United States Department of Agriculture

NRCS

Natural Resources Conservation Service
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Flood Hazard Assessment Report
Skin Gulch, Larimer County, Colorado

March 8, 2013

Prepared by: Al Albin, Dave Droullard, and Dave Wolff.

Purpose: The purpose of this report is to summarize the findings of our (NRCS) site evaluation of the Skin Gulch Area in relation to debris control and potential flooding that could be expected in the Skin Gulch Watershed following the High Park fire.

Background: Wildfire burned 259 homes and approximately 87,000 acres of forest land west of Fort Collins, Colorado in June 2012. Larimer County asked NRCS for assistance in evaluating the risk to infrastructure in the Skin Gulch area and make recommendations for mitigation of potential losses.

NRCS Evaluation Team: Al Albin, Dave Droullard, and Dave Wolff.

Introduction: Skin Gulch has a drainage area of almost 6 square miles. The confluence of the main branch and a smaller branch is located along Stove Prairie Road, County Road 27, about ½ mile south of Highway 14 (see Site Plan). The main branch of Skin Gulch has significant potential to produce large amounts of rocky and woody debris. This is evident from the bouldery lobes of material deposited years ago along Skin Gulch and the large boulders in the channel downstream of the confluence. A flood in July 2012 left fresh deposits of sand to boulder size material in the main branch of Skin Gulch just upstream of the confluence as well as the channel along the county road down to Highway 14. Gullies up to 4 feet deep were eroded in several places along the main branch immediately following the highest flows during the event. The county road embankment was eroded in several places. A large amount of woody debris was deposited along the channel and on the county road downstream of the confluence. There remains a considerable amount of woody debris deposited adjacent to Highway 14 where the highway embankment impounded water for some time during the flood event.

Assets and Resources at Risk: Flood flows in Skin Gulch have the potential to damage Stove Prairie Road by eroding the road embankment between the confluence and Highway 14. Erosion could undermine the road causing collapse. While Stove Prairie Road is more vulnerable to damage, flood flows may also overtop Highway 14 resulting in the deposition of debris and potentially damaging the embankment and/or the roadway. The deposition of debris or damage to the roadway would constitute a hazard to travelers and could restrict or prevent access. With things remaining as they are, it may be necessary to respond to flood events a number of times to clear the road of debris and potentially make repairs to the road until the forest recovers.

The potential influx of rocky and woody debris to the Poudre River by flood flows would negatively impact the resource which includes municipal and irrigation water supplies. There are no dwellings or other structures that might be affected.

Assessment of the Conditions: Profiles were measured across the channel in several locations in Skin Gulch (see Site Plan). Hydrologic data developed using post fire conditions were used to estimate flooding potential along the creek at the profile locations using the 25 year-1 hour flood event, 1.8 inches in 1 hour, which is estimated to produce 1500 cfs at the confluence. This is nearly four times the flow estimated for the same precipitation event under pre-fire conditions.

The 25 year flood event is estimated to overtop the county road from 0.6 to 1.4 feet in the lower section, further erode the embankment, and deposit significant amounts of debris on the county road, the highway, and adjacent areas. A significant amount of debris from the July event that currently occupies the channel area could be remobilized.

The evaluation team met with representatives of the Colorado Department of Transportation who are considering enlarging the culvert in Highway 14.

Recommendations: Woody debris in the channel between the confluence and Highway 14 should be removed in order to improve the capacity of this channel and remove the threat of plugging the Highway 14 culvert and overtopping of the road. The proposal is to remove all dead and downed woody debris one inch (1") in diameter and larger from the stream channel for ½ mile upstream from the confluence with the Poudre River. Living trees should be left standing.

Large rip rap should be placed along the county road embankment in three (3) areas subject to erosion (approximately 650 feet as shown on the plan view).

The debris impacting the county road and the state highway can be reduced by constructing or encouraging the formation of broad open channels upstream of the confluence where flow velocity and thus the potential for the transportation of debris would be reduced.

