



Flood Hazard Assessment Report Bellvue, Larimer County, Colorado

February 26, 2013

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

Purpose: The purpose of this report is to summarize the findings of our (NRCS) site evaluation in Bellvue Colorado and the surrounding area in relation to potential flooding that might be expected in the Mill Canyon 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 structures within the watersheds affected by fire and make recommendations for mitigation of potential losses.

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

Mill Canyon Watershed: Devil Gulch, Labeau Gulch, Brown Gulch, Long Gulch and several other smaller streams converge in Mill Canyon. The stream passes through ranch properties, under county roads and through the town of Bellvue before it flows into the Poudre River.

Assets and Resources at Risk: The large culvert under County Road 25E is capable of passing about 500 cubic feet per second (cfs). This culvert is subject to being blocked or partially blocked by debris. The 2, 4' diameter culverts on County Road 50E, Bingham Hill Road, near the fish hatchery are capable of passing about 125 cfs. The culvert under County Road 23, an oval 3' x 4', has less capacity. The 25 year-1 hour storm of 1.8 inches is predicted to produce peak flows of 1300 to 1500 cfs, far greater than the capacities of any of the culverts. All of these county roads will be overtopped at these crossings. Overland flow will cross County Road 25E north of the crossing. All the culverts are subject to being blocked or partially blocked by large woody debris. There are seven residences potentially at risk of flooding in Bellvue (see Site Plan).

The stream crosses the Pleasant Valley and Lake Canal upstream of Bellvue. A concrete structure conducts the stream over the canal. Water in excess of the structure's capacity will flow into the canal causing the canal to fill with water and debris potentially overtopping the canal banks.

Assessment of the Conditions: A large precipitation event occurred on July 7th, 2012, a few weeks after the fire. Flood water transported large woody debris that blocked or partially blocked all the culverts at road crossings. Woody debris accumulated on trees and other obstructions along the flow path restricting flow and forcing water onto adjacent properties. Water left the stream bank in numerous locations threatening several

homes, damaging property and depositing large amounts of debris on roads, in the irrigation canal, and on other property.

Investigative activities: Members of the investigative team met with several of the affected residents. The extent of flooding during the July event was identified based on the deposition of debris and the testimony of residents. Information was also gathered regarding previous flood events. The manager of the fish hatchery indicated they removed 20 dump truck loads of debris from the crossing on Bingham Hill Road.

The evaluation team observed and documented existing conditions along the stream. Some of this debris remains where it was deposited in July and thus continues to be detrimental to the flood response of the stream through the community.

Residents report that standing water accumulated in a pasture along the stream east of County Road 23 for a long period of time following the July flood event. The revised Laporte topographic map of 1979 shows this stream flowing from the crossing under county road 23 directly east to the Poudre. Since that time, a levee has been constructed along the Poudre, presumably to prevent flooding of the fields. As a result, the stream was diverted adding more than one half mile to the length of the stream. Lengthening the flow path of the stream consequently decreases the stream's gradient which decreases the potential rate of flow. As a result, water is impounded during high flow events until the area slowly drains.

The team surveyed several profiles through Bellvue and upstream to the Krist Ranch (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 of rain in 1 hour, estimated to produce a flow of 1500 cubic feet per second (cfs).

Recommendations: Construct debris control structures upstream of the large culvert under County road 25E and on the State Fish Hatchery property at the location shown on the Site Plan. A debris rack 12 foot wide should be installed for the culverts at the Bingham Hill Road crossing.

A constructed berm begins along County Road 25E, near the curve about ½ mile south of Rist Canyon Road. The berm extends to the east forming the north bank of the creek, across the Pleasant Valley and Lake Canal crossing structure and to the fish hatchery property. There are two large gaps in the berm to provide access to the Brewster property and the White property. Recommend filling both gaps up to two feet in height and ramping the approaches to provide easy access for equipment and vehicles.

The berm along 2nd Street from Bingham Hill Road to within 50 feet of the creek crossing should be maintained at a height of 2 feet above the adjacent ground. The generally east-west oriented berm extending along the fence from 2nd Street across the creek should be lowered to allow unobstructed flow through this area. Consider raising the grade of Bingham Hill Road in the area of the berm along 2nd Street in order to prevent or limit the eastward flow of flood water onto 2nd Street.

The home at 5129 Bingham Hill Road is vulnerable to flooding from the 25 year-1hr event of 1500 cfs. The west side and south side entrances should be protected to 1.5 feet

above the ground. An earthen berm could also be constructed on the west side of the house to provide additional protection.

Currently, the house on 2708 2nd Street is vulnerable to flooding. This house should be protected with sandbags to 2.5 feet high or with an earthen berm around the south and west sides of the residence. If the recommendations regarding the berms along 2nd Street and Bingham Hill Road are enacted, the risk of flooding at this home is reduced.

The houses at 2803, 2805, and 2825 N. County Road 23 are vulnerable to flooding. The floor levels are approximately 2 feet above ground level. The estimated peak flood flow in this area is 1500 cfs. These homes should be evacuated if flooding is expected. All three of these properties have constructed berms or other barriers that provide some protection from a minor flood event but have the effect of obstructing flow during a significant flood event and increasing the height of flood water at adjacent residences.

The house at 2803 N. County Road 23 constitutes a significant obstruction to flow through this area. The effect of this obstruction would be to raise the height of flood water on adjacent properties. Relocation of this house may be considered in order to improve passage of flood waters through the community.

Considerations: A potential option for limiting flood flows in Bellvue is to construct a channel that would bypass the community. The shortest possible route for such a channel would be from the area of the State Fish Hatchery, at or parallel to Bingham Hill Road extending to the flood plain of the Poudre River. NRCS policy requires that a channel designed or funded by NRCS have the capacity to conduct the 100 year pre-fire storm of 1500 cfs. Required dimensions of a concrete lined channel would be 80 feet wide and 2.5 feet deep for a design velocity of 15 ft/sec. and at least 1400 feet long to conduct flood flows onto the flood plain.

Another potential route for an overflow channel or bypass channel is from the area downstream of the Pleasant Valley and Lake Canal. Required dimensions for a trapezoidal channel, bottom width 250 feet, 3 feet deep with 4:1 side slopes, design velocity 3 ft/sec. Crossing for county roads would have to be incorporated in the canal design.

The amount of property required for the construction of a channel, the cost of constructing the channel, the crossings necessary to provide access to and from the community, and the resultant disruption to the community combine to make such a structure economically and practically infeasible.

Propane Tanks: Two large propane tanks at the Krist ranch house may be impacted by flood flows and should be secured. The tanks can be secured by running a chain or cable through one of the feet on the tank, preferably on the upslope end and attaching the chain or cable to a secure anchor point such as a large tree or a concrete footing. The valve on the propane tank should be shut off when flooding is expected.

