line with triangles)
Ground	(Black line with squares)
Left Levee	(Magenta line with squares)
Right Levee	(Purple line with squares)
Ground	(Black line with squares)

FINDINGS – WEST CREEK

Model-Computed 100-year Water Surface Elevation Profiles

West Creek Aug 2022 Plan: 1) ncc+2 DS DREDGE 8/25/2022 2) BSLN-ncc 8/25/2022

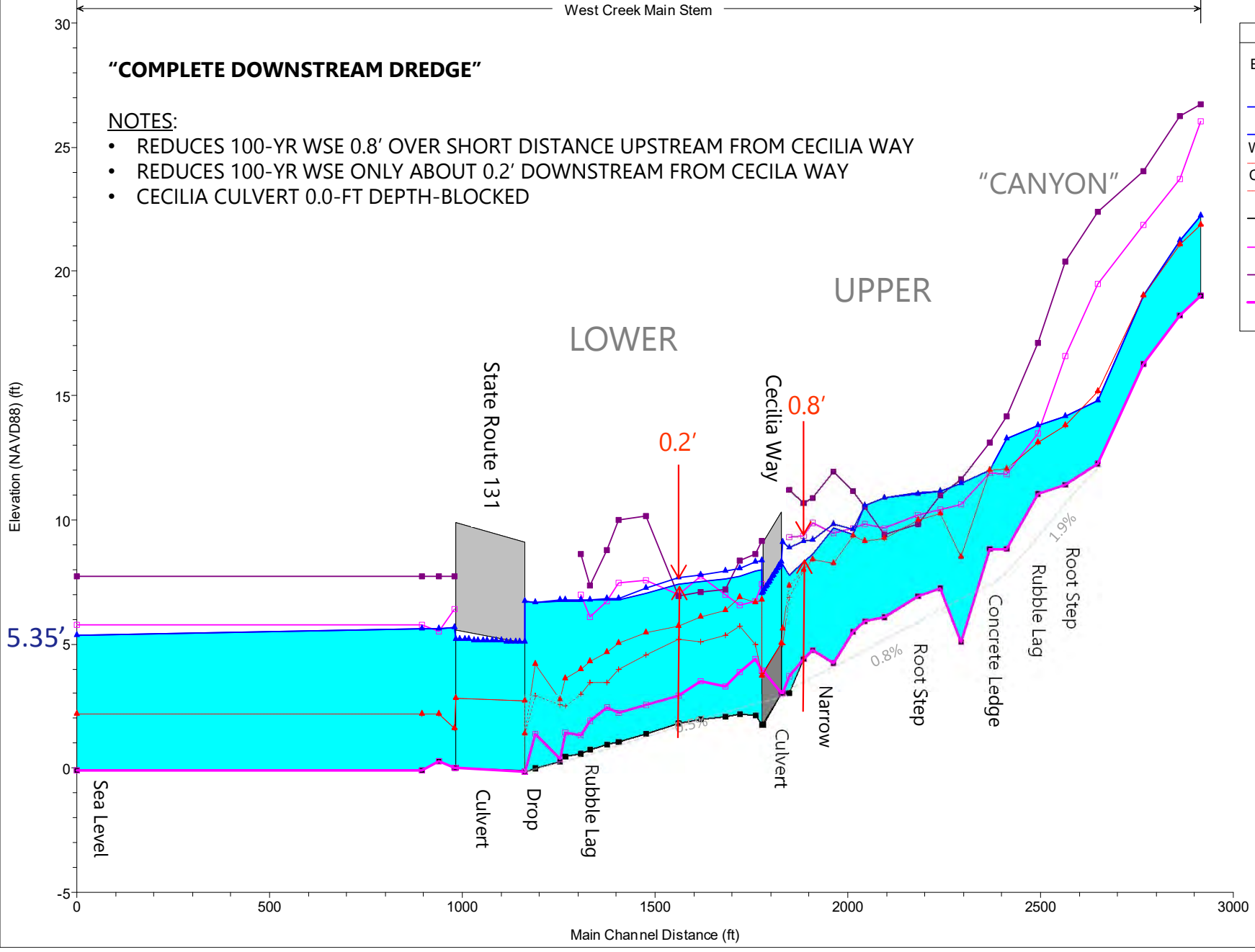
West Creek Main Stem

"COMPLETE DOWNSTREAM DREDGE"

NOTES:

- REDUCES 100-YR WSE 0.8' OVER SHORT DISTANCE UPSTREAM FROM CECILIA WAY
- REDUCES 100-YR WSE ONLY ABOUT 0.2' DOWNSTREAM FROM CECILA WAY
- CECILIA CULVERT 0.0-FT DEPTH-BLOCKED

Legend	
EG 100yr - ncc+2 DS DREDGE	(Red line with triangles)
EG 100yr - BSLN-ncc	(Blue line with triangles)
WS 100yr - BSLN-ncc	(Blue line with squares)
WS 100yr - ncc+2 DS DREDGE	(Red line with squares)
Crit 100yr - ncc+2 DS DREDGE	(Red line with circles)
Crit 100yr - BSLN-ncc	(Red line with triangles)
Ground	(Black line with squares)
Left Levee	(Magenta line with squares)
Right Levee	(Purple line with squares)
Ground	(Magenta line with squares)



5.35'

