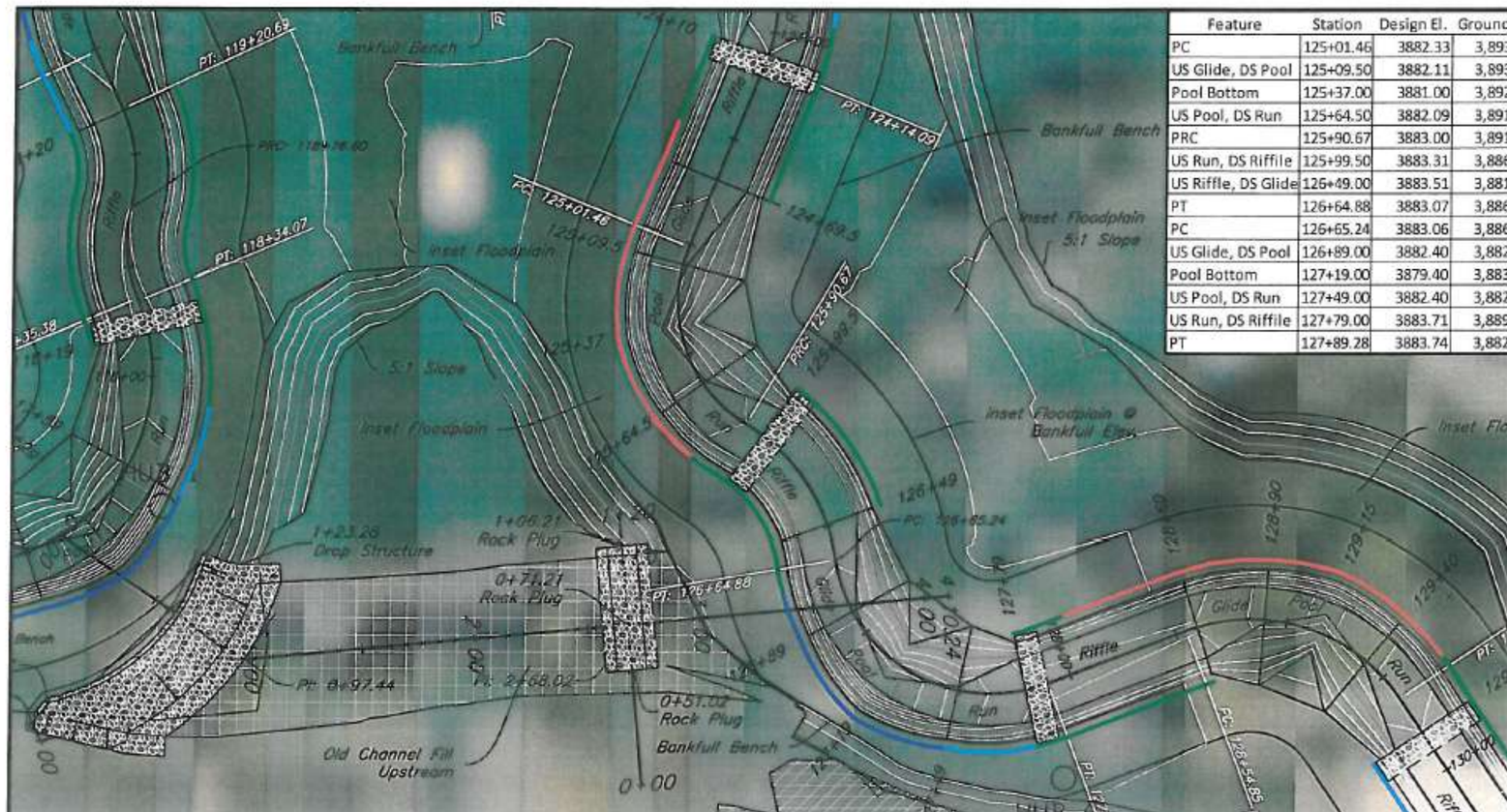
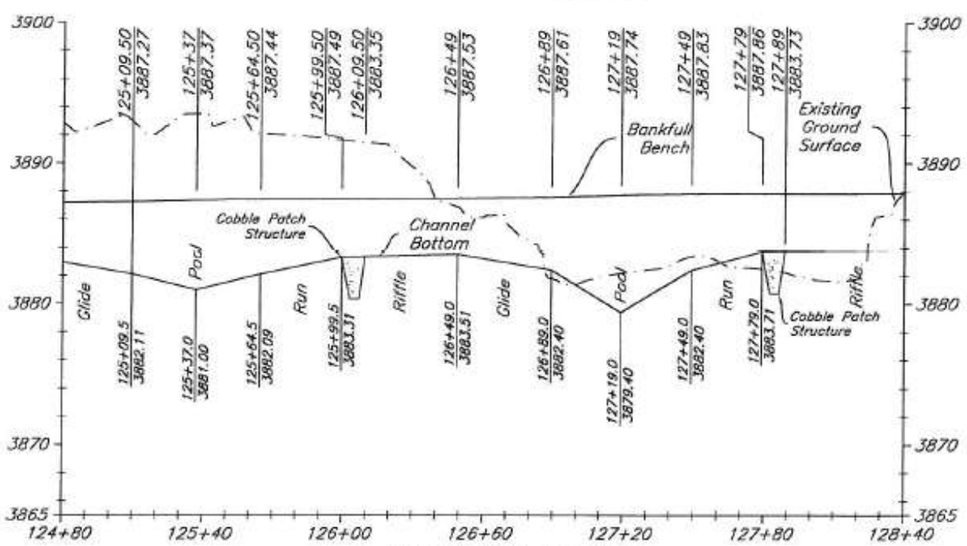
Feature	Station	Design El.	Ground El.	Easting	Norhting	L (ft)	R (ft)	Delta <	C (ft)
PC	125+01.46	3882.33	3,893.18	2030950.91	17108750.90	89.21	63.30	80.7427	82.01
US Glide, DS Pool	125+09.50	3882.11	3,893.52	2030947.27	17108716.01				
Pool Bottom	125+37.00	3881.00	3,892.11	2030957.75	17108690.82				
US Pool, DS Run	125+64.50	3882.09	3,891.64	2030984.00	17108668.09				
PRC	125+90.67	3883.00	3,891.85	2030976.71	17108673.05	74.21	86.03	49.4243	71.93
US Run, DS Riffle	125+99.50	3883.31	3,886.90	2031012.94	17108628.77				
US Riffle, DS Glide	126+49.00	3883.51	3,881.79	2031024.69	17108590.71				
PT	126+64.88	3883.07	3,886.31	2031016.93	17108613.42	0.35			
PC	126+65.24	3883.06	3,886.31	2031016.99	17108613.07	124.04	70.00	101.5296	108.44
US Glide, DS Pool	126+89.00	3882.40	3,882.18	2031044.23	17108568.24				
Pool Bottom	127+19.00	3879.40	3,883.36	2031071.33	17108555.93				
US Pool, DS Run	127+49.00	3882.40	3,882.50	2031101.10	17108555.99				
US Run, DS Riffle	127+79.00	3883.71	3,889.50	2031177.10	17108583.90				
PT	127+89.28	3883.74	3,882.23	2031110.94	17108558.93	65.58			