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

Bellvue

Summary of Recommended Flood Protection Measures

Location	Recommendations		Estimated Cost *
As indicated on the Site Plan	Sandbag placement	Purchase, filling, transportation, and placement of 7000 sandbags @ \$1.50 each	\$10,500
Above culvert on CR 25E	Debris barrier	Design included with this report	\$24,000
On Fish Hatchery property, see Site Plan	Debris barrier	Design included with this report	\$50,000
Stream crossing on Bingham Hill Rd.	Trash rack, 12 feet wide	Design and installation by County Road Department	\$5,000

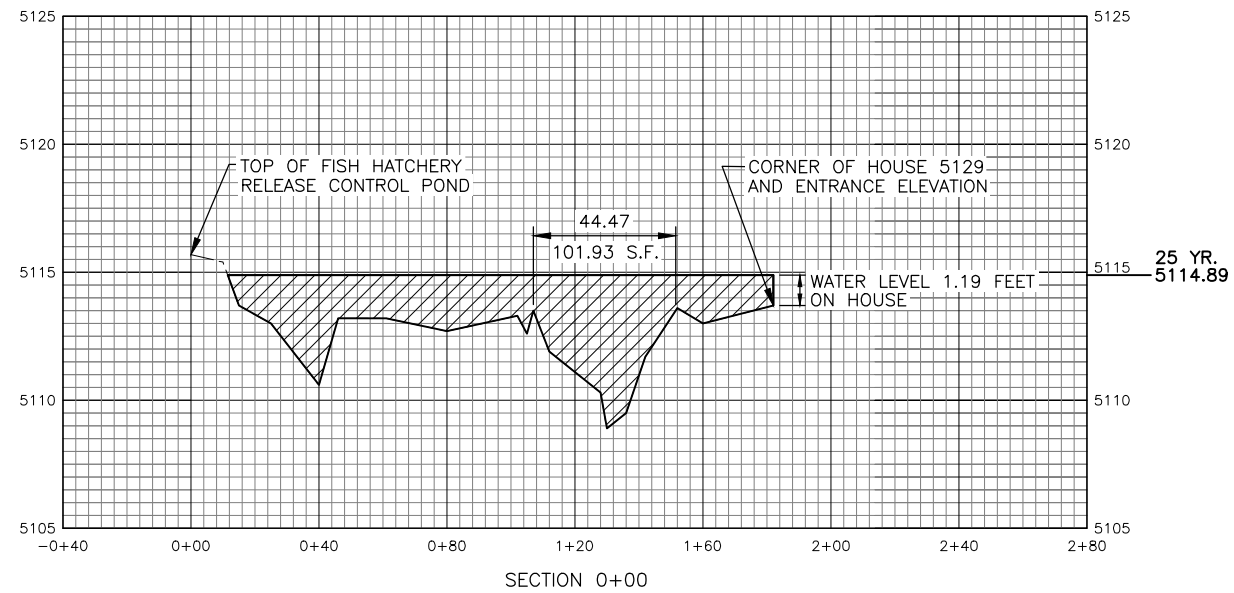
Total estimated cost

\$89,500

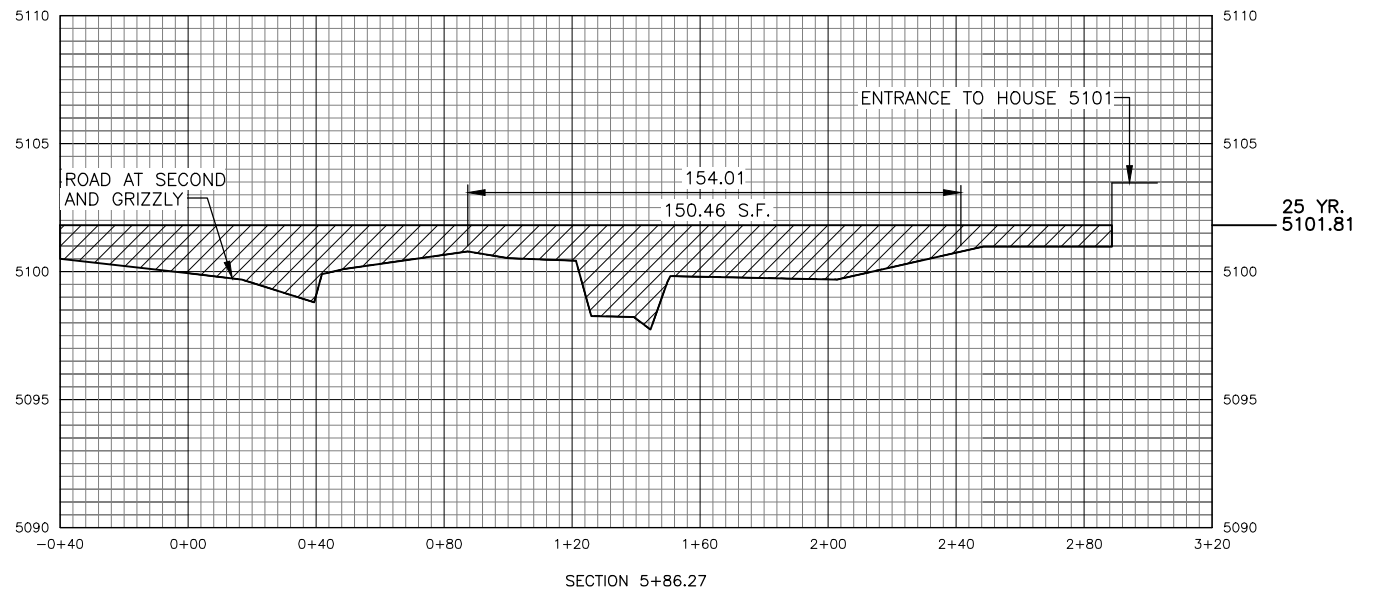
* Costs are estimated based on prevailing contract costs.



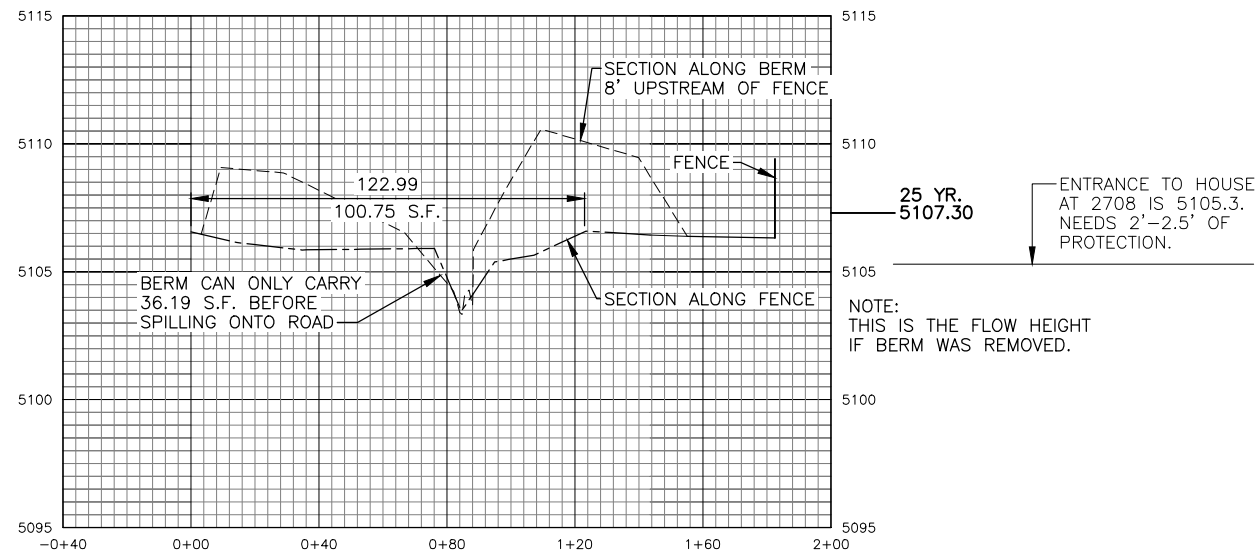
FILE NO.	
DRAWING NO.	
SHEET 2 OF 8	
 National Resource Conservation Service United States Department of Agriculture	
LARIMER COUNTY HIGH PARK BURN AREA	
SITE PLAN BELLVUE FLOOD PROTECTION RECOMMENDATIONS	
DESIGNED BY	D. WOLFF
DRAWN BY	D.D. DROULLARD
CHECKED BY	A. ALBILI
APPROVED	
DATE	07/13
	07/13
	07/13