Sea Level

State Route 131

Culvert

Drop

Rubble Lag

Cecilia Way

Culvert

Narrow

Root Step

Concrete Ledge

Rubble Lag

Root Step

"CANYON"

LOWER

UPPER

0.2'

0.8'

0.5%

0.8%

1.9%

FINDINGS – WEST CREEK

Model-Computed 100-year Water Surface Elevation Profiles

West Creek Aug 2022 Plan: 1) ncc +2+3+4 del CECI 8/25/2022 2) BSLN-ncc 8/25/2022

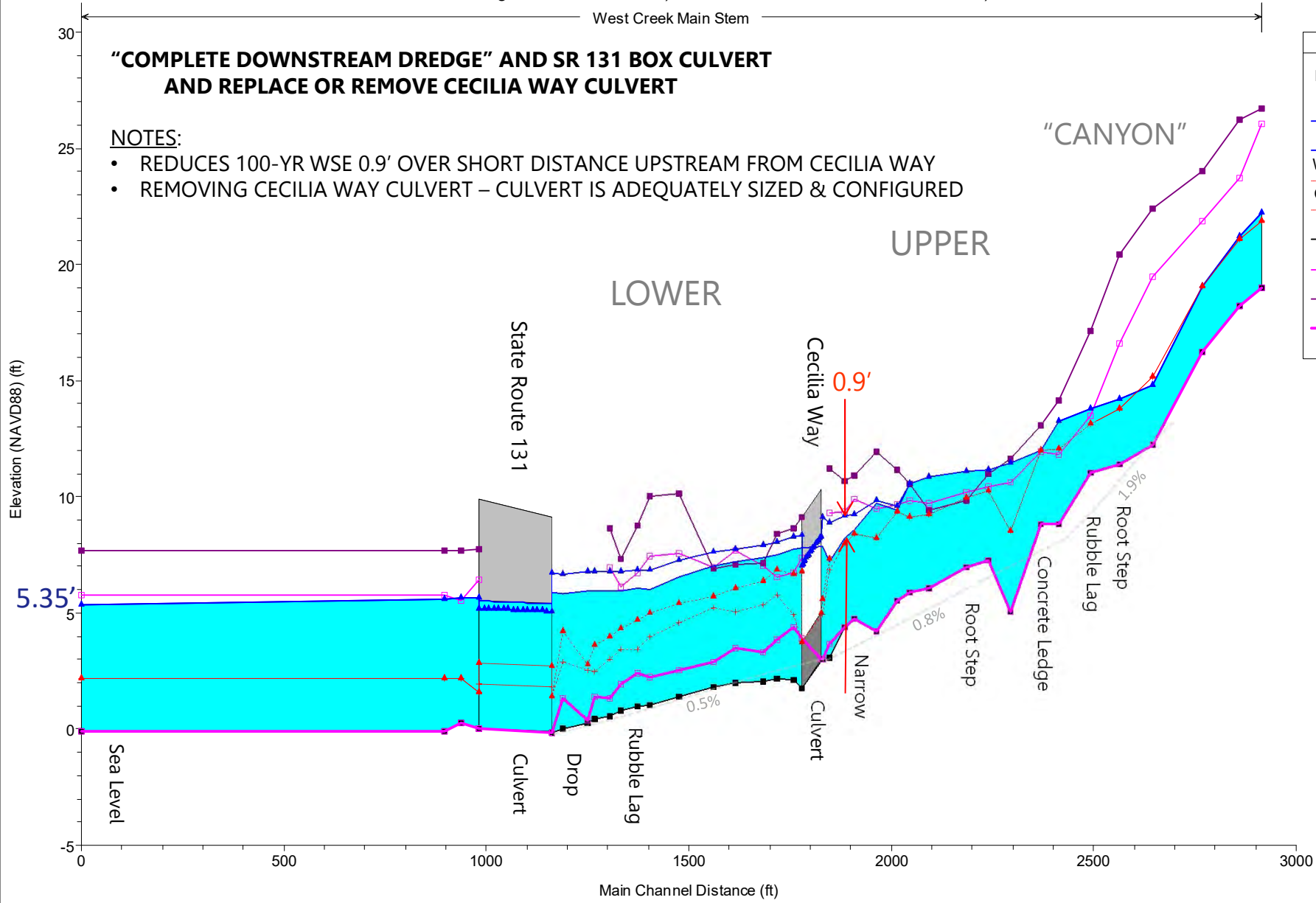
West Creek Main Stem

“COMPLETE DOWNSTREAM DREDGE” AND SR 131 BOX CULVERT AND REPLACE OR REMOVE CECILIA WAY CULVERT

NOTES:

- REDUCES 100-YR WSE 0.9’ OVER SHORT DISTANCE UPSTREAM FROM CECILIA WAY
- REMOVING CECILIA WAY CULVERT – CULVERT IS ADEQUATELY SIZED & CONFIGURED

Legend	
EG 100yr - ncc +2+3+4 del CECI	(Blue line with triangles)
EG 100yr - BSLN-ncc	(Blue line with squares)
WS 100yr - BSLN-ncc	(Blue line with circles)
WS 100yr - ncc +2+3+4 del CECI	(Red line with triangles)
Crit 100yr - ncc +2+3+4 del CECI	(Red line with squares)
Crit 100yr - BSLN-ncc	(Red line with circles)
Ground	(Black line with squares)
Left Levee	(Magenta line with squares)
Right Levee	(Purple line with squares)
Ground	(Magenta line with circles)