PLAN VIEW



NEW CHANNEL PROFILE

DRAFT

CHANNEL LAYOUT CHART

"PC" = Point of Curvature
"PT" = Point of Tangency
"PCC" = Point of Compound Curvature
"PRC" = Point of Reverse Curvature
"L" = Curve Length
"Delta <" = Angle at Curve Center Point (PC to PT)
"R" = Curve Radius
"C" = Chord Length
"O" = Curve Center Point

Note:
All stationing is located along approximate ℄ of channel.

Designed K Hoffman 7/2014
Drawn B Krueger 7/2014
Checked K Hoffman 7/2014
Approved

PLAN & PROFILE STA. 124+80–128+40
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

USDA United States Department of Agriculture
Natural Resources Conservation Service

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Drawing No. ----
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Point Table Inset Flood Plain Left			
Point #	Northing	Easting	Elevation
IL68	17108653.91	2030909.02	3887.63
IL69	17108641.64	2030925.76	3887.67
IL70	17108629.41	2030938.00	3887.70
IL71	17108609.91	2030946.60	3888.01
IL72	17108602.89	2030950.07	3888.11
IL73	17108581.14	2030960.82	3888.05
IL74	17108570.94	2030972.74	3887.90
IL75	17108567.88	2030976.52	3887.86
IL76	17108506.21	2031133.98	3888.07
IL77	17108500.45	2031161.62	3888.50

BANK PROTECTION LEGEND

- Type I Bank Protection
- Type II Bank Protection
- Type III Bank Protection
- Riffle Bank Protection

Point Table Bankfull Bench Left			
Point	Northing	Easting	Elevation
BL157	17108661.40	2030917.31	3887.44
BL158	17108647.70	2030928.81	3887.45
BL159	17108635.98	2030942.31	3887.46
BL160	17108630.96	2030949.71	3887.47
BL161	17108626.80	2030955.58	3887.50
BL162	17108619.68	2030961.90	3887.51
BL163	17108611.38	2030966.05	3887.53
BL164	17108605.35	2030967.58	3887.56
BL165	17108588.72	2030971.48	3887.58
BL166	17108572.77	2030977.72	3887.60
BL167	17108562.25	2030983.48	3887.62
BL168	17108560.47	2030985.68	3887.80
BL169	17108557.45	2030990.47	3887.80
BL170	17108550.52	2031001.45	3887.82
BL171	17108544.13	2031012.22	3887.83
BL172	17108537.04	2031024.18	3887.85
BL173	17108526.30	2031041.49	3887.85
BL174	17108520.09	2031052.90	3887.86

Point Table Bankfull Bench Left			
Point	Northing	Easting	Elevation
BL175	17108517.45	2031061.89	3887.86
BL176	17108513.27	2031080.65	3887.86
BL177	17108510.69	2031097.11	3887.85
BL178	17108507.64	2031113.87	3887.62
BL179	17108512.19	2031128.71	3887.86
BL180	17108519.56	2031148.08	3887.85

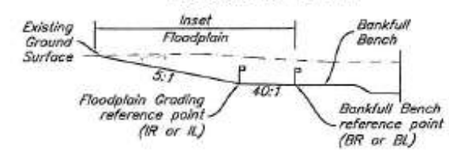
Point Table Inset Flood Plain Right			
Point	Northing	Easting	Elevation
IR76	17108725.82	2031102.39	3889.46
IR77	17108706.61	2031136.22	3890.01
IR78	17108672.99	2031168.83	3889.03
IR79	17108657.42	2031197.46	3888.63

Point Table Bankfull Bench Right			
Point	Northing	Easting	Elevation
BR188	17108835.60	2031036.75	3887.11
BR189	17108819.52	2031032.42	3887.11
BR190	17108813.13	2031030.03	3887.11
BR191	17108789.11	2031020.31	3887.12
BR192	17108770.57	2031012.81	3887.15
BR193	17108761.30	2031009.06	3887.18
BR194	17108752.03	2031005.31	3887.20
BR195	17108730.44	2030996.70	3887.27
BR196	17108726.27	2030996.31	3887.35
BR197	17108722.19	2030997.24	3887.42
BR198	17108719.43	2030998.75	3887.44
BR199	17108715.78	2031002.68	3887.47
BR200	17108707.45	2031014.84	3887.49
BR201	17108697.12	2031026.80	3887.50
BR202	17108685.47	2031037.48	3887.50
BR203	17108675.60	2031044.80	3887.51
BR204	17108658.86	2031054.44	3887.51
BR205	17108644.27	2031060.49	3887.53
BR206	17108629.06	2031064.81	3887.55
BR207	17108621.48	2031066.27	3887.56
BR210	17108614.50	2031068.67	3887.61