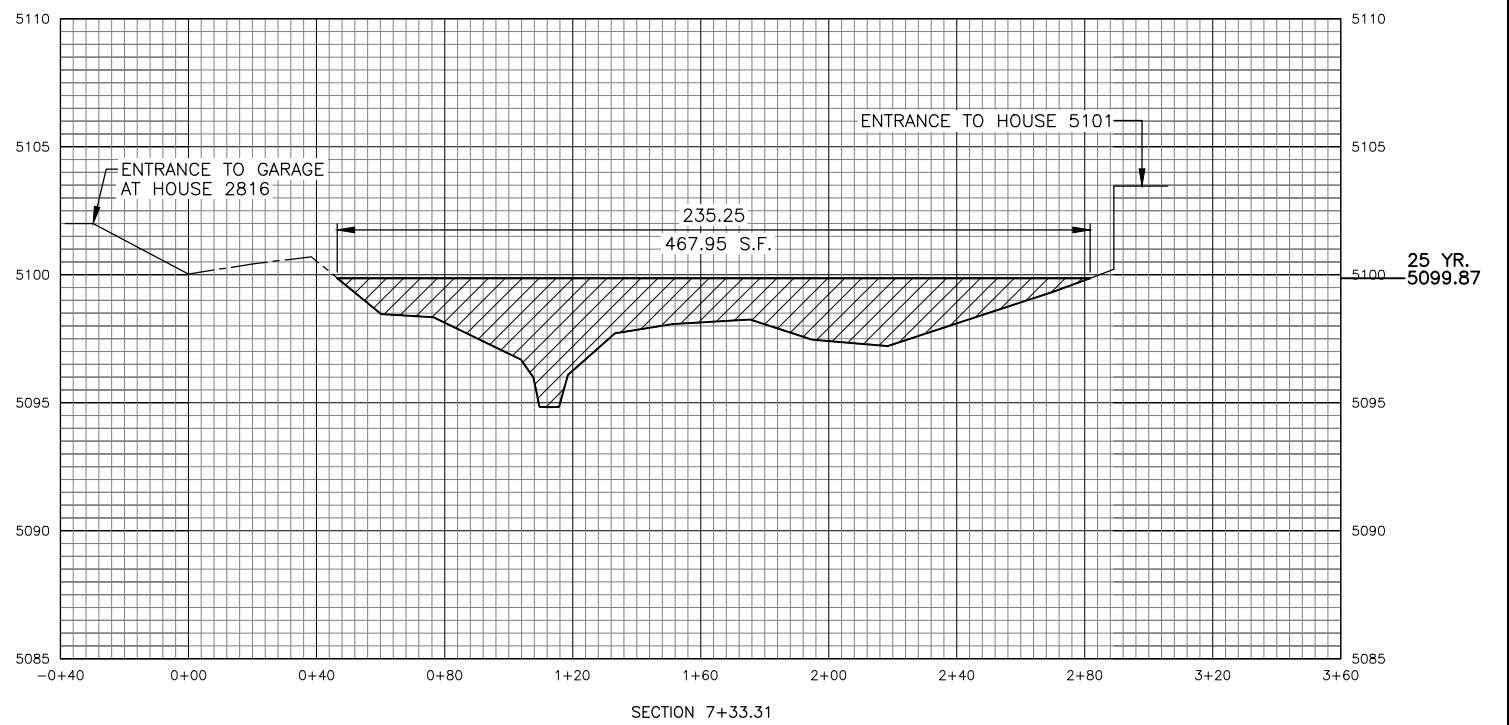
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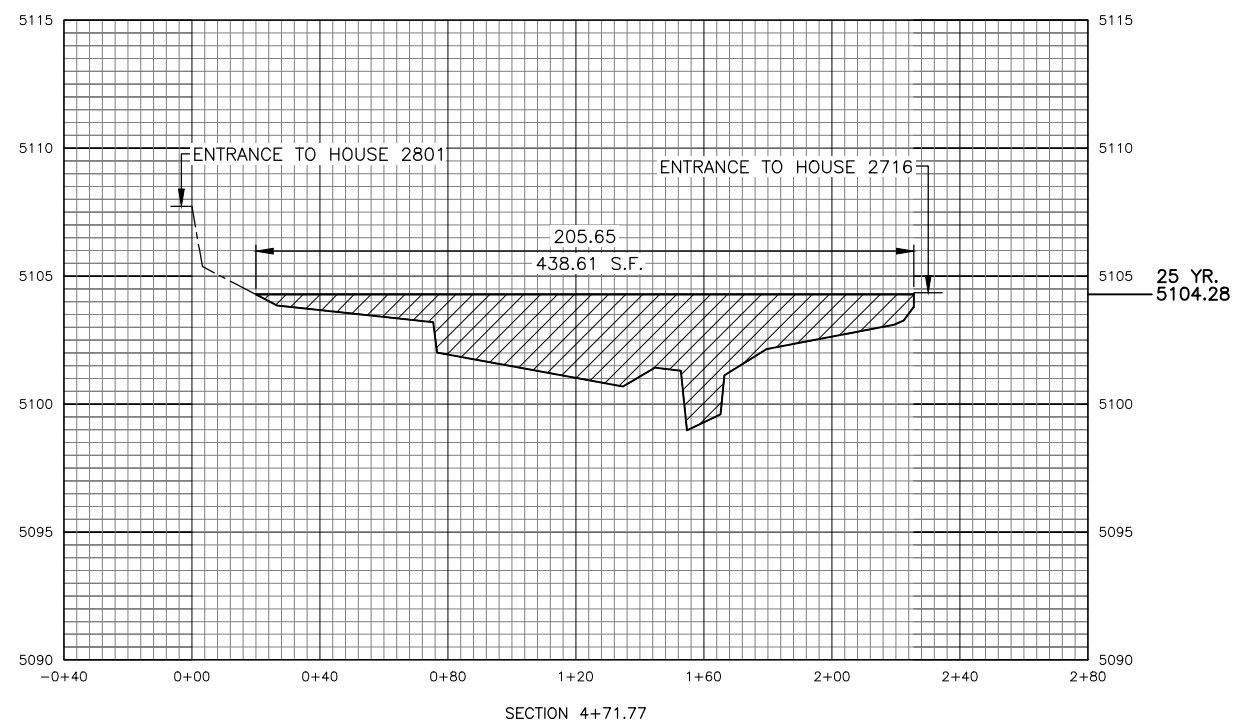
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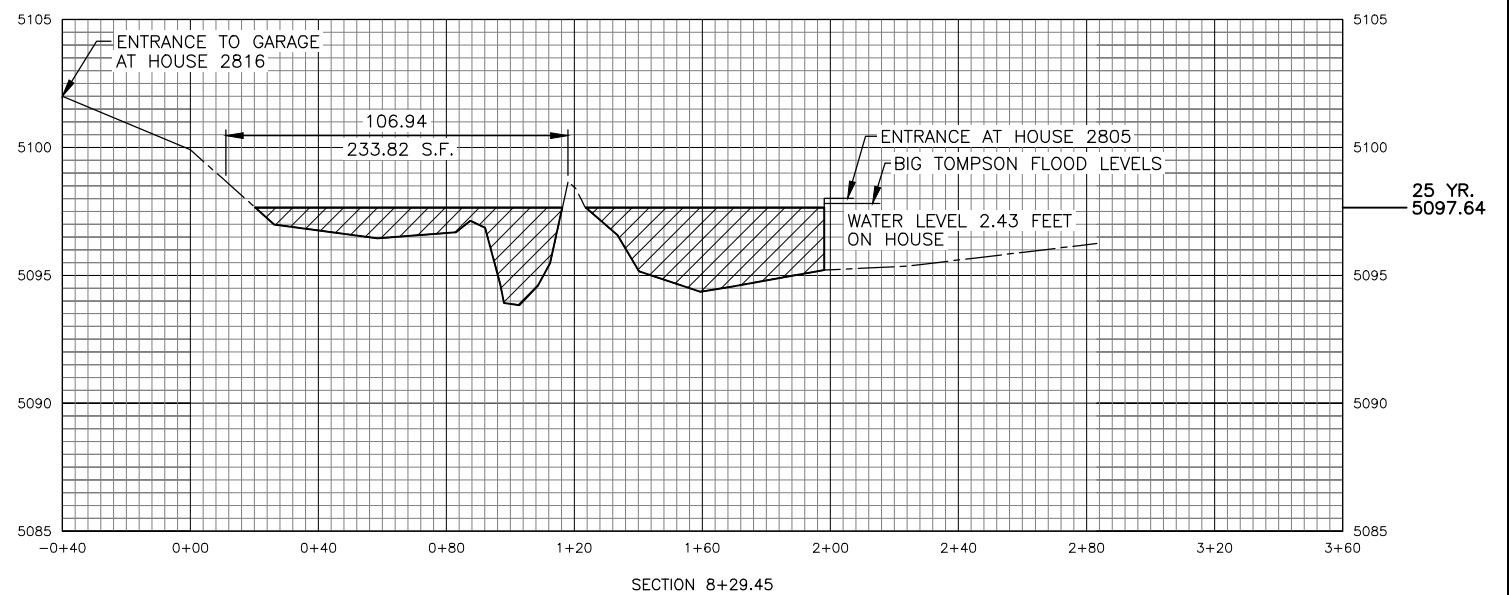
SECTION 2+40.90