UPPER WEST CK



190

167

180

161

170

155

Cypress Hollow Dr

160

149

150

143

Rancho Dr

140

137

Rancho Dr

130

131

120

125

110

119

110

113

107

101

Blackfield Dr

Claire Way

Karen Way

Claire Way

Cecilia Way x 12'

x 10'

205 ft

98

Google Earth

FINDINGS – WEST CREEK

Model-Computed 100-year Water Surface Elevation Profiles

West Creek Aug 2022 Plan: 1) ncc +1+2+3+5 8/25/2022 2) BSLN-ncc 8/25/2022

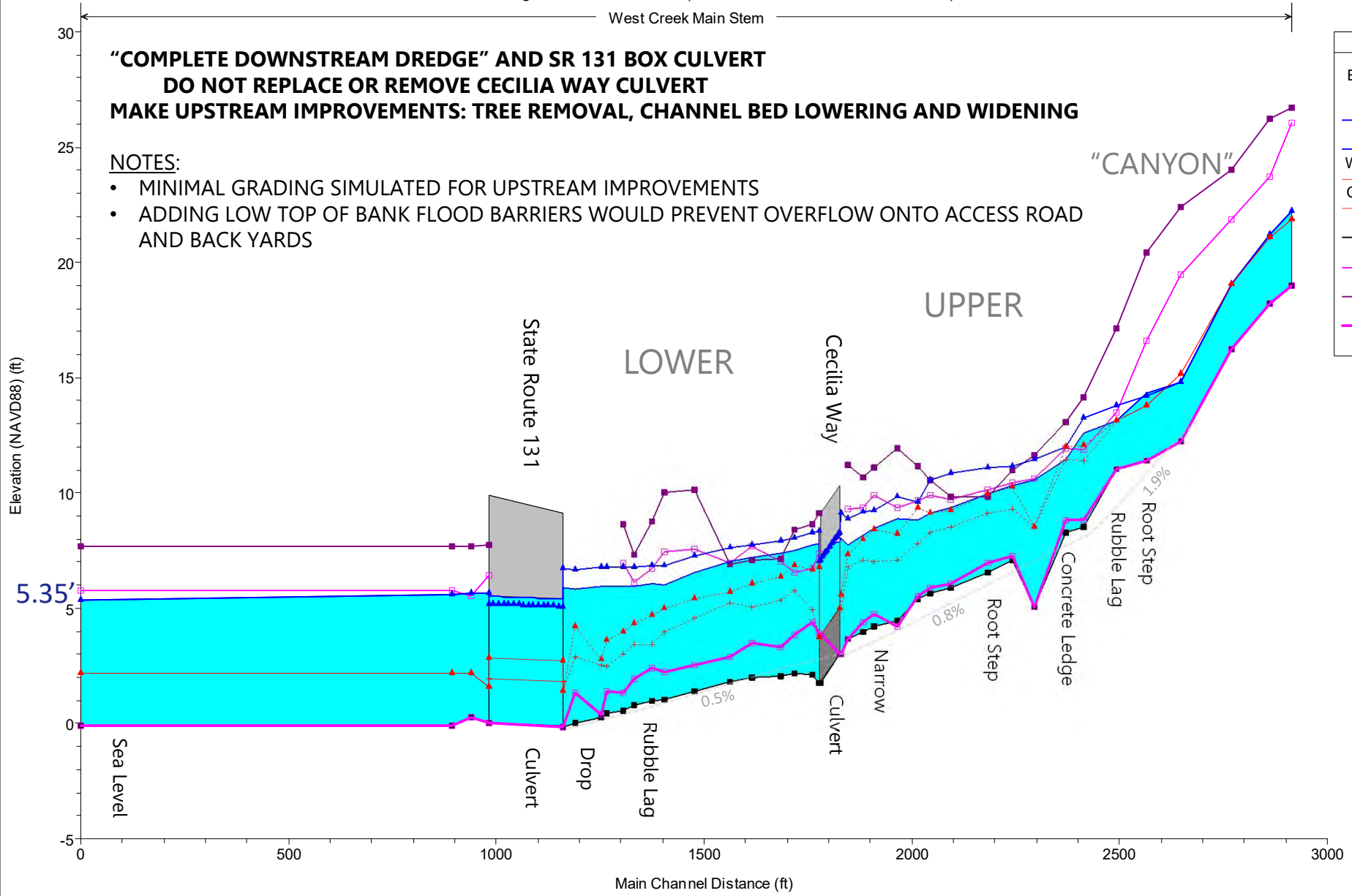
West Creek Main Stem

**“COMPLETE DOWNSTREAM DREDGE” AND SR 131 BOX CULVERT
DO NOT REPLACE OR REMOVE CECILIA WAY CULVERT
MAKE UPSTREAM IMPROVEMENTS: TREE REMOVAL, CHANNEL BED LOWERING AND WIDENING**

NOTES:

- MINIMAL GRADING SIMULATED FOR UPSTREAM IMPROVEMENTS
- ADDING LOW TOP OF BANK FLOOD BARRIERS WOULD PREVENT OVERFLOW ONTO ACCESS ROAD AND BACK YARDS

