

I-70 Twin Tunnels Impacts to Clear Creek

Kevin Shanks



Josh Hollon

ATKINS



- **PROJECT**
- **GOALS**
- **SCHEDULE**
- **PARTNERSHIPS**
- **COORDINATION**
- **CHANNEL ELEMENTS**

PROJECT
GOALS
SCHEDULE
PARTNERSHIPS
COORDINATION
CHANNEL
ELEMENTS

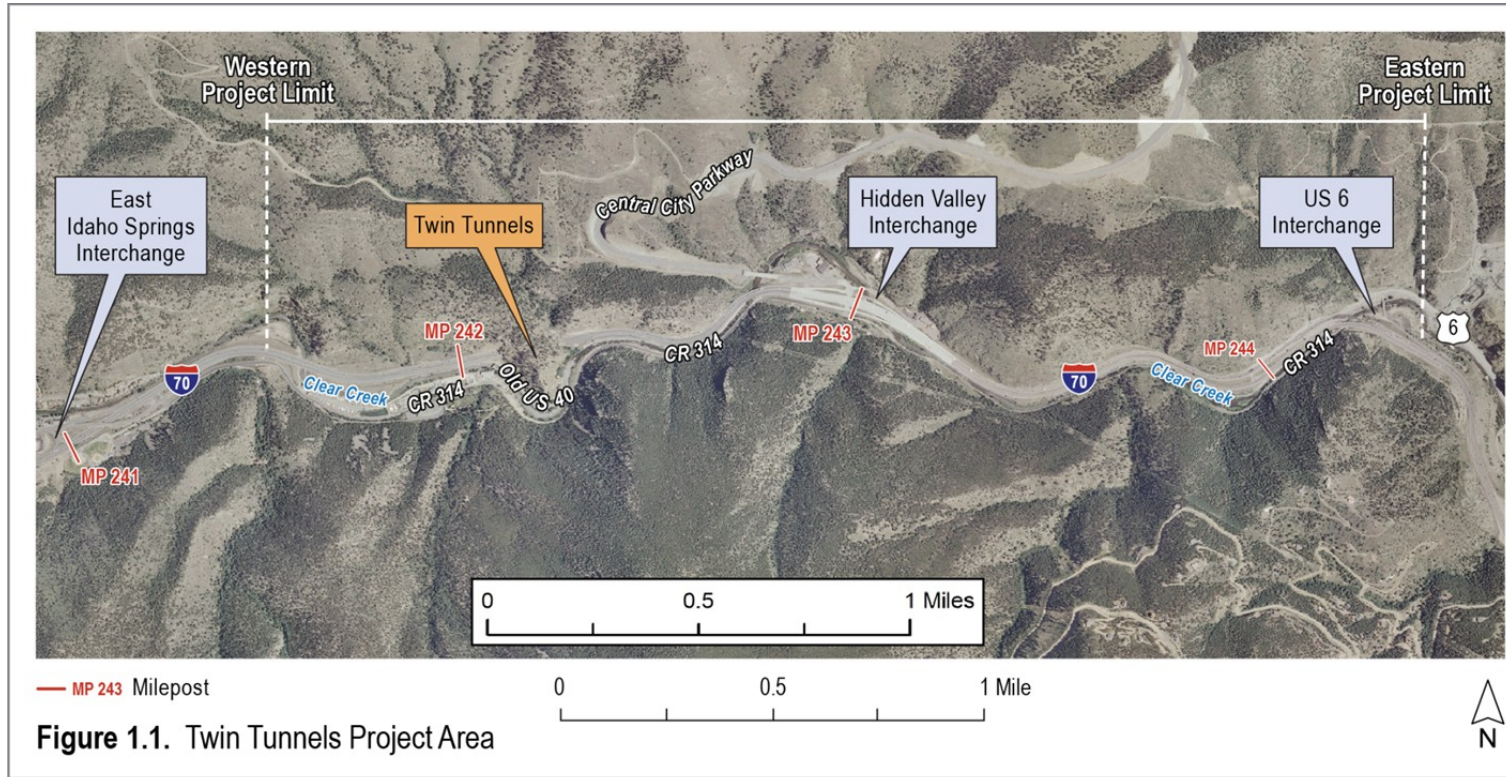
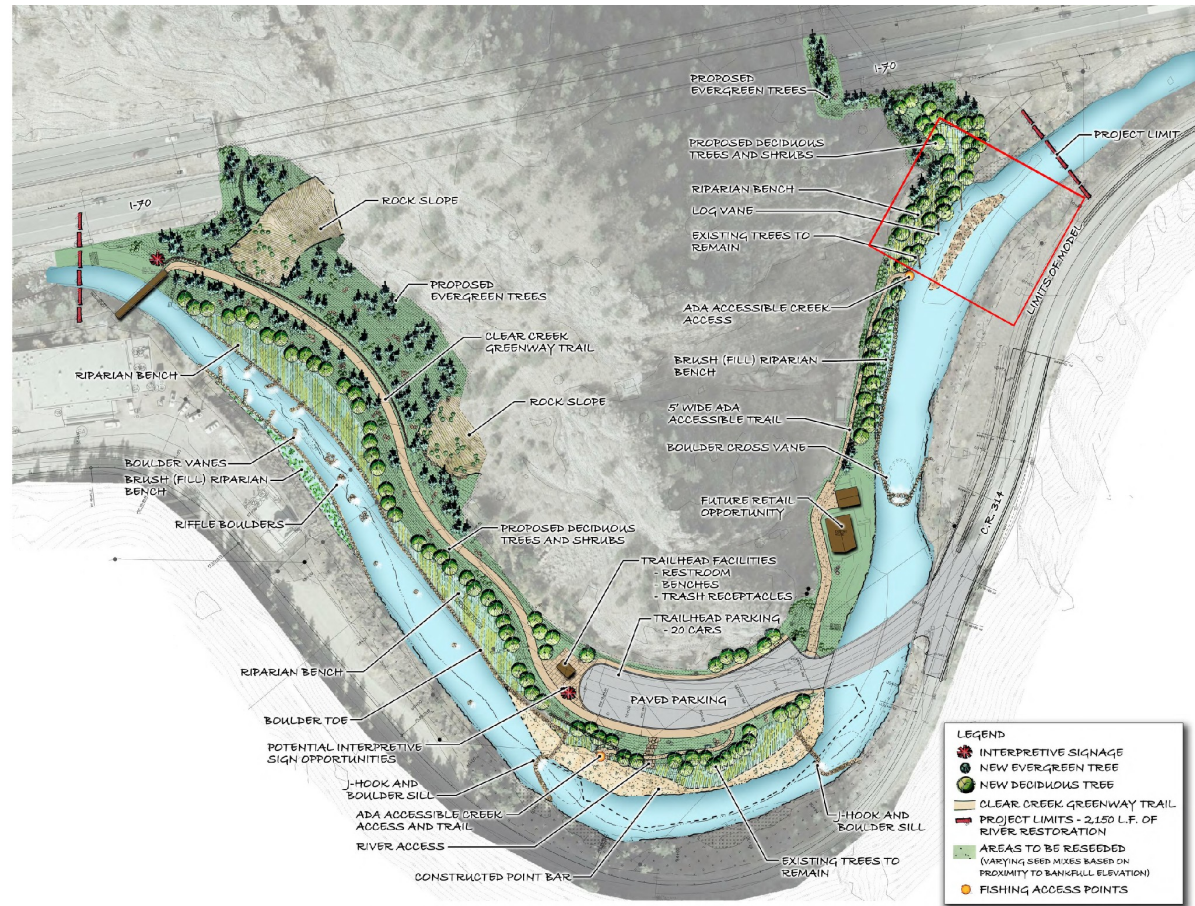