SECTION 7+33.31



SECTION 4+71.77



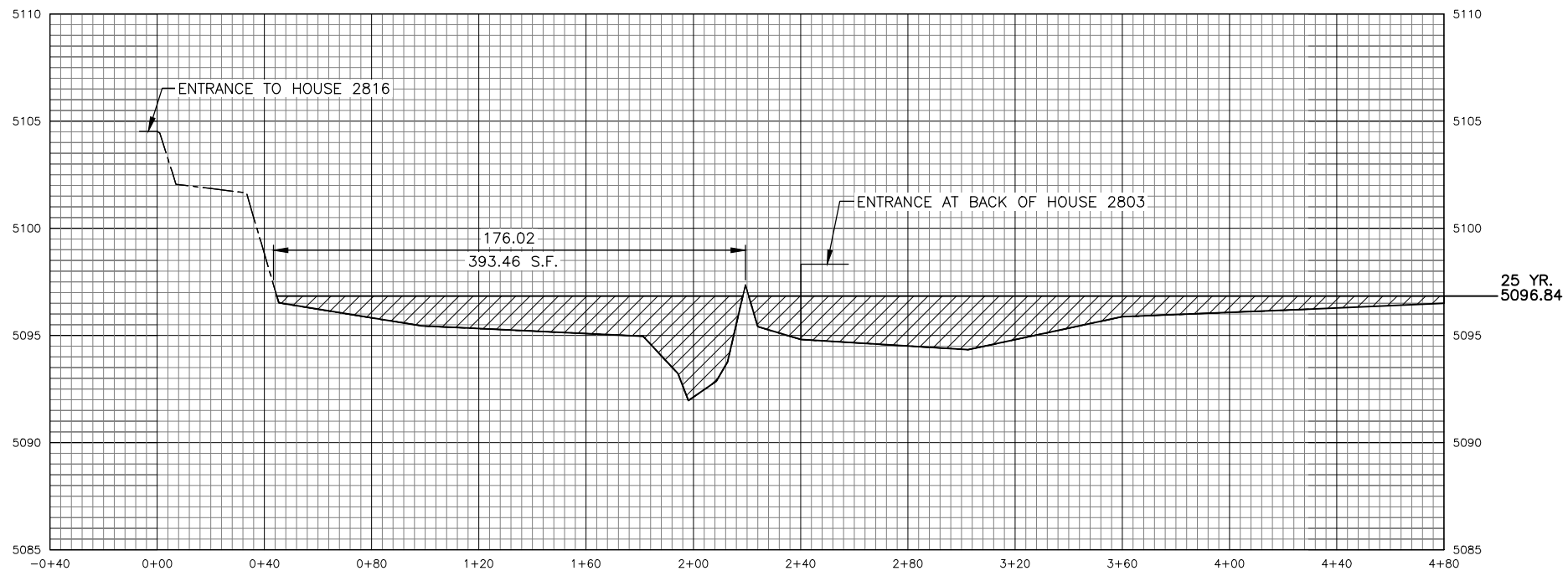
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DATE 01/13
 DESIGNED D. WOLFF
 DRAWN D.D. DROULLARD
 CHECKED A. ALBIN
 APPROVED _____

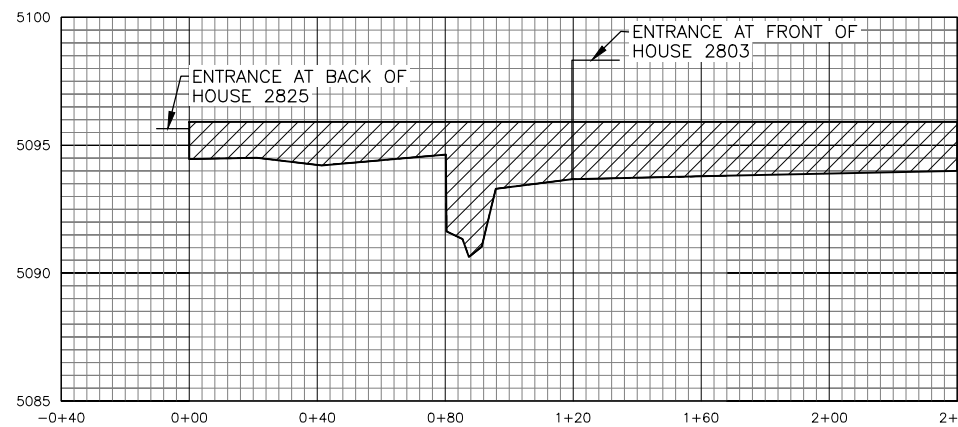
SECTIONS
 BELLVUE FLOOD PROTECTION RECOMMENDATIONS
 HIGH PARK BURN AREA
 LARIMER COUNTY
 COLORADO