Point Table Bankfull Bench Right			
Point	Northing	Easting	Elevation
BR211	17108609.99	2031072.16	3887.70
BR212	17108606.65	2031076.77	3887.79
BR213	17108604.75	2031082.14	3887.83
BR214	17108604.89	2031090.64	3887.86
BR215	17108605.67	2031093.17	3887.86
BR216	17108609.48	2031103.20	3887.86
BR217	17108616.58	2031121.89	3887.85
BR218	17108623.69	2031140.59	3887.90
BR219	17108628.97	2031154.47	3887.93
BR220	17108629.05	2031154.69	3887.93
BR221	17108631.69	2031162.38	3887.94
BR222	17108635.49	2031178.17	3887.96
BR223	17108637.30	2031194.30	3887.98
BR224	17108637.07	2031210.54	3888.01
BR225	17108634.83	2031226.63	3888.03
BR226	17108630.60	2031242.30	3888.07
BR227	17108624.45	2031257.33	3888.12
BR228	17108616.47	2031271.48	3888.16

DRAFT

FLOODPLAIN DETAIL



		Date
Designed	K Hoffman	2/2015
Drawn	B Krueger	2/2015
Checked	K Hoffman	2/2015
Approved:		

FLOODPLAIN GRADING STA 124+80–128+40
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

USDA United States Department of Agriculture
Natural Resources Conservation Service

File No. BigSpGradingPlan.dwg
Drawing No. ----

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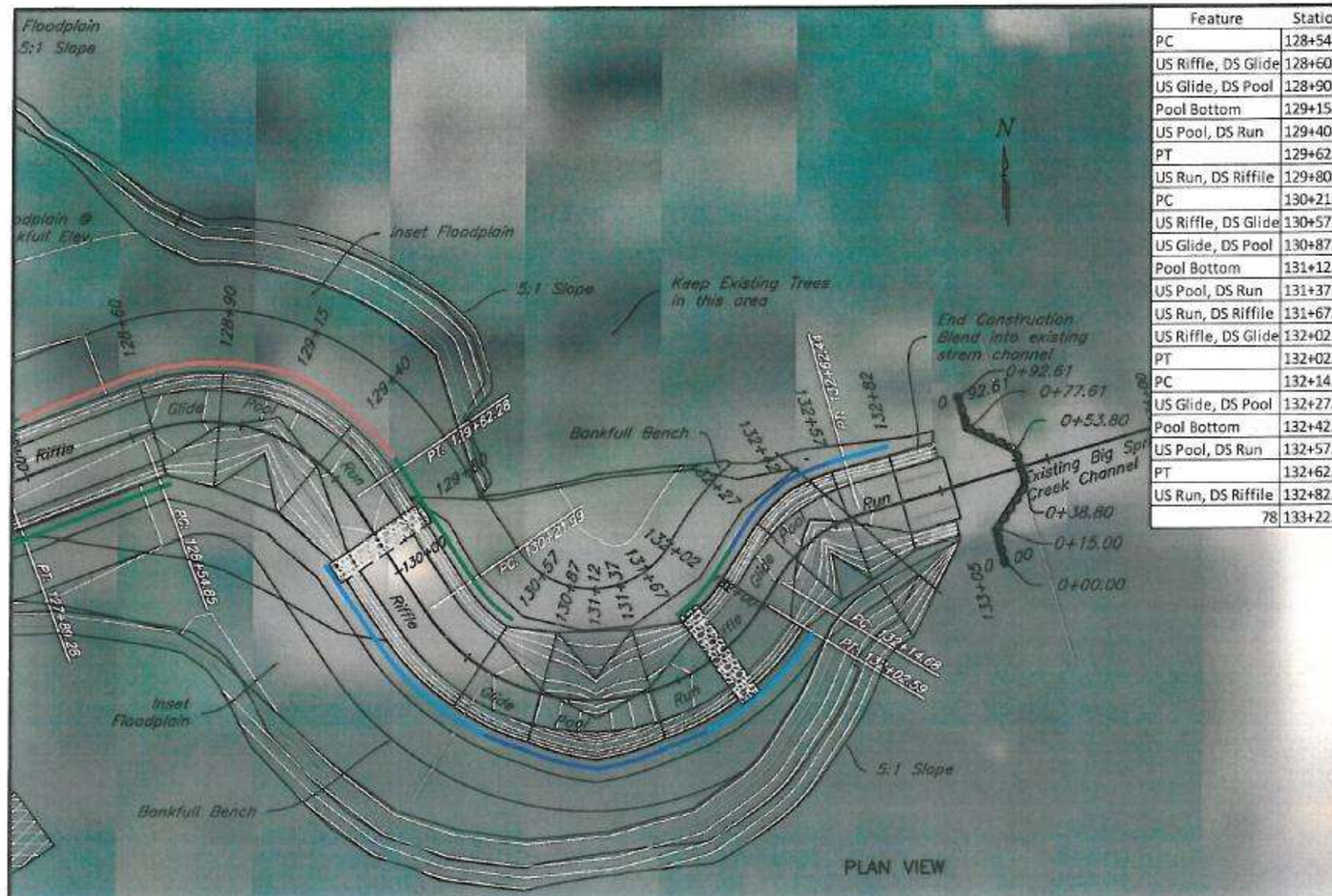
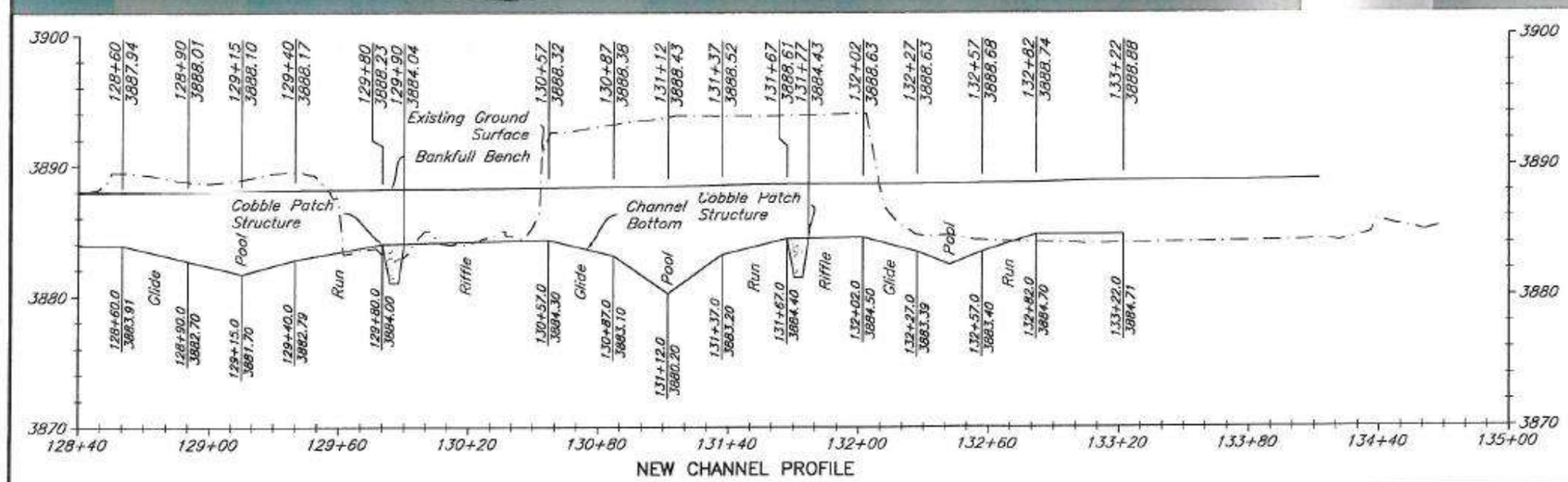