Figure 1.1. Twin Tunnels Project Area

PROJECT
GOALS
SCHEDULE
PARTNERSHIPS
COORDINATION
CHANNEL
ELEMENTS



OLD GAME CHECK STATION TRAILHEAD AND RIVER RESTORATION - CONCEPTUAL PLAN

Clear Creek County, Colorado

PROJECT
GOALS
SCHEDULE
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COORDINATION
CHANNEL
ELEMENTS

- **Do the right thing for people and the environment**
- **Maximize uses**
- **Balance regional transportation needs with local recreational needs**

PROJECT
GOALS
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ELEMENTS

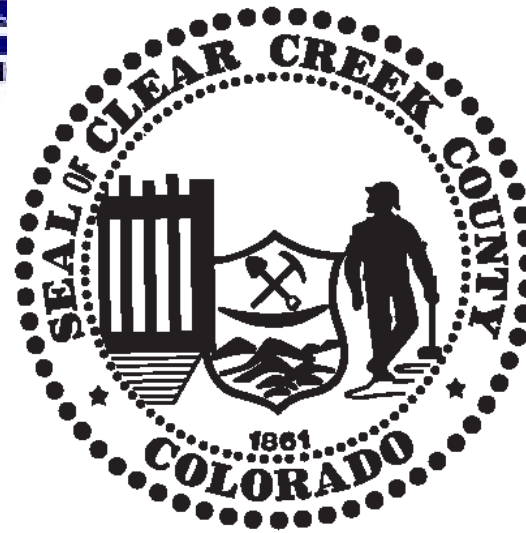
- **Successfully implement the complete vision for the trailhead**
- **Solidify a long-term successful partnership around the Creek**
- **Create a fish habitat research opportunity**