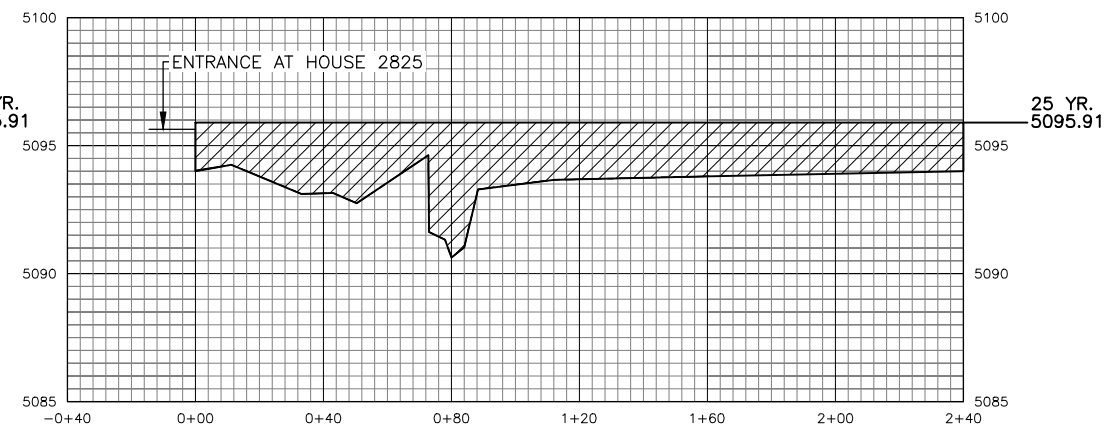
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 DRAWING NO.
 SHEET 3 OF 9



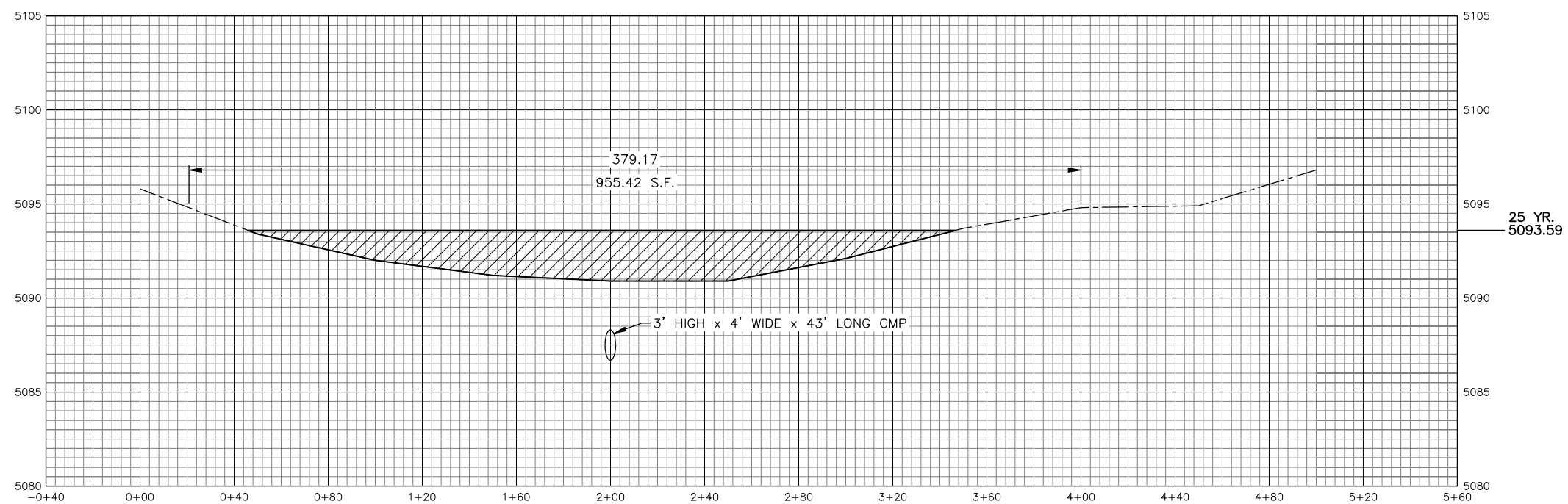
SECTION 9+07.25



SECTION 9+91.48



SECTION 9+92.00

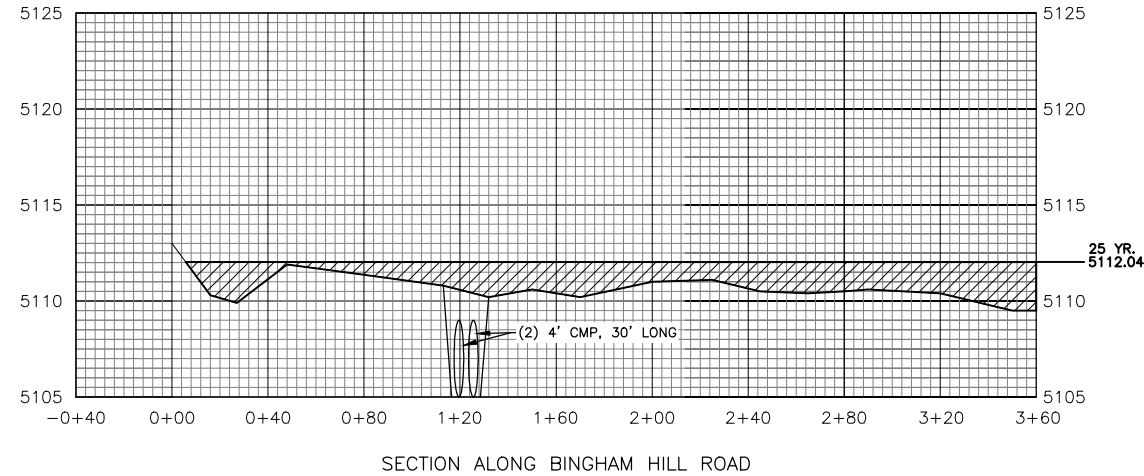
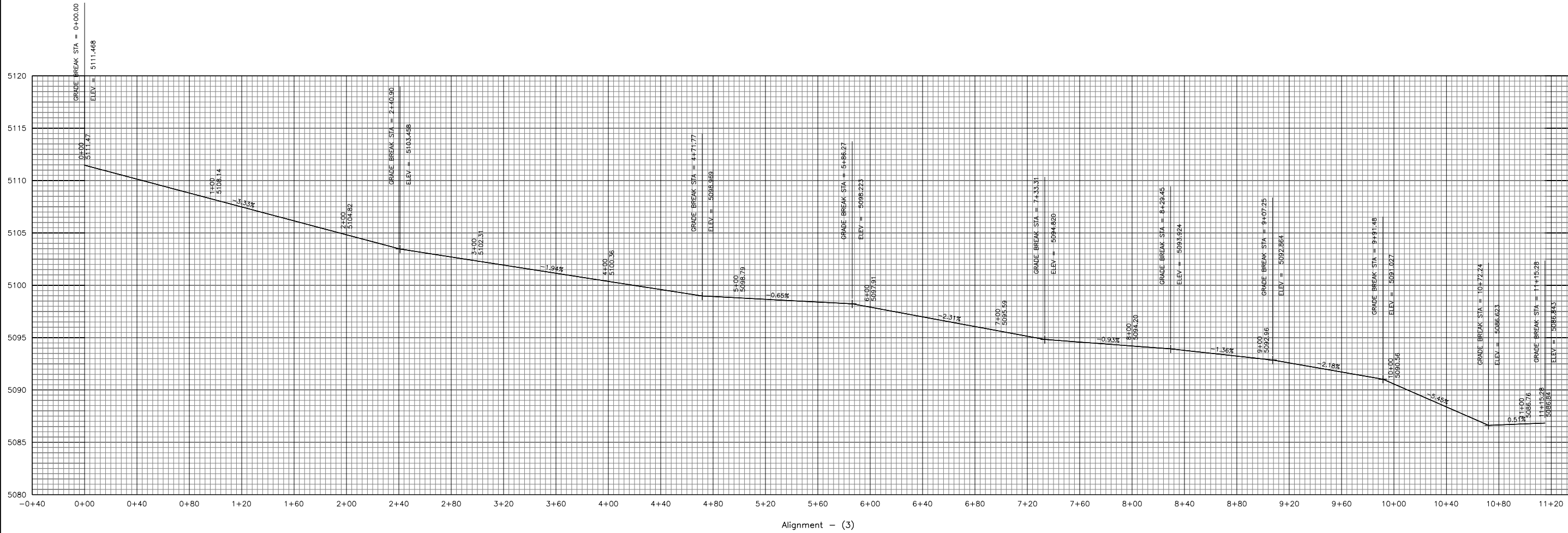