Feature	Station	Design El.	Ground El.	Easting	Norhting	L (ft)	R (ft)	Delta <	C (ft)
PC	128+54.85	3883.90	3,889.44	2031172.24	17108582.23	107.43	80.00	76.9388	99.54
US Riffle, DS Glide	128+60.00	3883.91	3,888.80	2031206.74	17108587.22				
US Glide, DS Pool	128+90.00	3882.70	3,888.96	2031230.97	17108581.49				
Pool Bottom	129+15.00	3881.70	3,889.58	2031252.27	17108568.58				
US Pool, DS Run	129+40.00	3882.79	3,883.17	2031276.96	17108537.33				
PT	129+62.28	3883.46	3,883.23	2031267.08	17108552.04	59.71			
US Run, DS Riffile	129+80.00	3884.00	3,892.25	2031324.97	17108477.88				
PC	130+21.99	3884.16	3,884.09	2031300.36	17108502.47	180.61	90.00	114.9778	151.79
US Riffle, DS Glide	130+57.00	3884.30	3,893.17	2031352.19	17108465.60				
US Glide, DS Pool	130+87.00	3883.10	3,893.73	2031376.94	17108462.65				
Pool Bottom	131+12.00	3880.20	3,893.80	2031401.54	17108466.61				
US Pool, DS Run	131+37.00	3883.20	3,893.84	2031428.23	17108480.00				
US Run, DS Riffile	131+67.00	3884.40	3,894.00	2031451.80	17108505.58				
US Riffle, DS Glide	132+02.00	3884.50	3,884.68	2031465.70	17108526.30				
PT	132+02.59	3884.47	3,894.00	2031452.11	17108506.08	12.09			
PC	132+14.68	3883.94	3,886.24	2031458.36	17108516.43	47.76	64.30	42.5576	46.67
US Glide, DS Pool	132+27.00	3883.39	3,884.64	2031476.97	17108536.16				
Pool Bottom	132+42.00	3882.40	3,884.27	2031490.20	17108543.14				
US Pool, DS Run	132+57.00	3883.40	3,884.14	2031514.13	17108550.38				
PT	132+62.44	3883.68	3,884.21	2031495.35	17108544.89	205.07			
US Run, DS Riffile	132+82.00	3884.70	3,884.03	2031533.32	17108555.99				
78	133+22.00	3884.71	3,884.00	2031536.20	17108556.83				



CHANNEL LAYOUT CHART

- "PC" = Point of Curvature
- "PT" = Point of Tangency
- "PCC" = Point of Compound Curvature
- "PRC" = Point of Reverse Curvature
- "L" = Curve Length
- "Delta <" = Angle at Curve Center Point (PC to PT)
- "R" = Curve Radius
- "C" = Chord Length
- "O" = Curve Center Point

Note:
All stationing is located along approximate ℄ of channel.

DRAFT

		Date
Designed	K Hoffman	7/2014
Drawn	B Krueger	7/2014
Checked	K Hoffman	7/2014
Approved		

PLAN & PROFILE STA. 128+40–135+00
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

USDA United States Department of Agriculture
Natural Resources Conservation Service