PROJECT
GOALS
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PARTNERSHIPS

PROJECT
GOALS
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ELEMENTS

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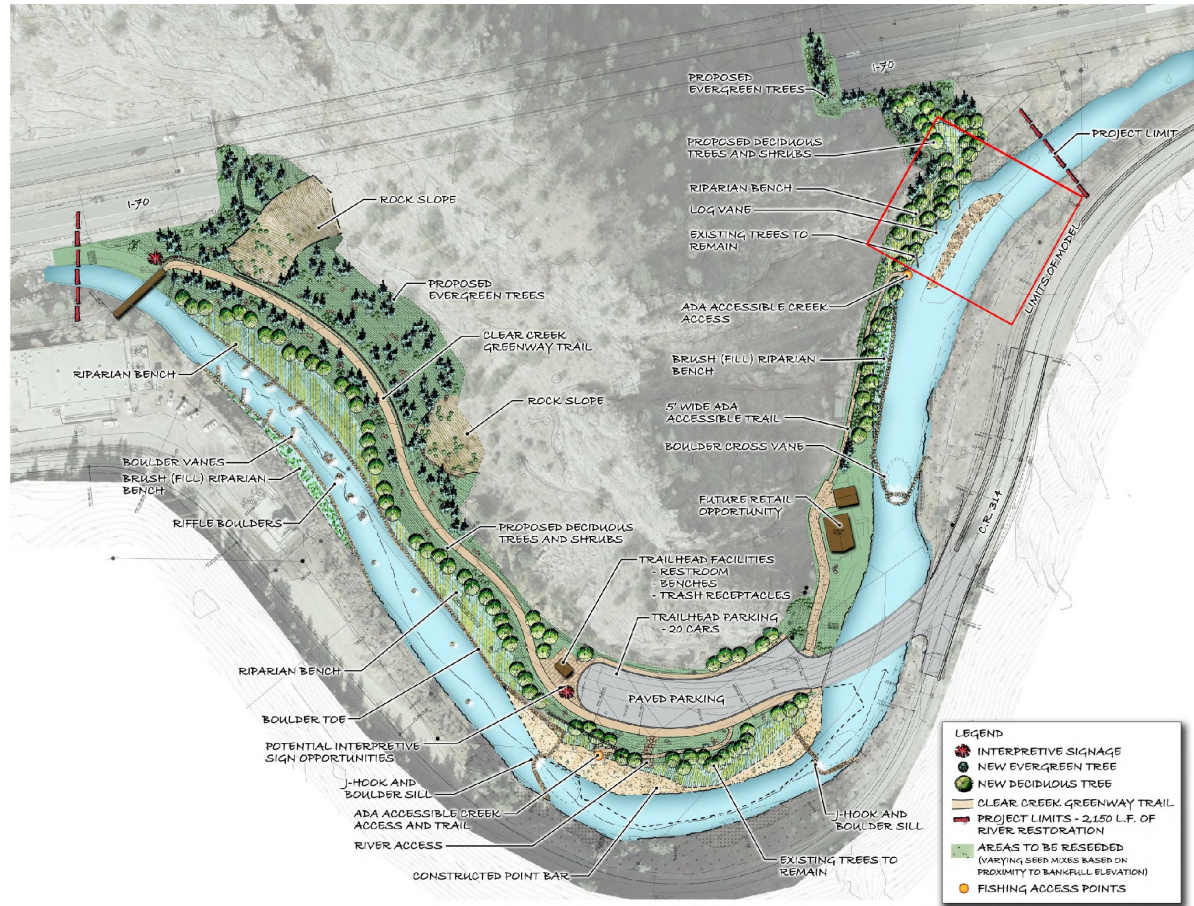


COORDINATION

PROJECT
GOALS
SCHEDULE
PARTNERSHIPS
COORDINATION
CHANNEL
ELEMENTS

- Rafting Community
- City of Idaho Springs
- Army Corps of Engineers
- Mountain Area Land Trust
(MALT)
- SWEEP
- ALIVE

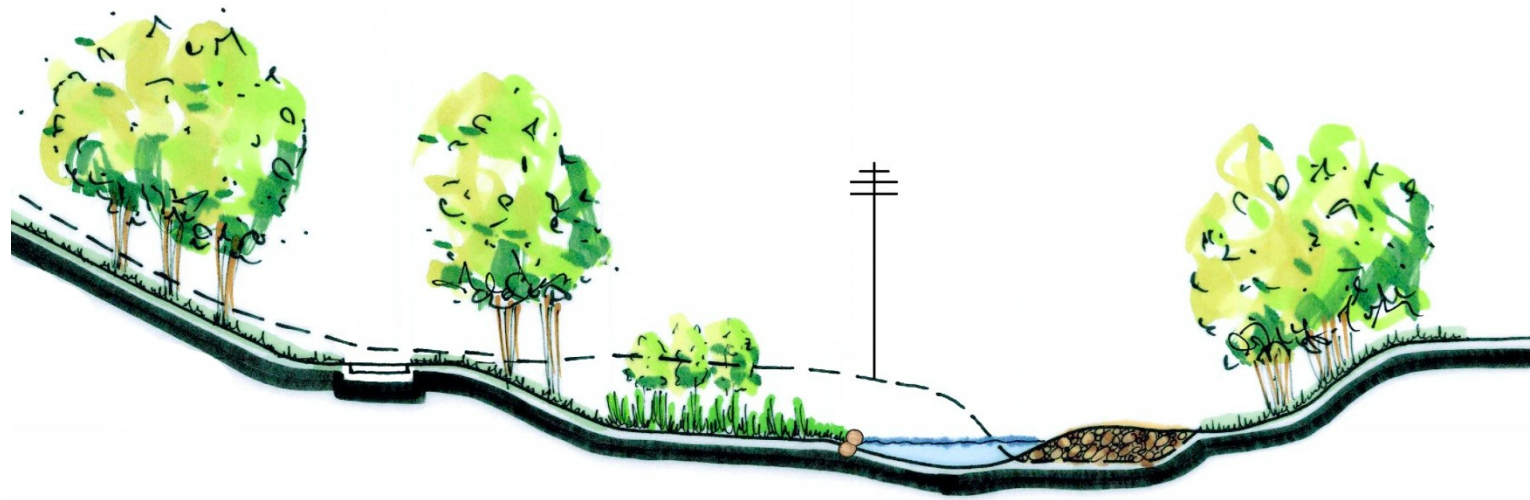
PROJECT
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OLD GAME CHECK STATION TRAILHEAD AND RIVER RESTORATION - CONCEPTUAL PLAN