SECTION 10+83.65

DATE	01/13
DESIGNED	D. WOLFF
DRAWN	D.D. DROULLARD
CHECKED	A. ALBIN
APPROVED	

SITE PLAN
 BELLVUE FLOOD PROTECTION RECOMMENDATIONS
 HIGH PARK BURN AREA
 LARIMER COUNTY
 COLORADO





SECTION ALONG BINGHAM HILL ROAD

Alignment - (3)

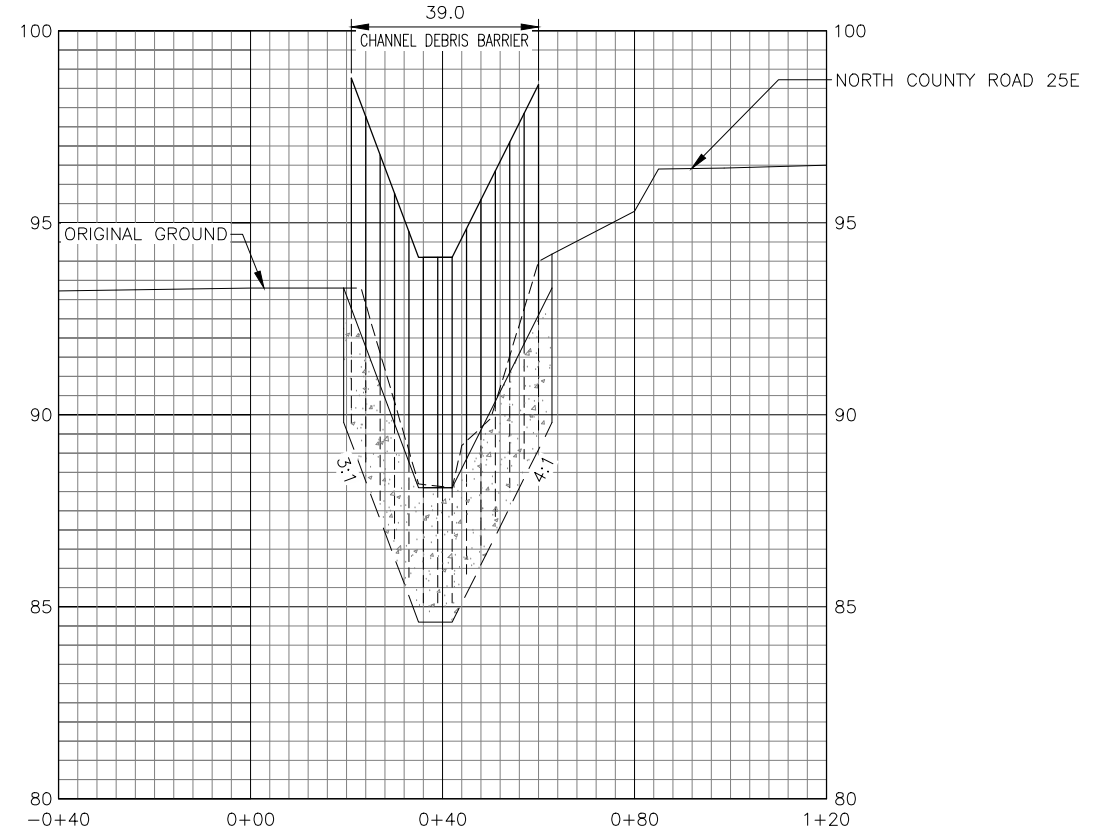
DESIGNED	D. WOLFF	DATE	01/13
DRAWN	D.D. DROULLARD		
CHECKED	A. ALBIN		
APPROVED			

SITE PLAN
 BELLVUE FLOOD PROTECTION RECOMMENDATIONS
 HIGH PARK BURN AREA
 LARIMER COUNTY
 COLORADO

FILE NO. _____
 DRAWING NO. _____
 SHEET 5 OF 9



PLAN VIEW MILL CANYON CREEK
NEXT TO NORTH COUNTY ROAD 25E



PROFILE VIEW MILL CANYON CREEK
NEXT TO NORTH COUNTY ROAD 25E

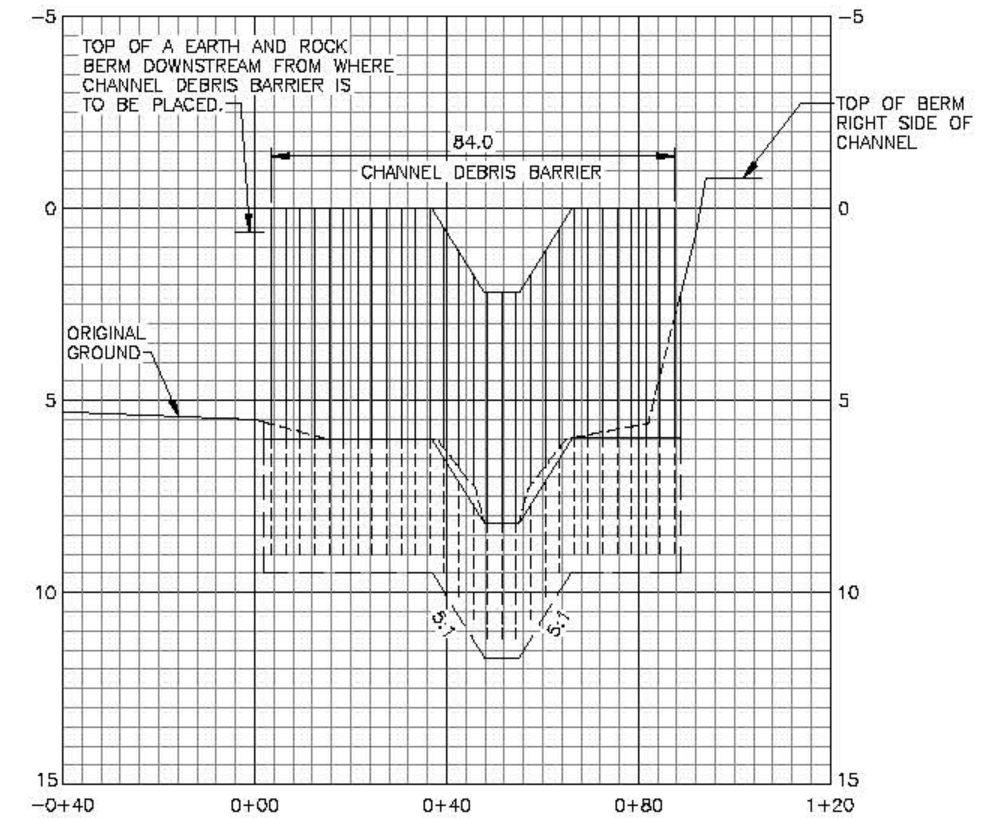
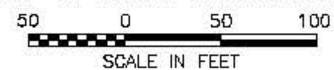
PLAN AND PROFILE
BELLVUE FLOOD PROTECTION RECOMMENDATIONS
HIGH PARK BURN AREA