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Drawing No. ----
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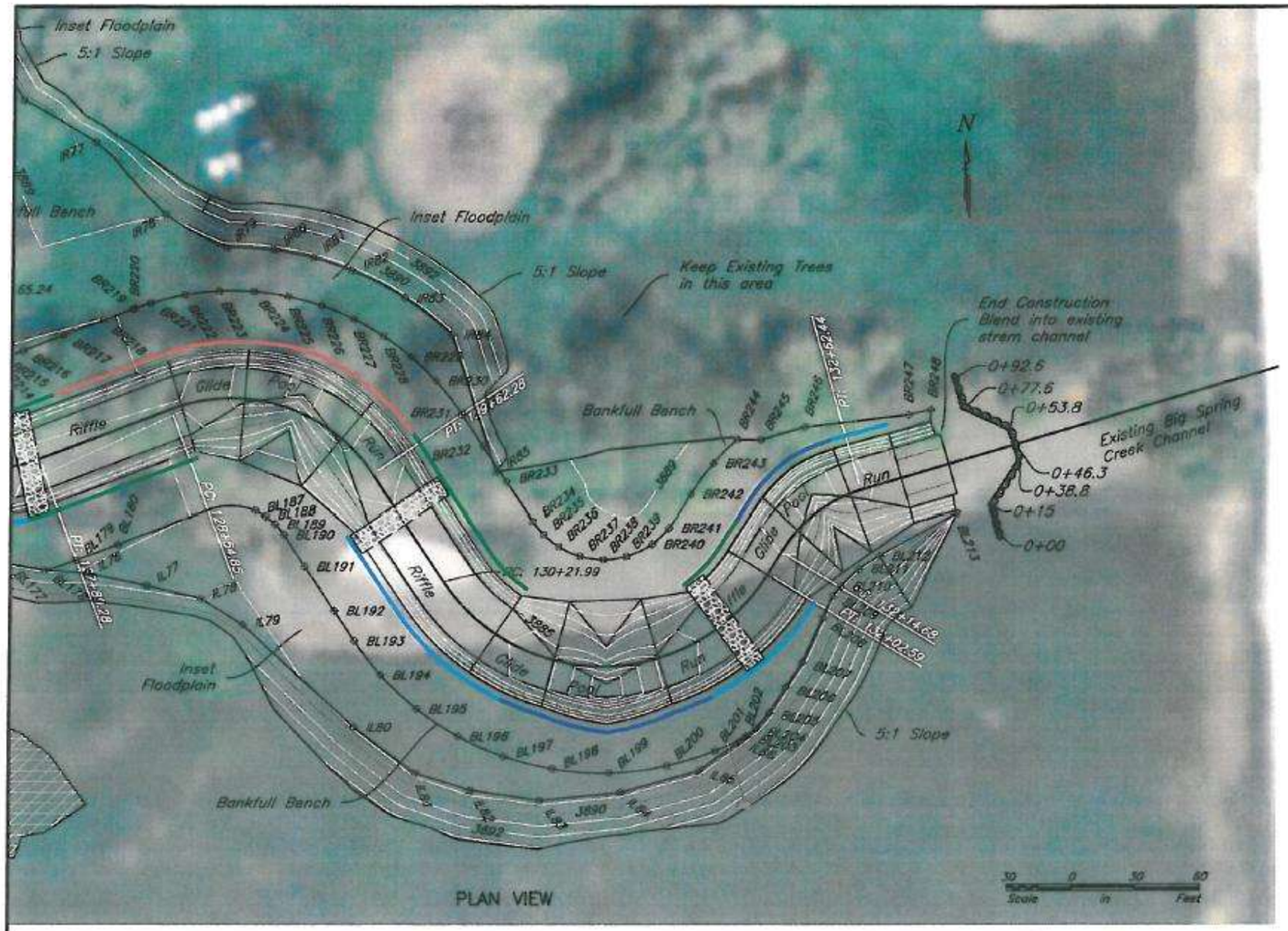

PLAN VIEW

Point Table Bankfull Bench Right			
Point	Northing	Easting	Elevation
BR229	17108606.79	2031284.52	3888.17
BR230	17108595.56	2031296.25	3888.18
BR231	17108579.91	2031308.50	3888.20
BR232	17108565.20	2031318.47	3888.23
BR233	17108548.59	2031329.62	3888.24
BR234	17108530.34	2031341.88	3888.25
BR235	17108524.18	2031346.97	3888.29
BR236	17108518.69	2031353.93	3888.33
BR237	17108514.19	2031364.05	3888.38
BR238	17108512.64	2031375.02	3888.43
BR239	17108514.15	2031385.99	3888.52
BR240	17108519.84	2031397.98	3888.61
BR241	17108527.37	2031406.10	3888.63
BR242	17108542.78	2031415.87	3888.63
BR243	17108557.16	2031426.28	3888.63
BR244	17108568.28	2031437.20	3888.64
BR245	17108568.07	2031448.35	3888.65
BR246	17108574.06	2031468.82	3888.67
BR247	17108579.74	2031517.30	3888.85
BR248	17108582.16	2031527.82	3888.94

Point Table Inset Flood Plain Right			
Point	Northing	Easting	Elevation
IR80	17108656.31	2031219.94	3888.67
IR81	17108652.77	2031238.35	3888.68
IR82	17108646.91	2031256.29	3888.69
IR83	17108634.21	2031281.18	3888.71
IR84	17108617.01	2031303.39	3888.73
IR85	17108553.13	2031324.57	3888.27

Point Table Rock Vane		
Station	Northing	Easting
0+00	17108524.33	2031559.75
0+15	17108538.73	2031555.54
0+38.8	17108558.53	2031568.75
0+46.3	17108565.73	2031566.65
0+53.8	17108572.93	2031564.54
0+77.6	17108582.50	2031542.75
0+92.6	17108596.89	2031538.54

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Point Table Inset Flood Plain Left			
Point #	Northing	Easting	Elevation
IL78	17108494.39	2031186.90	3888.91
IL79	17108482.13	2031206.70	3889.22
IL80	17108434.25	2031258.84	3888.82
IL81	17108412.73	2031287.84	3888.66
IL82	17108404.64	2031313.85	3888.50
IL83	17108399.94	2031345.89	3888.58
IL84	17108403.51	2031383.76	3888.63
IL85	17108413.76	2031420.48	3888.63
IL86	17108427.26	2031439.16	3888.63

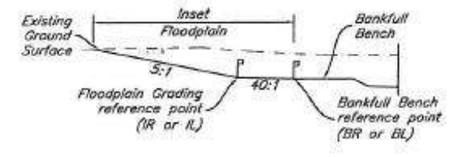
Point Table Bankfull Bench Left			
Point	Northing	Easting	Elevation
BL187	17108535.21	2031212.03	3888.10
BL188	17108532.61	2031217.01	3888.16
BL189	17108529.12	2031221.41	3888.18
BL190	17108524.17	2031225.57	3888.20
BL191	17108509.46	2031235.45	3888.23
BL192	17108488.70	2031249.38	3888.24
BL193	17108474.60	2031258.85	3888.25
BL194	17108458.67	2031271.31	3888.28
BL195	17108442.75	2031288.33	3888.31
BL196	17108429.88	2031307.77	3888.34
BL197	17108420.42	2031329.06	3888.37
BL198	17108414.61	2031351.64	3888.40
BL199	17108412.67	2031378.42	3888.43
BL200	17108416.03	2031405.72	3888.49