Clear Creek County, Colorado

PROJECT
GOALS
SCHEDULE
PARTNERSHIPS
COORDINATION
CHANNEL
ELEMENTS



CLEAR CREEK'S EXISTING CONDITION

PROJECT
GOALS
SCHEDULE
PARTNERSHIPS
COORDINATION
CHANNEL
ELEMENTS



**PROJECT
GOALS
SCHEDULE
PARTNERSHIPS
COORDINATION
CHANNEL
ELEMENTS**



**PROJECT
GOALS
SCHEDULE
PARTNERSHIPS
COORDINATION
CHANNEL
ELEMENTS**



TWIN TUNNELS

**PROJECT
GOALS
SCHEDULE
PARTNERSHIPS
COORDINATION
CHANNEL
ELEMENTS**



PROJECT
GOALS
SCHEDULE
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COORDINATION
CHANNEL
ELEMENTS





LEVERAGING OPPORTUNITIES

PROJECT

GOALS

SCHEDULE

PARTNERSHIPS

COORDINATION

CHANNEL

ELEMENTS

ELEMENTS CONSIDERED

PROJECT

GOALS

SCHEDULE

PARTNERSHIPS

COORDINATION

CHANNEL

ELEMENTS

EXAMPLES OF RESTORATION TECHNIQUES

PROJECT
GOALS
SCHEDULE
PARTNERSHIPS
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ELEMENTS

- Collaborative Design Effort
- Science and Experience used to Develop the Design
 - Boulder Toe
 - Rock Ribs
 - Riffle Boulders
 - J-Hook
 - Cross Vane

**PROJECT
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EXAMPLE: BOULDER TOE

DESIGN OF BOULDER TOE

PROJECT
GOALS
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BOULDER TOE INTO BANK AS SHOWN ON PLANS
10' MIN.
EXISTING BANK
MINIMIZE GAPS BETWEEN BOULDERS
KEY BOULDER TOE AT UPSTREAM END A MIN. OF 10'
PROVIDE VARIATION IN BOULDER FACE
2:1 SLOPE (TYP.)
FLOW
FLOW

BOULDER TOE - CUT RIPARIAN BENCH
N.T.S.
SEEDED RIPARIAN BENCH
ADD 9 OF CY SOIL CONDITIONER PER 1,000 S.F. AND TILL TO A DEPTH OF 8 INCHES
5' LONG WILLOW STAKE AT APPROX. 45°
2.5'x2.5'x2' MIN. BOULDER
WATER SURFACE AT BANKFULL
3' LONG WILLOW STAKE AT APPROX. 45°
FOOTER BOULDER
EXISTING STREAM SUBSTRATE
BACKFILL WITH RIVER COBBLE
BURY BOULDER 1/2 DEEP
BACKFILL BEHIND BOULDER TOE AS NEEDED ON CUT BENCH WITH EXISTING SOIL. BACKFILL WILL NOT BE PAID FOR SEPARATELY, BUT INCLUDED IN THE COST OF THE WORK.
NOTES:
1. SEE LANDSCAPE PLANS FOR LOCATIONS.

BOULDER TOE - FILL RIPARIAN BENCH
N.T.S.
EXISTING CHANNEL
2:1 EXISTING SLOPE (TYP.)
SEEDED RIPARIAN BENCH SEE LANDSCAPE PLANT SCHEDULE FOR SEED MIX.
FILL MATERIAL SHALL BE A MIXTURE OF CLASS 2 STRUCTURE BACKFILL AND SOIL CONDITIONER AS PER DETAIL AND SPECIFICATIONS.
VARIABLE BENCH
5' LONG WILLOW STAKE AT APPROX. 45°
2.5'x2.5'x2' MIN. BOULDER
WATER SURFACE AT BANKFULL
3' LONG WILLOW STAKE AT APPROX. 45°
FOOTER BOULDER
BACKFILL WITH RIVER COBBLE
BURY BOULDER 1/2 DEEP
VARIABLE DEPTH LAYER OF SLASH. SLASH SHALL CONSIST OF LARGER BRANCHES AND LOGS MIXED WITH EMBANKMENT MATERIAL.
BRUSH FILL SHALL BE CONSTRUCTED TO REDUCE SETTLEMENT OF FILL MATERIAL LAYER.
USE SLASH FROM TREE REMOVALS WITHIN THE PROJECT LIMIT FOR BRANCHES AND LOGS. ADDITIONAL SLASH MAY BE COLLECTED FROM LOCAL SOURCES. SEE SECTION 214 PLANTING SPECIFICATION.
NOTES:
1. SEE LANDSCAPE PLANS FOR LOCATIONS.

BOULDER TOE
N.T.S.
2' O.C.
KEY BOULDER TOE INTO BANK AT DOWNSTREAM END A MIN. OF 10'.
NOTES:
1. FOOTER COURSE WILLOWS SHALL BE 3' LONG STAKES, BURY 2.4".
2. HEADER COURSE WILLOWS SHALL BE 5' LONG STAKES, BURY 4".
3. STAKES SHALL BE PLANTED AT APPROX. 45° FROM THE HORIZONTAL GROUND PLANE.
4. ALL WILLOW STAKES SHALL BE PLACED AT TIME OF BOULDER TOE CONSTRUCTION IN THE APPROPRIATE COURSE, AND BACKFILLED AS PART OF THE BOULDER TOE BACKFILL OPERATIONS.
5. SEE LANDSCAPE PLANS FOR LOCATIONS OF WILLOW PLANTINGS.

WILLOW STAKE IN BOULDER TOE LAYOUT
N.T.S.