DESIGNED	D. WOLFF	DATE	01/13
DRAWN	D.D. DROULLARD		01/13
CHECKED	A. ALBIN		01/13
APPROVED			





PLAN VIEW MILL CANYON CREEK
NEXT TO STATE FISH HATCHERY



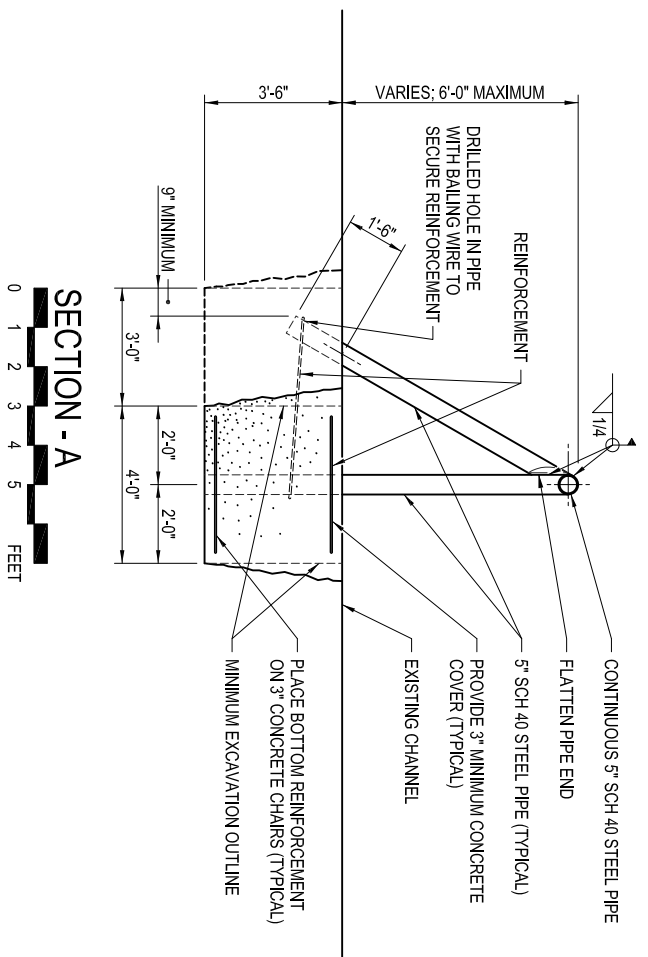
PROFILE VIEW MILL CANYON CREEK
NEXT TO STATE FISH HATCHERY

PLAN AND PROFILE
CHANNEL DEBRIS BARRIER
BELLVUE FLOOD PROTECTION RECOMMENDATIONS
HIGH PARK BURN AREA
LARIMER COUNTY
COLORADO

DESIGNED D. WOLFF	DATE 01/13
DRAWN D.D. DROULLARD	DATE 01/13
CHECKED A. ALBIN	DATE 01/13
APPROVED _____	

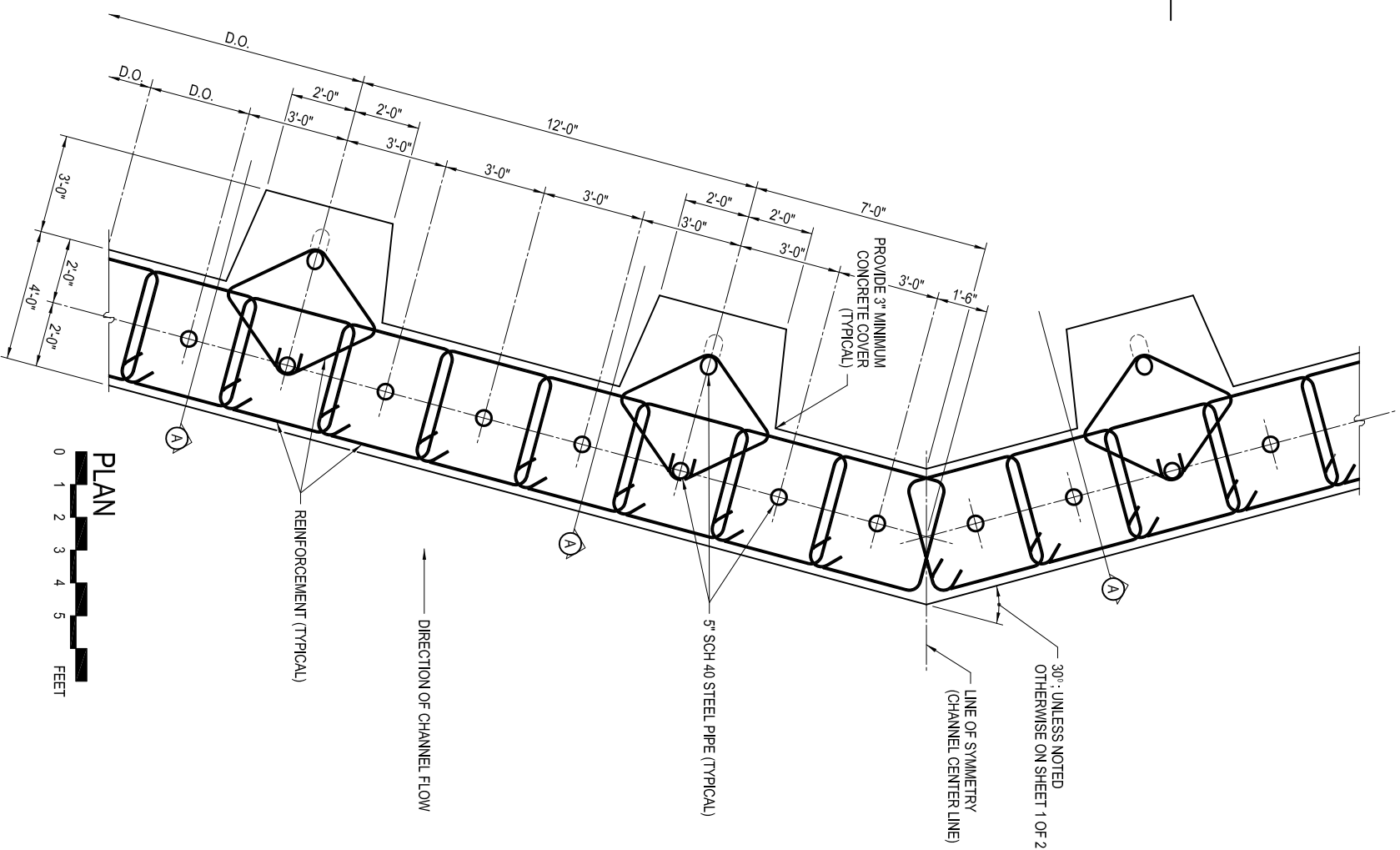
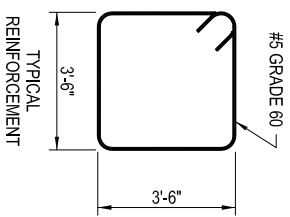


FILE NO.
DRAWING NO.
SHEET 7 OF 9



SECTION - A
0 1 2 3 4 5
FEET

- 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 IN⁴ MAY BE USED, OR 1 1/2" OR 1" SHAPES HAVING A SECTION MODULUS OF AT LEAST 4.9 IN⁴ MAY BE USED.
 3. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 LB/IN². 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.