Legend	
EG 100yr - ncc +1+2+3+5	EG 100yr - BSLN-ncc
WS 100yr - BSLN-ncc	WS 100yr - ncc +1+2+3+5
Crit 100yr - ncc +1+2+3+5	Crit 100yr - BSLN-ncc
Ground	Left Levee
	Right Levee
	Ground



FINDINGS – EAST CREEK

1. REMOVING SEDIMENT AND VEGETATION WITHIN 300' DOWNSTREAM FROM CECILIA WAY CULVERT ("LIMITED DREDGE") HAS TEMPORARY BUT REASONABLY SUBSTANTIAL BENEFITS
2. EXTENDING DREDGING WORK TO REACH 600' DOWNSTREAM ("COMPLETE DREDGE") WOULD MAKE BENEFITS GREATER AND MORE PERMANENT
3. CECILIA WAY CULVERT APPEARS ADEQUATELY CONFIGURED – PERFORMS ADEQUATELY DOWNSTREAM CHANNEL MAINTAINED CLEAR
4. REPLACEMENT CULVERT(S) UNDER SR 131 (TIBURON BLVD) MAY IMPROVE SUSTAINABILITY OF CLEAR DOWNSTREAM CONDITIONS
5. TOP OF BANK BARRIERS WOULD ELIMINATE OVERFLOW ONTO CECILIA WAY AND INTO BACK YARDS ALONG UPPER EAST CREEK

FINDINGS – EAST CREEK

Model-Computed 100-year Water Surface Elevation Profiles

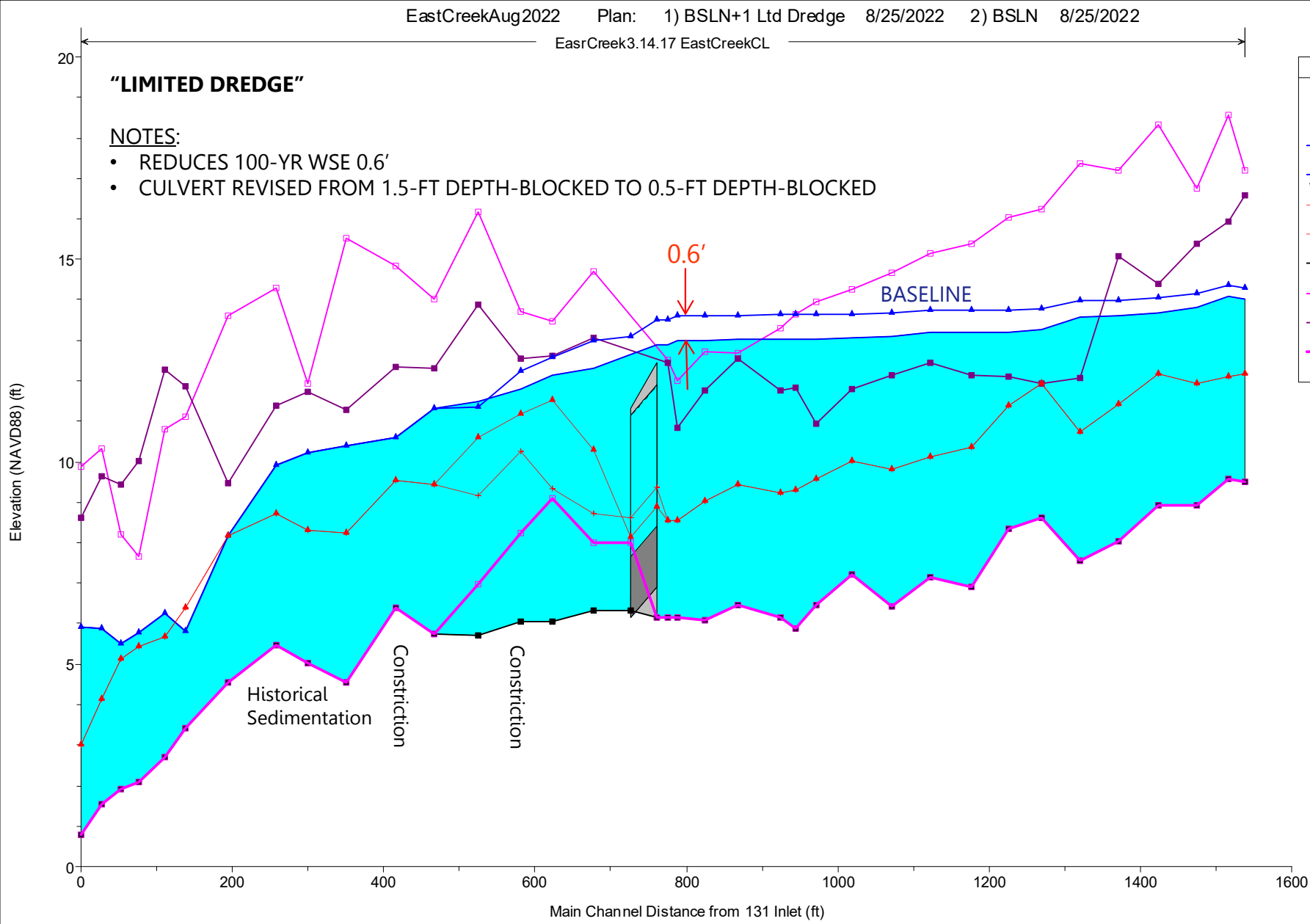
EastCreekAug2022 Plan: 1) BSLN+1 Ltd Dredge 8/25/2022 2) BSLN 8/25/2022