The recently eroded channels in Skin Gulch have the effect of concentrating the flow resulting in higher velocities that have greater potential to transport larger material and further erode the existing channel. This could be reduced by filling the deeply eroded channel thus providing a broader channel where flows would spread out, slow down thus allowing debris to settle out of the flow. The eroded channels could be filled using the large rocky debris recently deposited upstream of the confluence.

Trash racks very effectively arrest large woody and rocky debris. Trash racks require some maintenance. Debris would have to be removed from the rack following a large flood event to maintain its capacity. A trash rack constructed about 200 feet upstream of the confluence on the main branch of Skin Gulch (see Site Plan) would be very effective in controlling debris. This location provides for access to clean the structure after a flood event.

A trash rack design approved by NRCS is included with this report (see plans). There are other design approaches that could be utilized. Trash racks could be constructed of logs or structural steel members embedded in concrete. The advantage of a log structure is the availability of material nearby. Also these log structures will gradually decay as the

years pass and the forest recovers lessening the need for such structures. The advantage of the structural steel trash rack is that they are relatively easy to construct. They are very durable and effective but may have to be physically removed after the threat of debris flows has past. Another design should be approved by a qualified engineer.

Flood Control Considerations: The county road embankment may be protected from erosion by the placement of rip rap. Preventing inundation of the road would require the placement of a barrier along the shoulder of the road. Currently, the shoulder of the road is much too narrow for such a barrier. The installation of a warning device along the road that would be activated during a flood event may be suitable alternative. Consider closing the road to traffic when rainfall in excess of 1.5 inches in an hour is forecast. An event of this magnitude has the potential to flood the roadway, deposit debris creating hazardous conditions.

Cost Estimates: A summary of recommended flood protection measures and cost estimates is attached. These figures are based on prevailing contract costs.

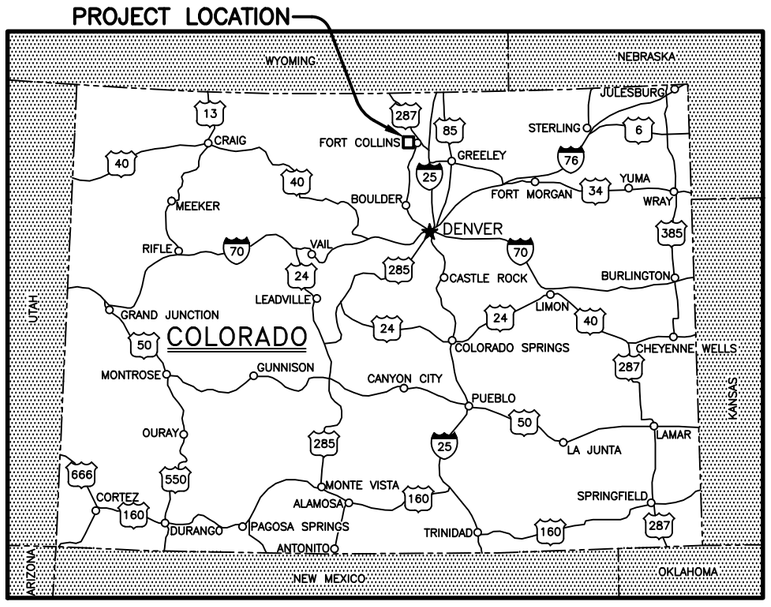
_____

John Andrews
State Conservation Engineer

Skin Gulch Summary of Recommended Flood Protection Measures			
Location	Recommendations		Estimated Cost *
Between the confluence and Highway 14, 0.5 mi.	Debris removal	Remove accumulated woody debrin > 1" in diameter. Estimated cost, $30,000/mile.	$15,000
At the confluence, see Site Plan	Debris barrier	Design included with this report	$31,200
Along Stove Prairie Road, see Site Plan	Rip rap	Three placements along the road embankment, total of 680 running feet, 4 tons of rock/ft @ $70/ton.	$190,000
		Total estimated cost	$236,200

* Costs are estimated based on prevailing contract costs.