Point Table Bankfull Bench Left			
Point	Northing	Easting	Elevation
BL201	17108423.00	2031427.96	3888.56
BL202	17108429.66	2031442.01	3888.59
BL203	17108430.23	2031443.06	3888.63
BL204	17108433.48	2031446.73	3888.63
BL205	17108440.95	2031452.99	3888.63
BL206	17108452.93	2031460.56	3888.65
BL207	17108464.74	2031468.21	3888.67
BL208	17108485.46	2031477.60	3888.71
BL209	17108495.83	2031482.28	3888.74
BL210	17108500.22	2031486.10	3888.79
BL211	17108508.36	2031494.47	3888.87
BL212	17108514.45	2031504.28	3888.88
BL213	17108534.13	2031540.20	3888.90

BANK PROTECTION LEGEND

- Type I Bank Protection
- Type II Bank Protection
- Type III Bank Protection
- Riffle Bank Protection

FLOODPLAIN DETAIL



		Date
Designed	K Hoffman	2/2015
Drawn	B Krueger	2/2015
Checked	K Hoffman	2/2015
Approved		

FLODDPLAIN GRADING STA. 128+40–135+00
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

United States Department of Agriculture
Natural Resources Conservation Service

File No. BigSpGradingPlan.dwg
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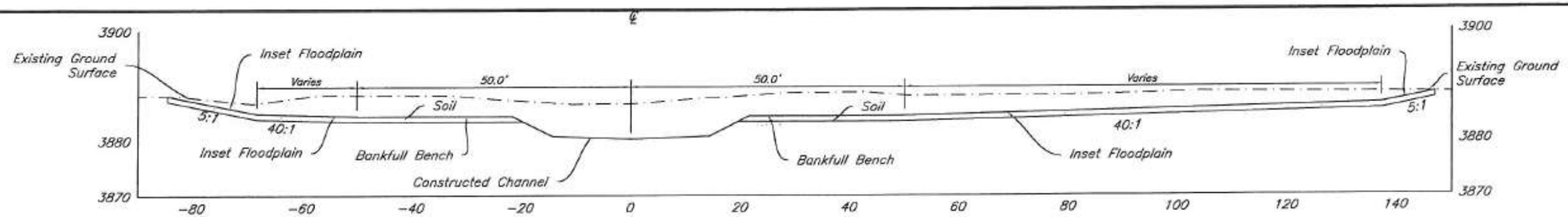
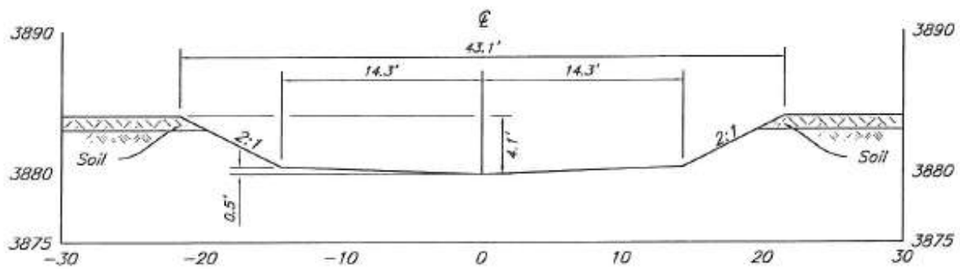
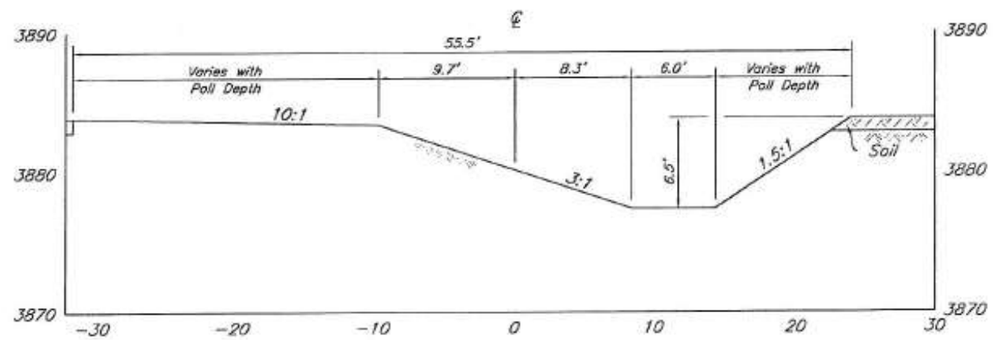