7109-000/PANORAMA 3 FINAL/11-01/STREAM

Print Date: 09-30-13	Sheet Revisions			Colorado Department of Transportation	As Constructed	BOULDER TOE DETAIL		Project No./Code
File Name: IK-CHANNEL DETAILS	Date:	Comments	Init.	425 A Corporate Circle Golden, CO 80401 Phone: 720-497-6900 FAX: 720-497-6901	No Revisions:	Designer: KRS	Structure Numbers:	160703-392
Horiz. Scale: As Noted	Vert. Scale: As Noted				Revised:	Detailer: JKG		19037
Unit Information	Unit Leader Initials				Void:	Subset: CHANNEL DETAIL	Subset Sheets: 2 of 8	Sheet Number: 109
associates inc. 3885 South Peoria Street, Suite 100 Aurora, Colorado 80014 303.755.2200 FAX 303.755.2201				Region 1	CRC			

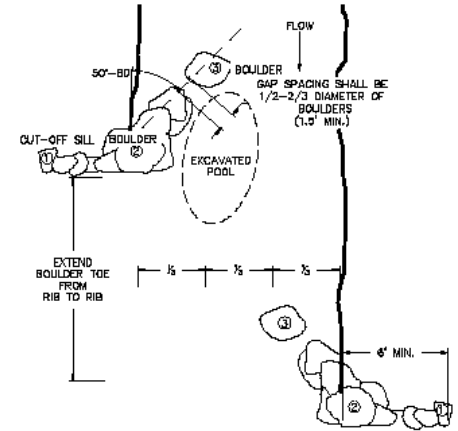
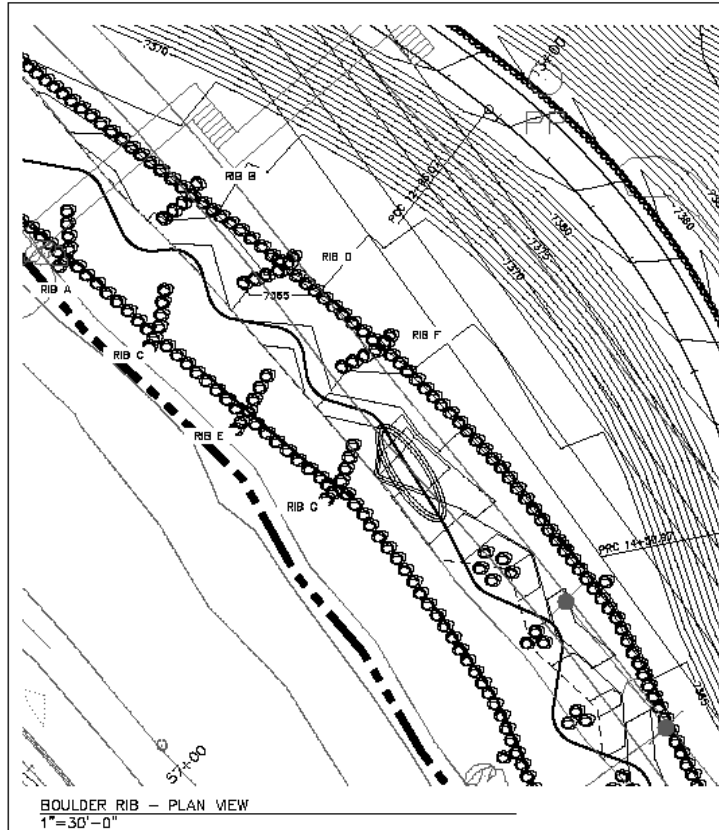
**PROJECT
GOALS
SCHEDULE
PARTNERSHIPS
COORDINATION
CHANNEL
ELEMENTS**



EXAMPLE: Rock Rib

DESIGN OF ROCK RIB

PROJECT
GOALS
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BOULDER RIB (TYP.)
N.T.S.

BOULDER RIB INFORMATION

RIB N.O.	OVERALL LENGTH	ANGLE FROM BANK (DEGREES)	BOULDER ① ELEV. BACK ROCK OF TOE		BOULDER ② ELEV. ROCK A* BANK		BOULDER ③ ELEV. END ROCK IN CHANNEL	
			Elevation	North/East	Elevation	North/East	Elevation	North/East
A	15.8'	50	7368.90	695813.57 11016718.957	7368.16	695815.233 11016711.170	7368.50	635861.072 13016711.170
B	13.4'	78.5	7368.50	695896.057 1006752.182	7367.21	695864.205 1006750.604	7365.87	635825.438 1006740.305
C	15.5'	57	7367.80	695813.336 11016735.517	7366.97	695821.277 11016740.411	7365.42	635836.509 1206742.623
D	15.8'	58.3	7367.40	695702.545 1006783.057	7365.55	695768.207 1006780.050	7364.97	635810.022 1206765.164
E	14.4'	74.5	7366.90	695773.887 1006764.236	7365.94	695768.207 1006768.207	7364.50	635809.910 1206774.440
F	15.3'	66.5	7366.30	695773.588 1006769.124	7365.53	695773.588 1006795.315	7361.30	635788.190 1206795.565
G	15.4'	60.5	7365.90	695792.116 1006792.116	7365.04	695795.174 1006795.174	7363.50	635660.213 1206601.213

210-000-PHASE 3 FINAL-STREAM

Print Date: 09-30-13
File Name: H-DRAWING DETAILS
Horis. Scale: As Noted Vert. Scale: As Noted
Unit Information Unit Leader Initials
JKC associates inc. 2003 South Platte Street, Suite 101
Denver, CO 80202 Phone: 303.733.1100

Sheet Revisions		
Date:	Comments	Init.