EasrCreek3.14.17 EastCreekCL

“LIMITED DREDGE”

NOTES:

- REDUCES 100-YR WSE 0.6'
- CULVERT REVISED FROM 1.5-FT DEPTH-BLOCKED TO 0.5-FT DEPTH-BLOCKED



Legend	
EG 100 yr - BSLN+1 Ltd Dredge	(magenta line with squares)
EG 100 yr - BSLN	(blue line with triangles)
WS 100 yr - BSLN+1 Ltd Dredge	(orange line with triangles)
Crit 100 yr - BSLN+1 Ltd Dredge	(red line with triangles)
Crit 100 yr - BSLN	(black line with squares)
Ground	(cyan shaded area)
Left Levee	(magenta line with squares)
Right Levee	(purple line with squares)
Ground	(magenta line with squares)

FINDINGS – EAST CREEK

Model-Computed 100-year Water Surface Elevation Profiles

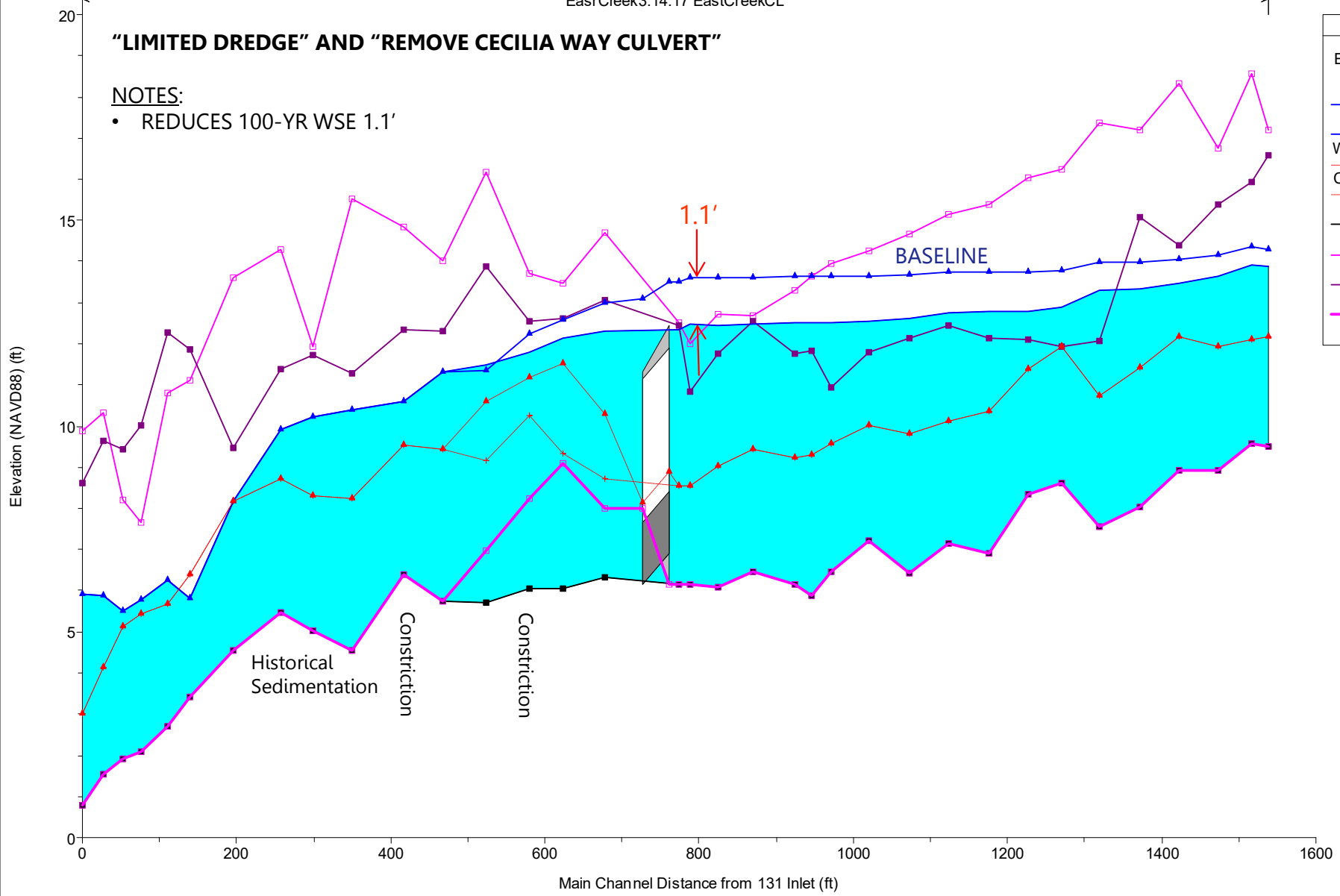
EastCreekAug2022 Plan: 1) BSLN+1+2 Del Ceci 8/25/2022 2) BSLN 8/25/2022

EasrCreek3.14.17 EastCreekCL

“LIMITED DREDGE” AND “REMOVE CECILIA WAY CULVERT”

NOTES:

- REDUCES 100-YR WSE 1.1'