PLAN
0 1 2 3 4 5
FEET

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

CHANNEL DEBRIS BARRIER

DETAILS, REINFORCEMENT, AND SECTION
6-FOOT MAXIMUM HEIGHT



File Name
XXXXXXXXXX
Drawing No.
X - X - XXXX



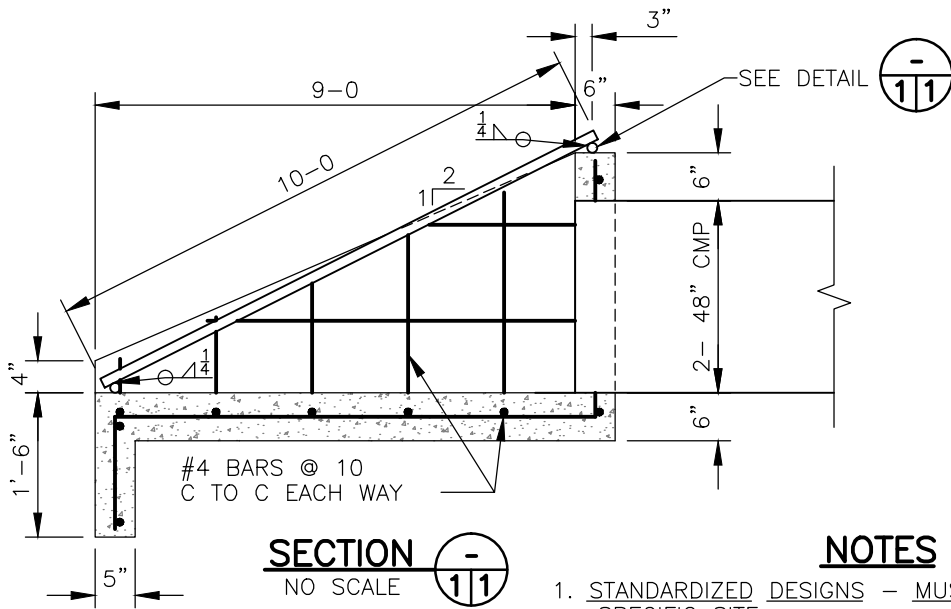
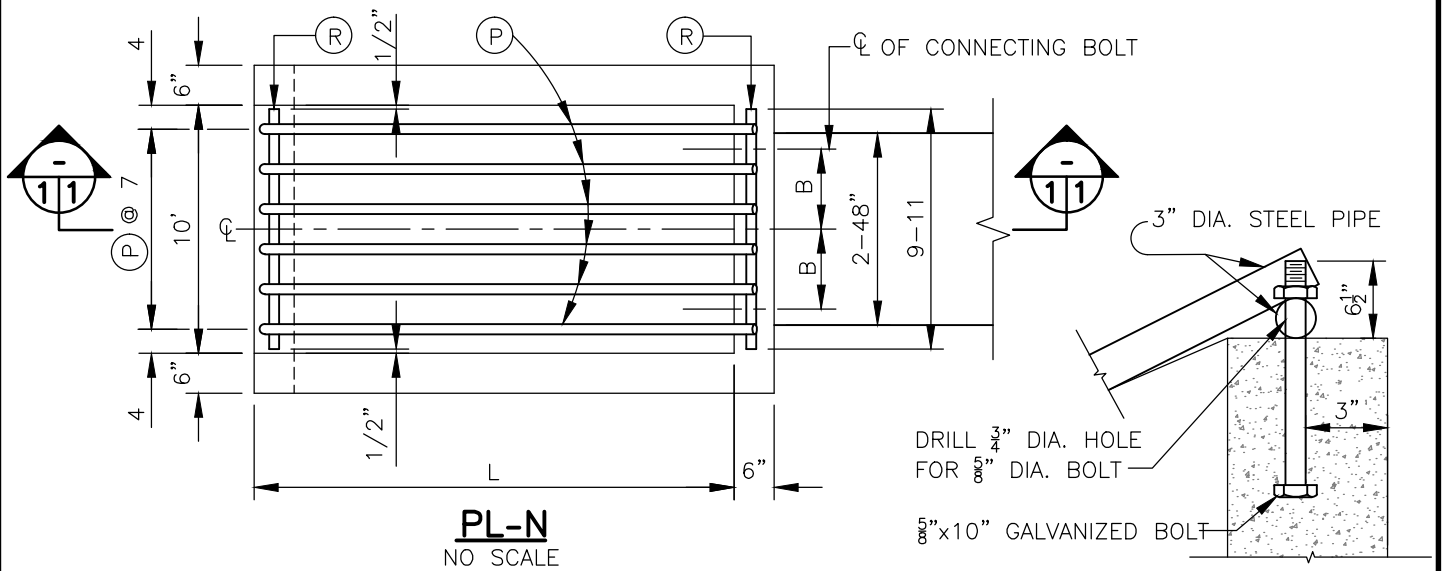
PROPERTIES LOCATED AT 2484 N. COUNTY ROAD 25E AND 2516 N. COUNTY ROAD 25E
NOT TO SCALE



FILE NO.
DRAWING NO.
SHEET 9 OF 9

LARIMER COUNTY
HIGH PARK BURN AREA
BELLVUE FLOOD PROTECTION RECOMMENDATIONS
2516 N. COUNTY ROAD 25E
2484 N. COUNTY ROAD 25E

DESIGNED D. WOLFF
DRAWN D.D. DROULLARD
CHECKED A. ALBIN
APPROVED _____
DATE 01/13
01/13
01/13
COLORADO



DET-IL
NO SCALE

NOTES

1. STANDARDIZED DESIGNS - MUST BE ADAPTED TO THE SPECIFIC SITE.
2. THE STRUCTURE SHALL CONFORM TO ENGINEERING STANDARD AND SPECIFICATIONS 37B, POND.

TABLE OF DIMENSIONS AND QUANTITIES FOR INLET

D PIPE DIA. (IN)	B (IN)	L (FT-IN)	W (FT-IN)	CONCRETE (CU. YDS.)	REINFORCING STEEL (APPROX. LBS.)	CONNECTING BOLTS NEEDED (EACH)
48	10	9-0	10-0	3.30	246	2

TRASH RACK DIMENSIONS

D PIPE DIA. (IN)	A (IN)	C (FT-IN)	G (FT-IN)	NO. OF MARK (P) REQ'D.	NO. OF MARK (R) REQ'D.	TOTAL LENGTH OF PIPE REQ'D.
48	40	10-0	9-11	17	2	89-10



**INLET AND TRASH RACK
DETAIL**

(REVISED LAST ON 10-09)

	Date	File Name
Designed_RDM	7-69	
Drawn_DDD	8-08	Drawing Name
Checked_DW	3-13	CO-SSP-26
Approved_J.E. ANDREWS S.C.E.	10-09	Sheet 1 of 1