Colorado Department of Transportation
DOT 425 A Corporate Circle
Golden, CO 80401
Phone: 720-497-6900 FAX: 720-497-6901
Region 1 CRC

As Constructed
No Revisions:
Revised:
Void:

BOULDER RIB DETAIL
(1 OF 2)
Designer: KRS
Detailer: JKC
Subject: CHANNEL DETAIL
Subst Sheets: 3 of 8

Project No./Code	110703-392
	19037
Sheet Number	110

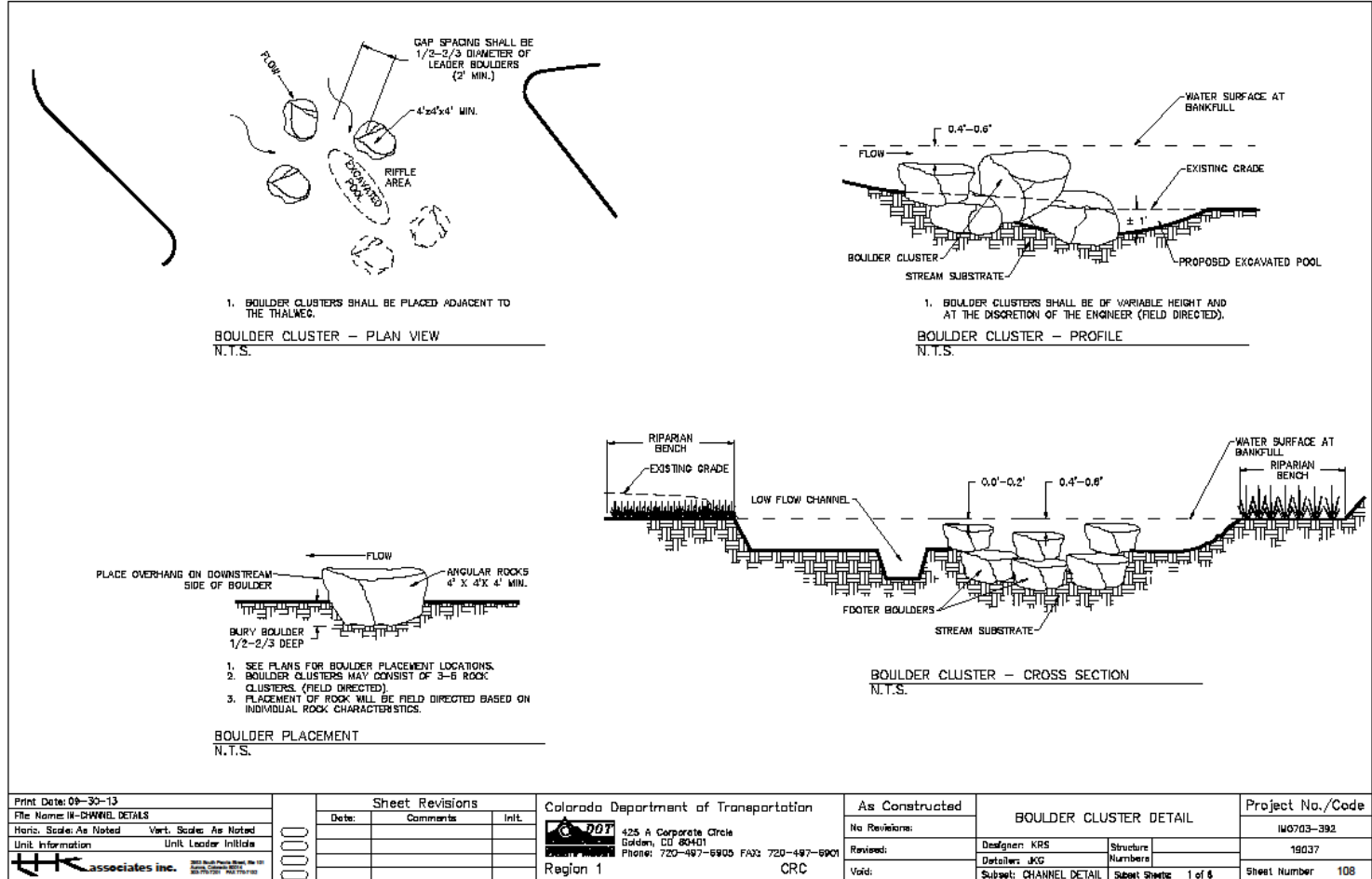
PROJECT
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EXAMPLE: BOULDER CLUSTER

DESIGN OF BOULDER CLUSTER

PROJECT
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2108-000/P/04/06E 3 P.M./JL-BREDAW

Print Date: 09-30-13	
File Name: M-CHANNEL DETAILS	
horiz. Scale: As Noted	vert. Scale: As Noted
Unit Information	Unit Leader Initials
	200 South Platte Street, Suite 101 Golden, CO 80401 303.750.0700 FAX 303.750.0702

Sheet Revisions		
Date:	Comments	Init.

Colorado Department of Transportation	As Constructed
425 A Corporate Circle Golden, CO 80401 Phone: 720-497-6900 FAX: 720-497-6901	No Revisions:
Region 1	Revised:
	Void:

BOULDER CLUSTER DETAIL	
Designer: KRS	Structure Numbers
Detailer: JKG	Sheet Number: 1 of 8
Subject: CHANNEL DETAIL	

Project No./Code	16037
Sheet Number	108

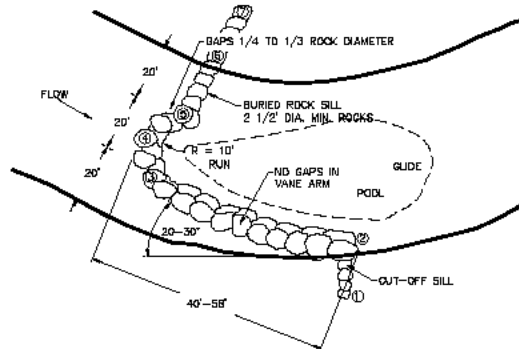
**PROJECT
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EXAMPLE: J-Hook

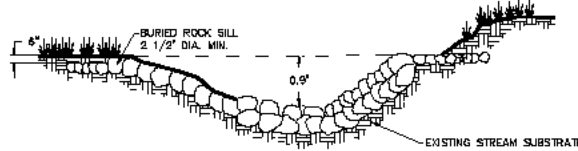
DESIGN OF J-HOOK STRUCTURE

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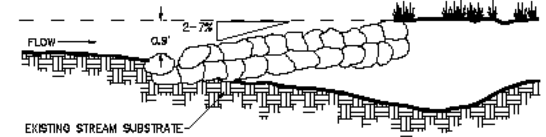


ROCK J-HOOK VANE - PLAN VIEW
N.T.S.