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
SKIN GULCH FLOOD PROTECTION RECOMMENDATIONS



COLORADO STATE MAP
NOT TO SCALE

PROJECT VICINITY MAP
NOT TO SCALE

INDEX OF DRAWINGS

TITLE	SHEET NO.
COVER SHEET	1
SITE PLAN	2
CROSS SECTIONS AND DETAILS	3
CHANNEL DEBRIS BARRIER	4

GENERAL NOTES

CONSTRUCTION SPECIFICATIONS

NO.	TITLE

CONSTRUCTION QUANTITIES

COOPERATOR AGREEMENT

THIS PLAN HAS BEEN DISCUSSED WITH ME BY THE NRCS AND I AM IN AGREEMENT WITH THE CALCULATIONS AND DESIGN. I WILL PROVIDE NRCS WITH THE UTILITY NOTIFICATION CENTER OF COLORADO (UNCC) TICKET NUMBER MY CONTRACTOR HAS ACQUIRED PRIOR TO START OF CONSTRUCTION.

_____ DATE: _____
COOPERATOR

UTILITY NOTIFICATION

NOTICE TO THE COOPERATOR AND CONTRACTOR

NO REPRESENTATION IS MADE BY THE NATURAL RESOURCES CONSERVATION SERVICE AS TO THE EXISTENCE OR NONEXISTENCE OF UNDERGROUND UTILITIES. **CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.** CALL UTILITY NOTIFICATION CENTER OF COLORADO AT 1-800-922-1987 OR 811. IN THE METRO DENVER AREA CALL 303-232-0491 OR 811.

UNCC TICKET NUMBER: _____

CONSTRUCTION DATA & AS-BUILT DRAWINGS

LAYOUT BY:

_____ DATE: _____

CONTRACTOR NAME AND ADDRESS:

_____

_____

_____

CONSTRUCTION COMPLETED _ _ _ _ _ _ _ _ _ _ _ DATE: _____

PRACTICE (DOES) (DOES NOT) MEET STANDARDS AND SPECIFICATIONS.

_____ DATE: _____

_____
TITLE:

AS-BUILT DRAWINGS REVIEWED AND APPROVED BY:

_____ DATE: _____

TITLE:

DESIGNED A. ALBIN DATE 02/13
DRAWN D.D. DROULLARD DATE 02/13
CHECKED D. WOLFF DATE 02/13
APPROVED _____

COVER SHEET
SKIN GULCH FLOOD PROTECTION RECOMENDATIONS
HIGH PARK BURN AREA
JOB CLASS _____
LARIMER COUNTY COLORADO

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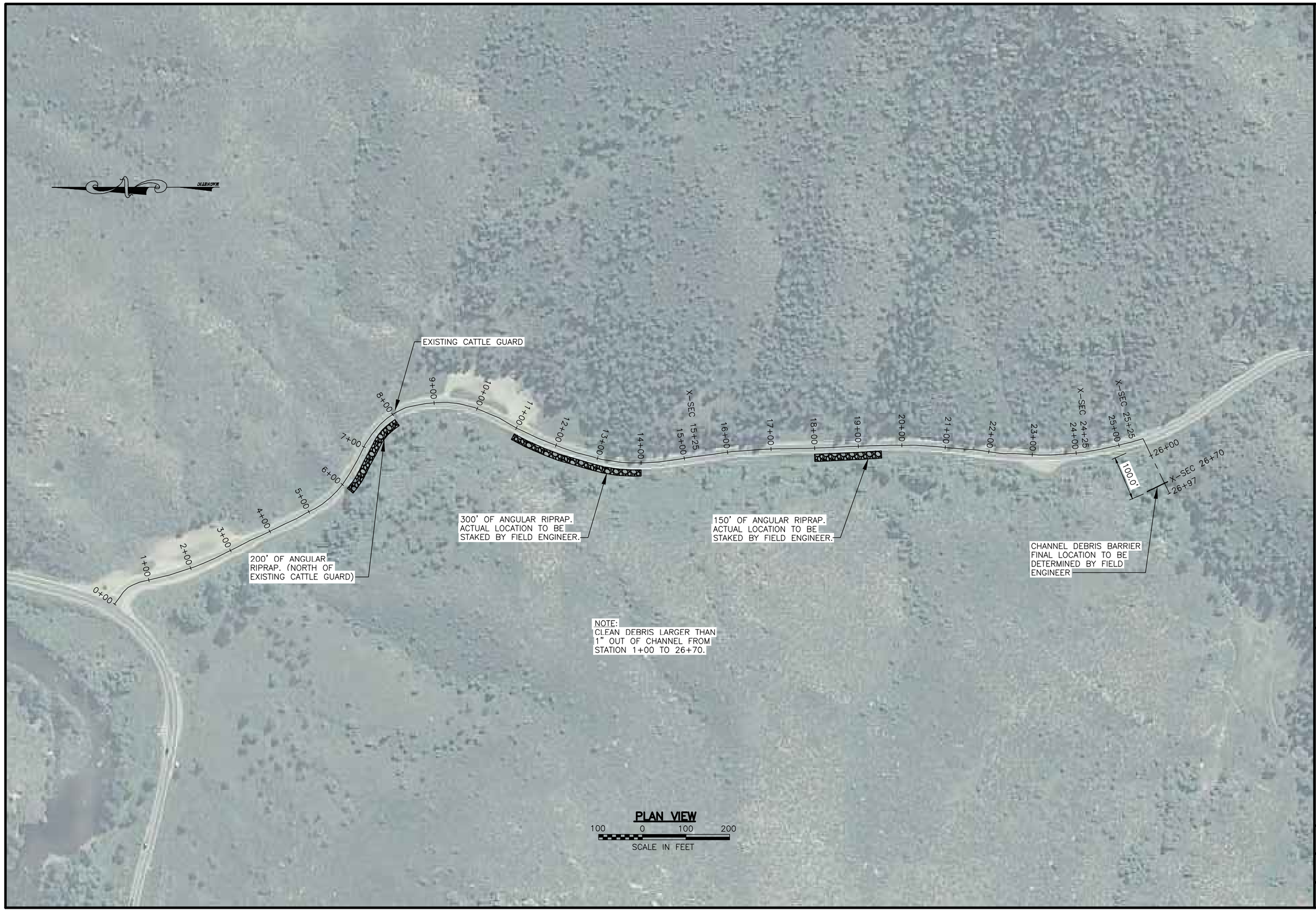
FILE NO.
DRAWING NO.
SHEET 1 OF 4