Legend	
EG	100 yr - BSLN+1+2 Del Ceci
EG	100 yr - BSLN
WS	100 yr - BSLN
WS	100 yr - BSLN+1+2 Del Ceci
Crit	100 yr - BSLN+1+2 Del Ceci
Crit	100 yr - BSLN
	Ground
	Left Levee
	Right Levee
	Ground

FINDINGS – EAST CREEK

Model-Computed 100-year Water Surface Elevation Profiles

EastCreekAug2022 Plan: 1) BSLN+3 ds dredge 8/25/2022 2) BSLN 8/25/2022

EasrCreek3.14.17 EastCreekCL

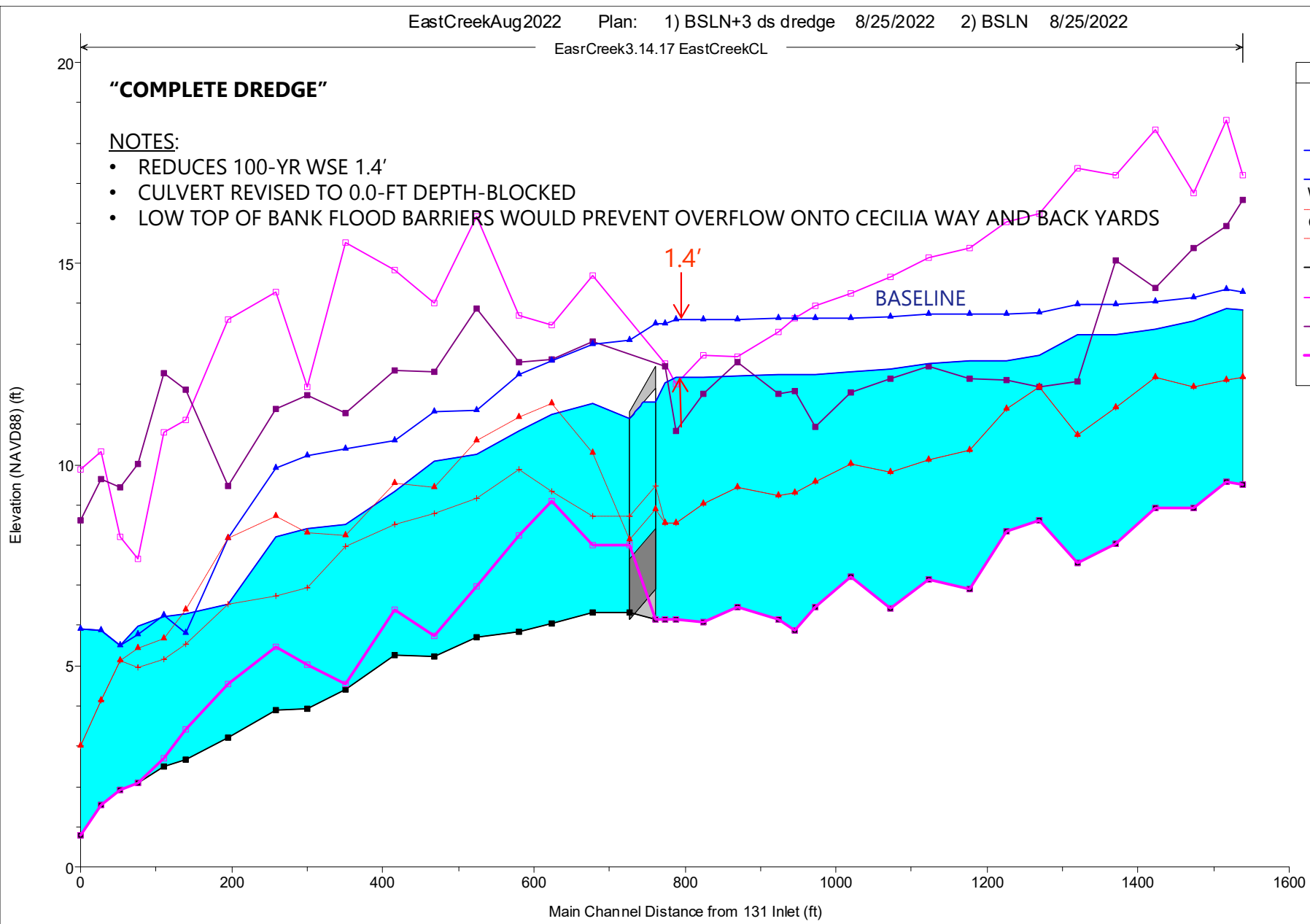
“COMPLETE DREDGE”

NOTES:

- REDUCES 100-YR WSE 1.4'
- CULVERT REVISED TO 0.0-FT DEPTH-BLOCKED
- LOW TOP OF BANK FLOOD BARRIERS WOULD PREVENT OVERFLOW ONTO CECILIA WAY AND BACK YARDS

1.4'

BASELINE



Legend	
EG 100 yr - BSLN+3 ds dredge	(magenta line with squares)
EG 100 yr - BSLN	(blue line with triangles)
WS 100 yr - BSLN+3 ds dredge	(orange line with triangles)
Crit 100 yr - BSLN+3 ds dredge	(red line with triangles)
Crit 100 yr - BSLN	(black line with squares)
Ground	(cyan shaded area)
Left Levee	(magenta line with squares)
Right Levee	(purple line with squares)
Ground	(magenta line with squares)