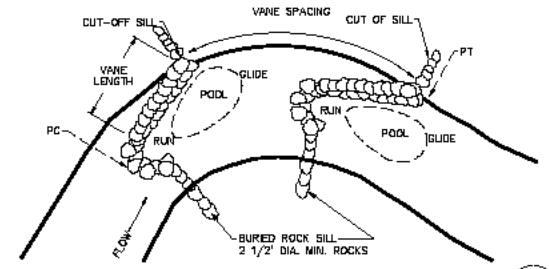
- NOTES:
1. J-HOOK POINTS 3, 4 AND 5 SHALL BE PLACED AT A RADIUS OF 10'
 2. PLACEMENT OF ROCK WILL BE FIELD DIRECTED BASE ON INDIVIDUAL ROCK CHARACTERISTICS.
 3. J-HOOK ROCKS SHALL BE 4-5' DIA. X 2-3' HEIGHT.



ROCK J-HOOK VANE - CROSS SECTION VIEW
N.T.S.



ROCK J-HOOK VANE - PROFILE VIEW
N.T.S.



ROCK J-HOOK VANE SPACING
N.T.S.

J-HOOK IS FORMATION

HOOK ARM No.	S&M LENGTH	ANGLE DEGREE	SLOULDER 3		SLOULDER 2		SLOULDER 1		SLOULDER 4	
			Elevation	North/East	Elevation	North/East	Elevation	North/East	Elevation	North/East
1	40'	Atteprec	7501.0	355/282.354	7542.0	330/104-018	7588.9	100/0-2-439	7588.4	100/0-2-439
			7590.0	355/351.751	7560.1	635/06-612	7590.3	695/15-512		
			7590.0	130/108.909	7560.1	130/117-113	7590.3	100/124-789		
			Flowline	North/East	Flowline	North/East	Flowline	North/East	Flowline	North/East
2	40'	90 Degree	7555.0	48/530-773	7555.0	695/05-787	7584.6	695/05-784	7584.1	100/0-2-439
			7555.0	130/444-173	7555.0	130/475-438	7584.6	130/475-438	7584.1	100/0-2-439
			7584.6	100/420-452	7584.6	130/475-438	7584.6	100/475-438		
			Flowline	North/East	Flowline	North/East	Flowline	North/East	Flowline	North/East

Print Date: 08-30-13
File Name: IN-CHWNL DETAILS
HORIZ. Scale: As Noted Vert. Scale: As Noted
Unit: Information Unit Leader Initials
associates inc.

Sheet Revisions		
Date:	Comments	Init.

Colorado Department of Transportation
DOT
425 A Corporate Circle
Golden, CO 80401
Phone: 720-497-5905 FAX: 720-497-5901
Region 1 CRC

As Constructed	No Revisions:
Revised:	
Void:	

J-HOOK DETAIL	
Designer: KRS	Structure Numbers:
Detailer: JKG	Sheet Number: 6 OF 8

Project No./Code	1M0703-392
Sheet Number	19037
Sheet Number	113

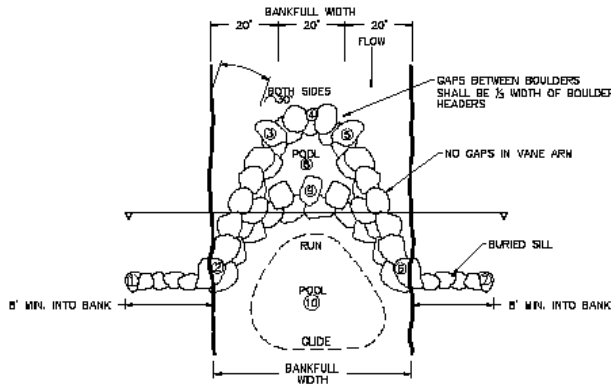
PROJECT
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EXAMPLE: Cross Vane

DESIGN OF CROSS VANE

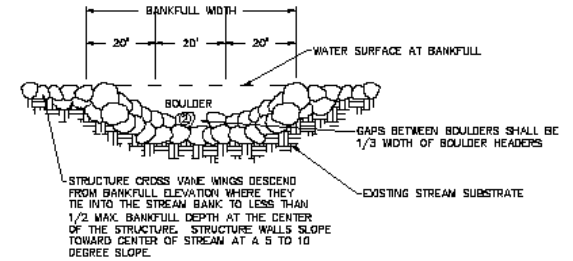
PROJECT
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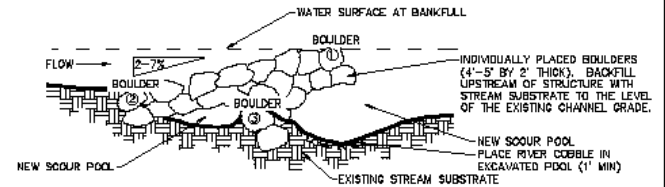
INDIVIDUALLY PLACED FOOTER ROCKS 4' TO 5' BY 2' THICK (MIN. TWO ROWS OF FOOTER ROCKS PLACED TIGHTLY TOGETHER WITH INTERSTITIAL SPACES FILLED WITH COBBLE AND GRAVEL).