SITE PLAN

SKIN GULCH

HIGH PARK BURN AREA

DESIGNED	A. ALBIN
DRAWN	D.D. DROULLARD
CHECKED	D. WOLFF
APPROVED	

DATE 02/13
02/13
02/13

COLORADO

LARIMER COUNTY

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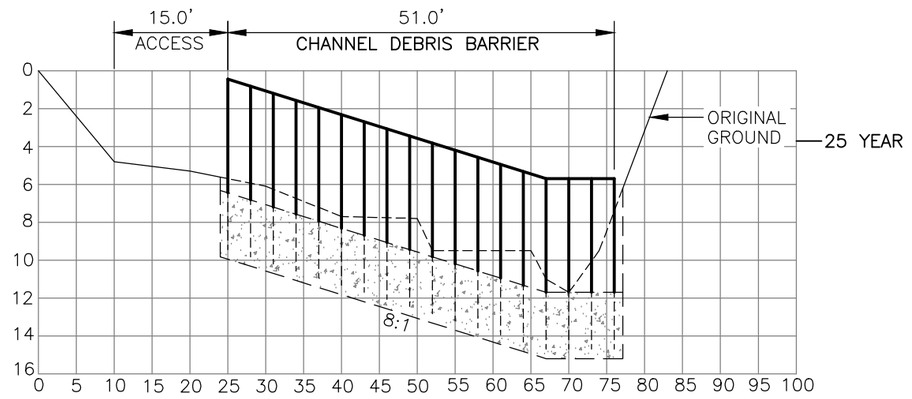
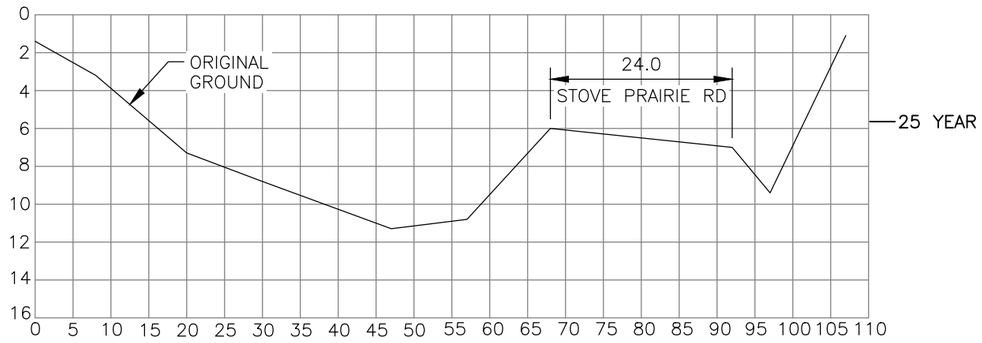
FILE NO.

DRAWING NO.

SHEET 2 OF 4



X–SEC 26+70
(CHANNEL DEBRIS BARRIER LOCATION)



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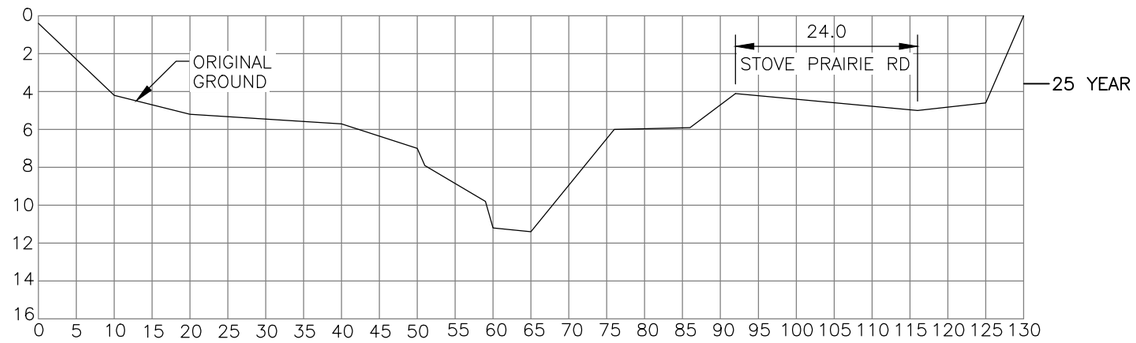

X–SEC 25+25

X–SEC 24+25

CROSS SECTIONS
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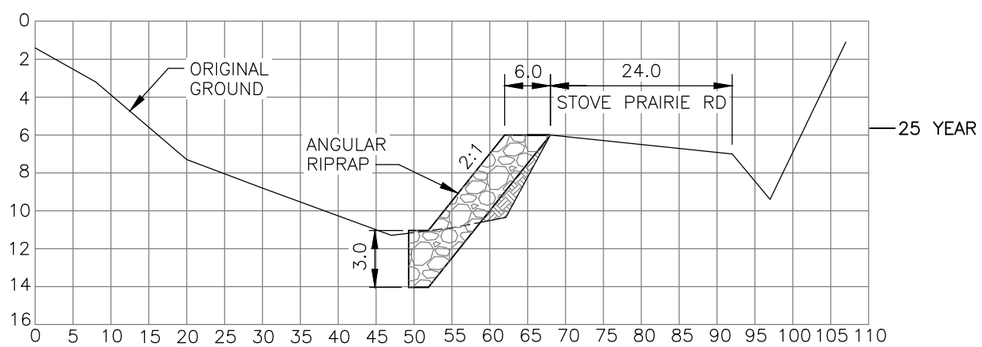
SCALE IN FEET