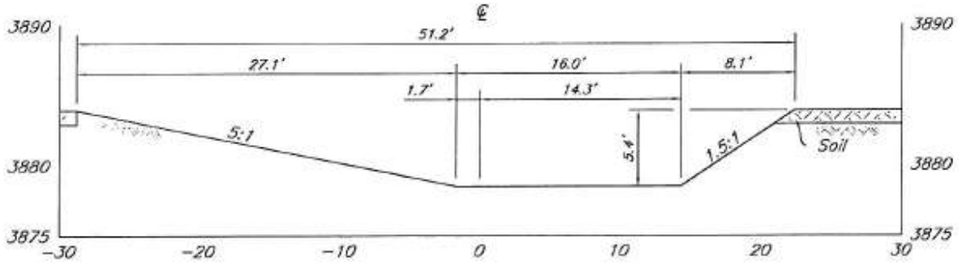
TYPICAL FLOODPLAIN SECTION



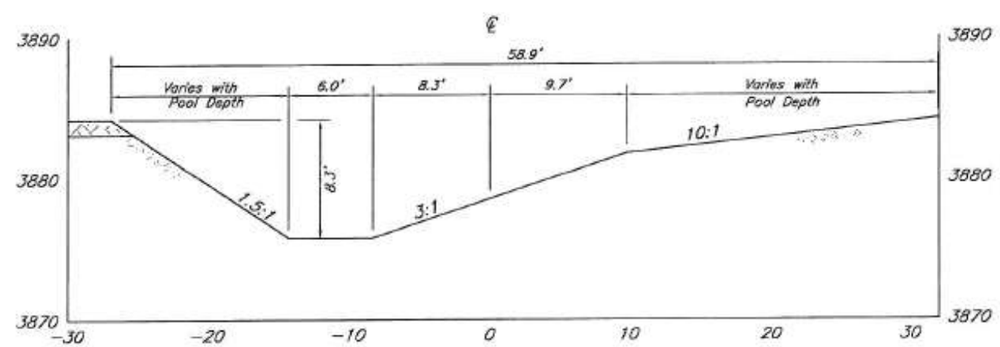
TYPICAL RIFFLE SECTION



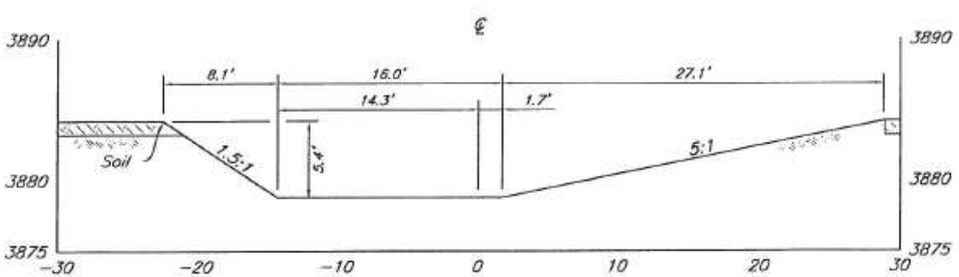
TYPICAL POOL SECTION



TYPICAL RUN / GLIDE SECTION



TYPICAL POOL SECTION



TYPICAL RUN / GLIDE SECTION

DRAFT

Note: Pool depths vary from 6.3' – 8.3'

Designed	K Hoffman	Date 7/2014
Drawn	B Krueger	7/2014
Checked	K Hoffman	7/2014
Approved		

TYPICAL CHANNEL XSECTIONS

BIG SPRING CREEK RESTORATION PROJECT

MACHLER, ADAMS And MT FISH WILDLIFE & PARKS

FERGUS COUNTY MONTANA

USDA United States Department of Agriculture Natural Resources Conservation Service

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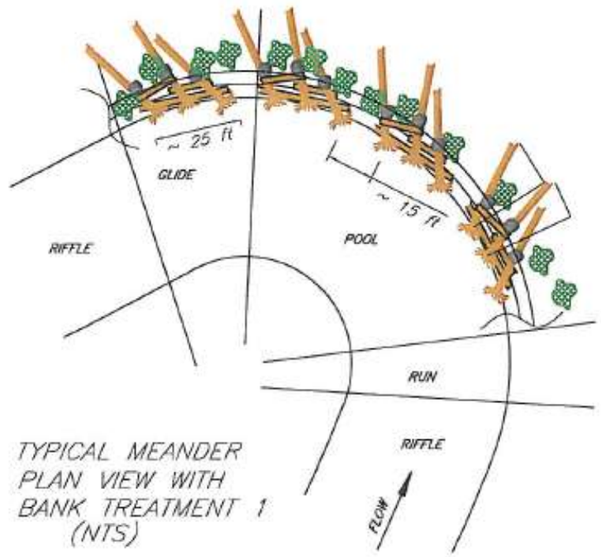
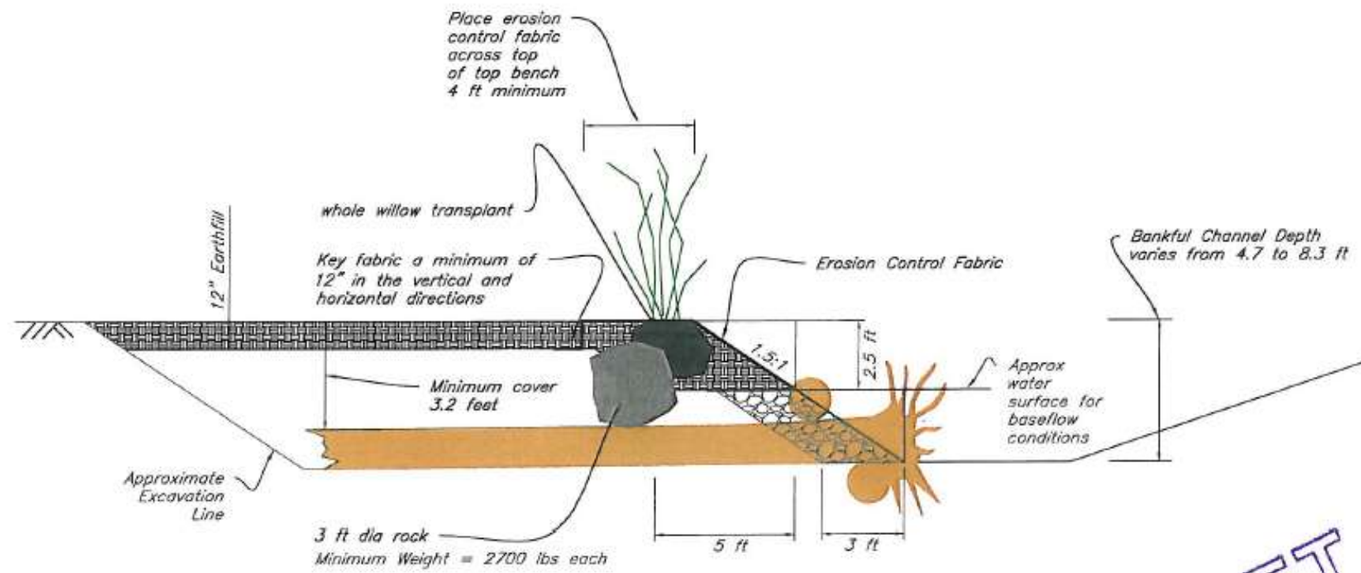
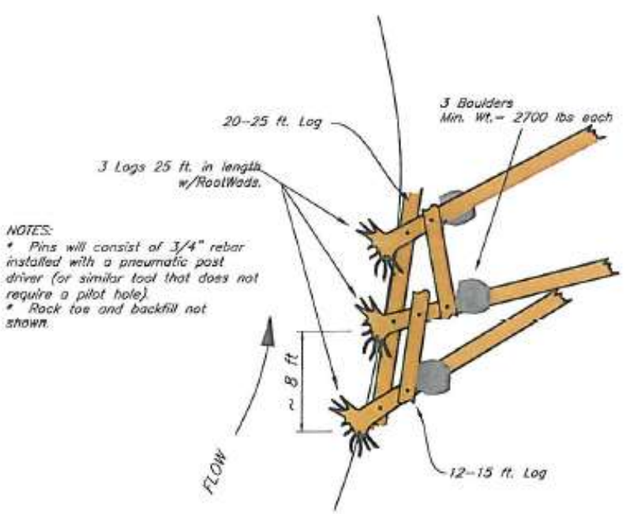