FINDINGS – EAST CREEK

Model-Computed 100-year Water Surface Elevation Profiles

EastCreekAug2022 Plan: 1) BSLN+3+4 del ceci 8/25/2022 2) BSLN 8/25/2022

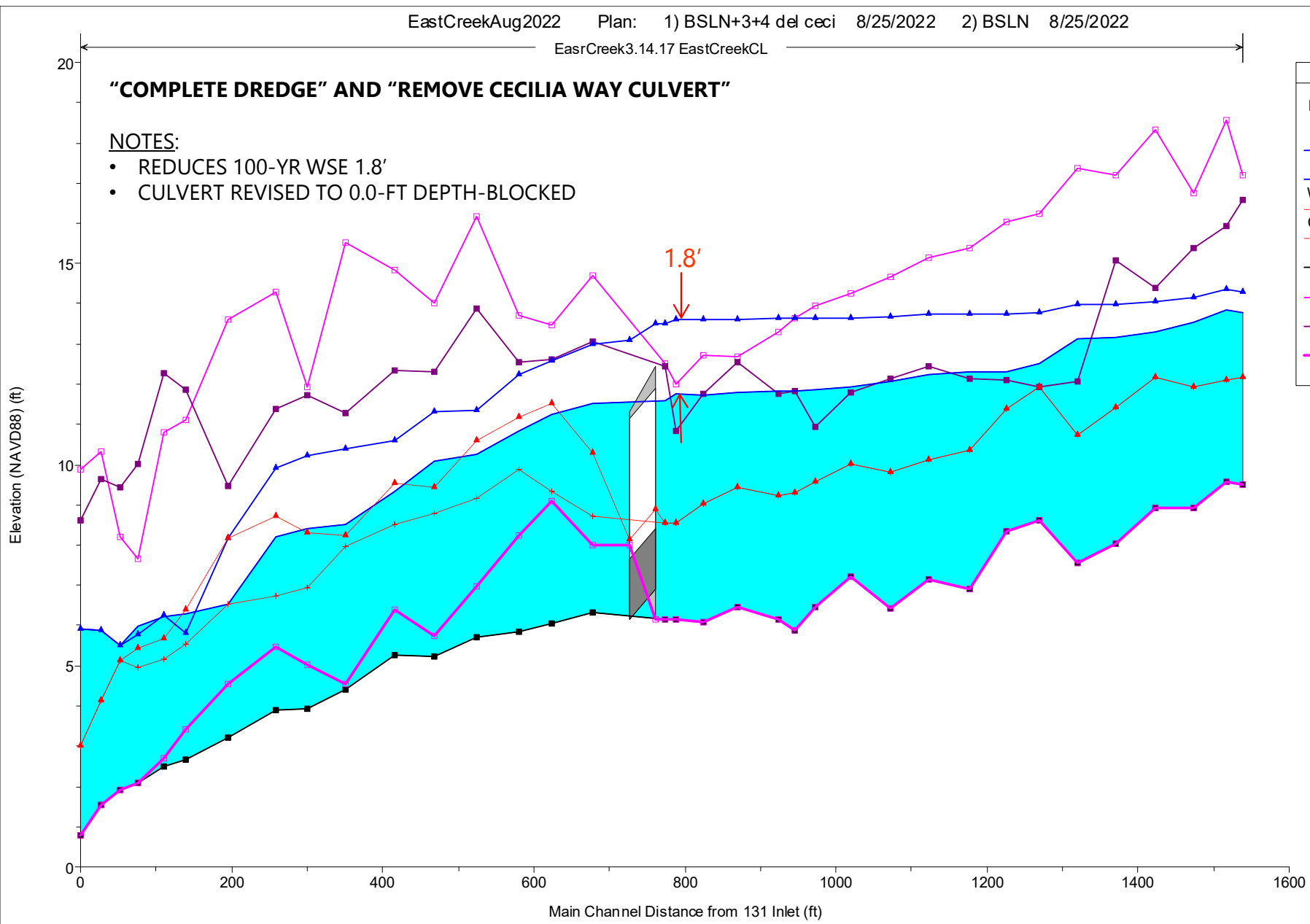
EasrCreek3.14.17 EastCreekCL

“COMPLETE DREDGE” AND “REMOVE CECILIA WAY CULVERT”

NOTES:

- REDUCES 100-YR WSE 1.8'
- CULVERT REVISED TO 0.0-FT DEPTH-BLOCKED

Legend	
EG 100 yr - BSLN+3+4 del ceci	
EG 100 yr - BSLN	
WS 100 yr - BSLN	
WS 100 yr - BSLN+3+4 del ceci	
Crit 100 yr - BSLN+3+4 del ceci	
Crit 100 yr - BSLN	
Ground	
Left Levee	
Right Levee	
Ground	