TYPICAL ANGULAR RIPRAP DETAIL

		DATE
DESIGNED	A. ALBIN	02/13
DRAWN	D.D. DROULLARD	02/13
CHECKED	D. WOLFF	02/13
COLORADO	APPROVED	

CROSS SECTIONS AND DETAILS

SKIN GULCH

HIGH PARK BURN AREA

LARIMER COUNTY

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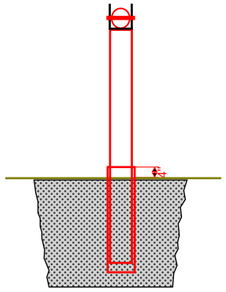
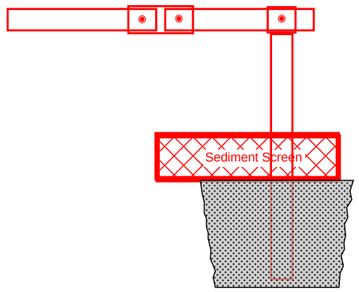
FILE NO.

DRAWING NO.

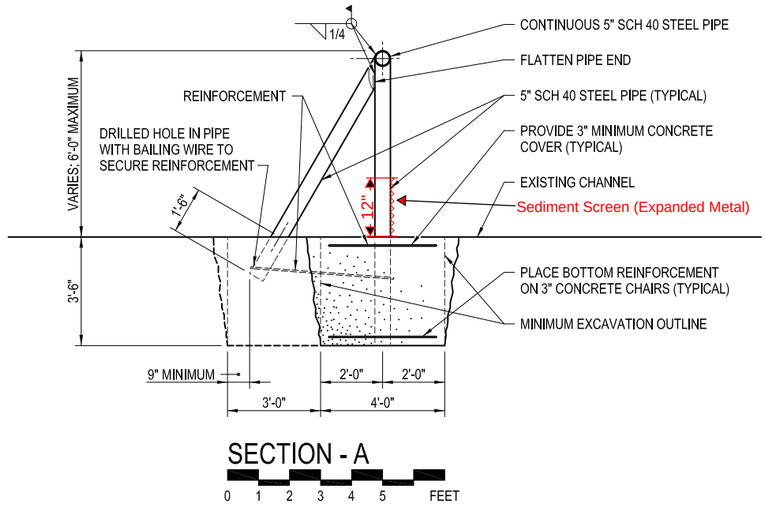
SHEET 3 OF 4



Post Sleeve Detail

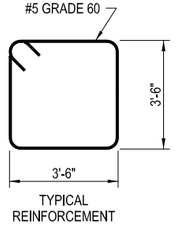


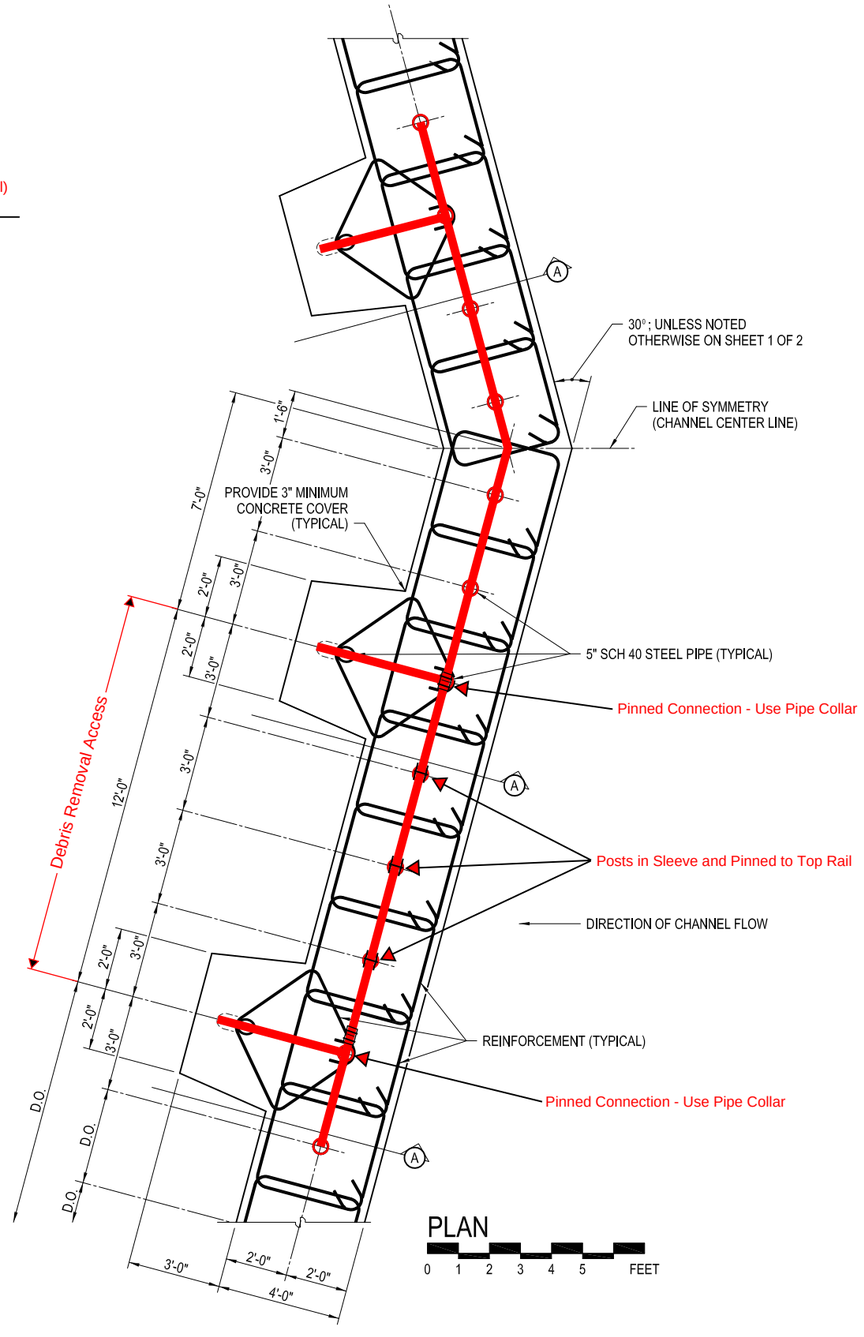
Top Rail Connection Detail



NOTES

1. LENGTH AND ALIGNMENT OF STRUCTURE TO BE DETERMINED ON A SITE SPECIFIC BASIS. SEE SHEET 1 OF 2 FOR DIMENSIONS AND ELEVATIONS.
2. IN LIEU OF 5" SCH 40 STEEL PIPE; STRUCTURAL STEEL TUBE SHAPES HAVING A SECTION MODULUS OF AT LEAST 4.5 IN^3 MAY BE USED, OR 'W' OR 'I' SHAPES HAVING A SECTION MODULUS OF AT LEAST 4.9 IN^3 MAY BE USED.
3. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 LB/IN^2, AND SHALL HAVE A SLUMP BETWEEN 3 AND 5 INCHES. ALL CONCRETE SHALL BE VIBRATED. EXPOSED CONCRETE SURFACES SHALL BE COATED WITH CURING COMPOUND, OR WET CURED FOR 28 DAYS.





Designed	Stambaugh	AUG 2012
Drawn	Stambaugh	AUG 2012
Checked	Marine	AUG 2012
Approved	Andrews	AUG 2012

CHANNEL DEBRIS BARRIER

DETAILS, REINFORCEMENT, AND SECTION
6-FOOT MAXIMUM HEIGHT

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File Name
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Drawing No.
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Sheet 2 of 2