CROSS VANE - PLAN MEW
N.T.S.

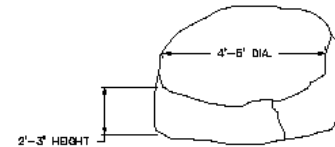
POINT	Northing	Easting	Elevation
1	695752.253	1007484.138	7349.0
2	695751.900	1007482.149	7349.0
3	695659.272	10047509.4	7348.0
4	695655.579	1007518.726	7347.9
5	695656.538	1007528.212	7348.0
6	695749.985	1007551.516	7349.0
7	695749.585	1007559.564	7349.0
8	695701.581	1007520.927	7347.0
9	695707.465	1007520.152	7347.5
10	695717.802	1007520.397	7345.0



CROSS VANE - CROSS SECTION
N.T.S.



CROSS VANE - PROFILE
N.T.S.



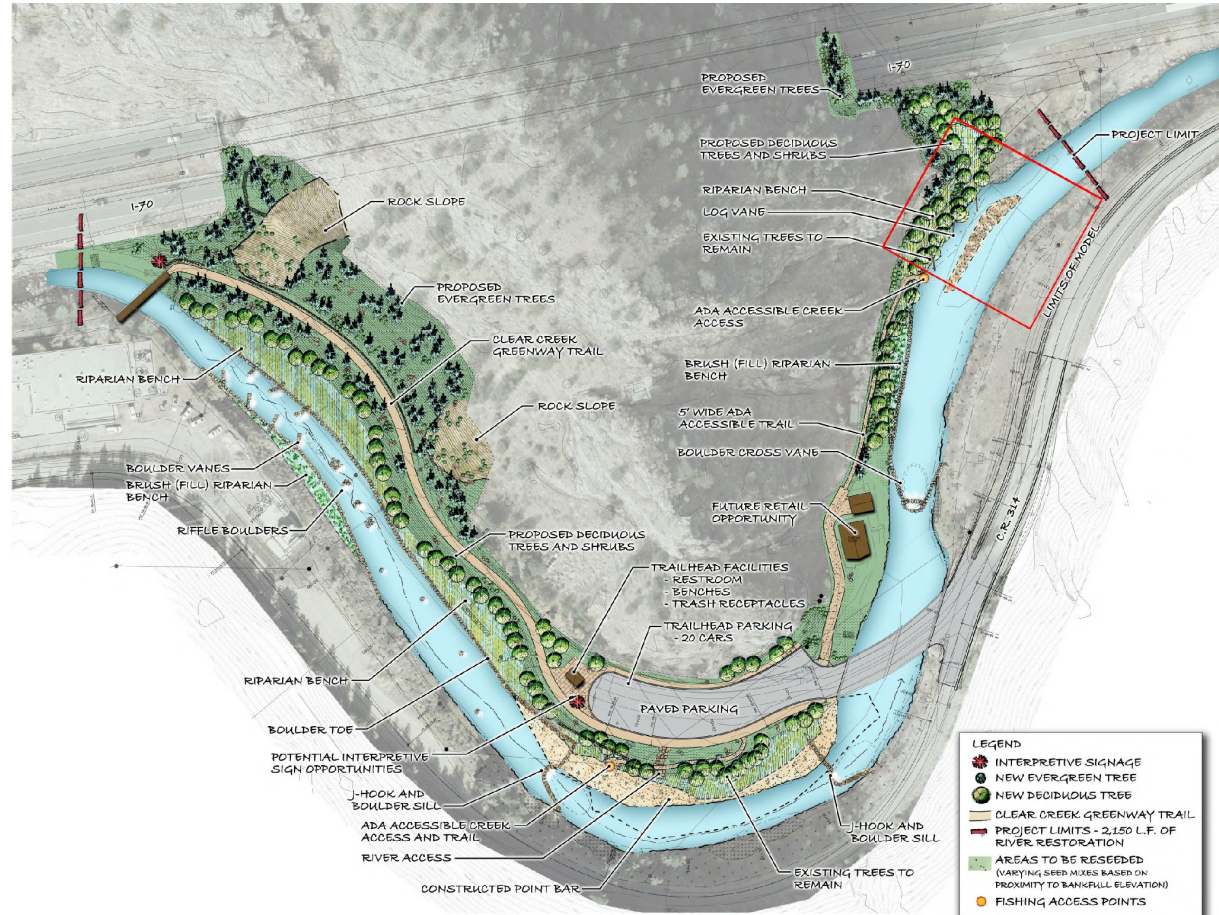
PLACEMENT OF ROCK WILL BE FIELD DIRECTED BASED ON INDIVIDUAL ROCK CHARACTERISTICS.

TYPICAL BOULDER HEADER/FOOTER
N.T.S.

Print Date: 09-30-13	Sheet Revisions			Colorado Department of Transportation	As Constructed	CROSS-VANE DETAIL		Project No./Code	
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Horiz. Scale: As Noted	Vert. Scale: As Noted			Phone: 720-497-6900 FAX: 720-497-6901	Revised:	Detailer: JKG		19037	
Unit Information	Unit Leader Initials			Region 1	CR	Subset: CHANNEL DETAIL	Subset Sheets: 7 of 8	Sheet Number 114	

CHANNEL IMPROVEMENTS

PROJECT
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ELEMENTS



OLD GAME CHECK STATION TRAILHEAD AND RIVER RESTORATION - CONCEPTUAL PLAN

Clear Creek County, Colorado

SUMMARY

PROJECT

GOALS

SCHEDULE

PARTNERSHIPS

COORDINATION

CHANNEL

ELEMENTS



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