FINDINGS – EAST CREEK

Model-Computed 25-year Water Surface Elevation Profiles

EastCreekAug2022 Plan: BSLN+3 Complete d/s Dredge 8/25/2022

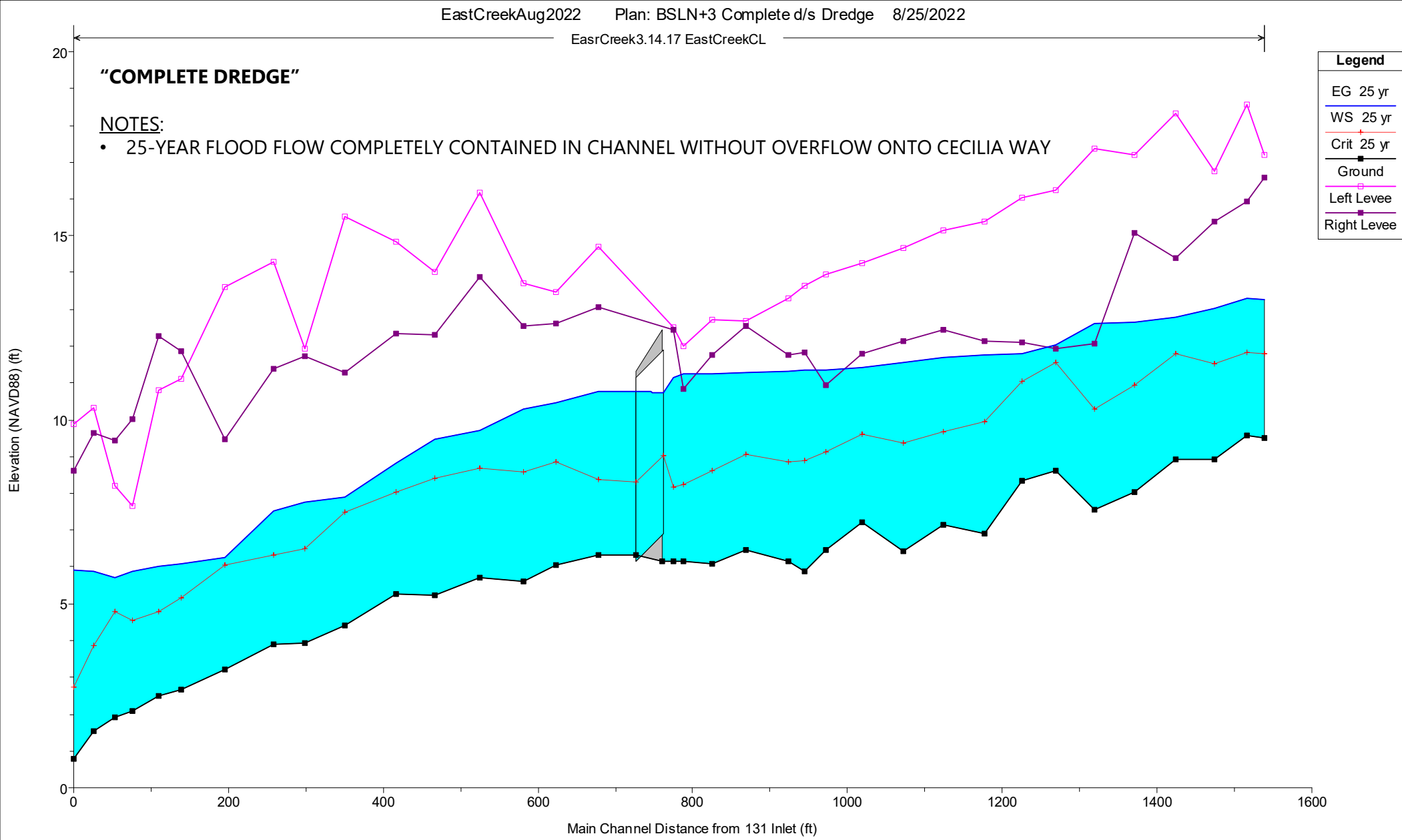
EasrCreek3.14.17 EastCreekCL

“COMPLETE DREDGE”

NOTES:

- 25-YEAR FLOOD FLOW COMPLETELY CONTAINED IN CHANNEL WITHOUT OVERFLOW ONTO CECILIA WAY

Legend	
EG 25 yr	
WS 25 yr	
Crit 25 yr	
Ground	
Left Levee	
Right Levee	



RECOMMENDATIONS

SR 131 (TIBURON BLVD) IMPROVEMENTS – CULVERTS ARE DETERIORATING AND NEARING END OF ENGINEERING SERVICE PERIOD. CALTRANS SHOULD REPLACE THEM WITH CONCRETE BOX CULVERTS EQUAL TO OR LARGER THAN THE CECILIA WAY CULVERTS.

CHANNEL MAINTENANCE DREDGING – SEDIMENT AND VEGETATION REMOVAL WAS PERFORMED THIS YEAR ON EAST CREEK. EXTENDING FARTHER DOWNSTREAM IN FUTURE YEARS REQUIRES DESIGN, ENVIRONMENTAL REVIEW, AND PERMITTING.

IMPROVEMENT OPTIONS – TOP OF BANK BARRIERS ARE RECOMMENDED ALONG FLOODPRONE CHANNEL SEGMENTS. RELIANCE ON BARRIERS ALONG UPPER EAST AND UPPER WEST CREEK CAN BE REDUCED BY IMPLEMENTING OTHER IMPROVEMENTS:

UPPER WEST CREEK – TREE REMOVAL, RUBBLE REMOVAL, SELECT WIDENING, STORM OUTFALL APRON REPLACEMENT

UPPER EAST CREEK – SEDIMENT AND VEGETATION REMOVAL, RUBBLE REMOVAL, POTENTIALLY SELECT WIDENING AND TREE REMOVAL