TYPICAL MEANDER PLAN VIEW WITH BANK TREATMENT 1 (NTS)



TYPICAL SECTION (MEANDER RIGHT)
(NTS)

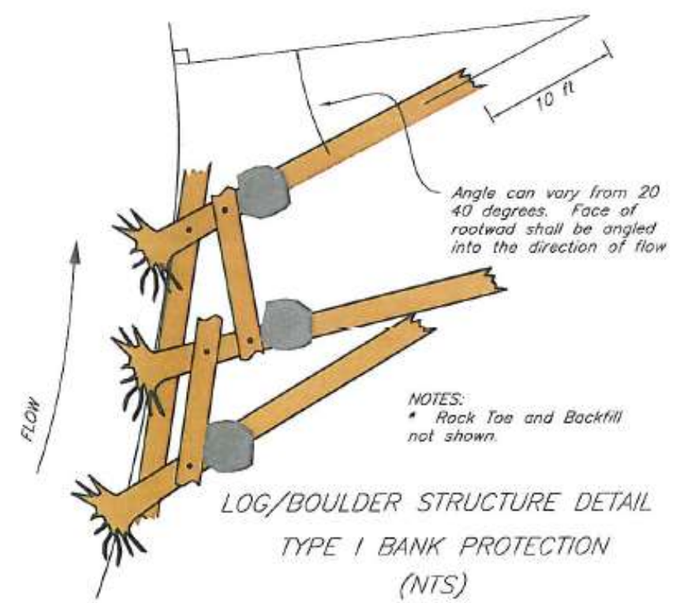
DRAFT



LOG/BOULDER STRUCTURE DETAIL
TYPE I BANK PROTECTION
(NTS)

TYPE I BANK PROTECTION REACH LOCATION						
DNSTREAM CL STA.*	UPSTREAM CL STA.*	NO. OF STR.S	NO. OF WILLOW CLUMPS	NO. OF LOGS	NO. OF Boulder	TON
101+25 R	101+95 R	3	9	3	7	12.2
102+90 L	103+08 L	3	9	3	9	12.2
107+85 R	108+60 R	2.5	8	2.5	8	10.1
110+54 R	111+55 R	4	12	4	12	16.2
113+42 L	114+40 L	3.5	12	3.5	12	14.2
116+64 L	117+59 L	3.5	12	3.5	12	14.2
119+61 R	120+60 R	4	12	4	12	16.2
123+05 R	123+70 R	2	6	2	6	8
126+73 L	127+49 L	3	9	3	9	12.2
130+72 L	131+52 L	2	6	2	6	8.1
132+15 R	132+57 R	1.5	3	1.5	3	6.1

*NOTE: "L" or "R" on Stations denote Left Bank or Right Bank location when looking downstream.



LOG/BOULDER STRUCTURE DETAIL
TYPE I BANK PROTECTION
(NTS)

	Date
Designed K Hoffman	7/2014
Drawn K Hoffman	01/2015
Checked	
Approved	

TYPE I BANK PROTECTION
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

United States Department of Agriculture
Natural Resources Conservation Service

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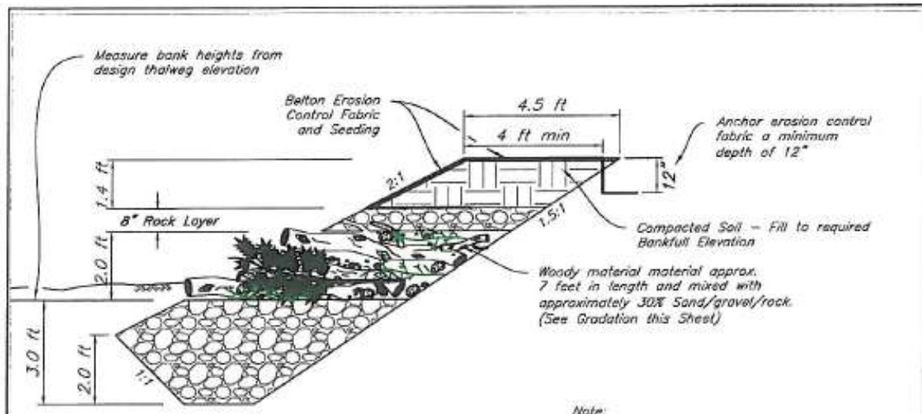


TYPE II BANK PROTECTION
WOODY TOE DETAIL FOR
RIFFLE SECTIONS
N.T.S.

Note:

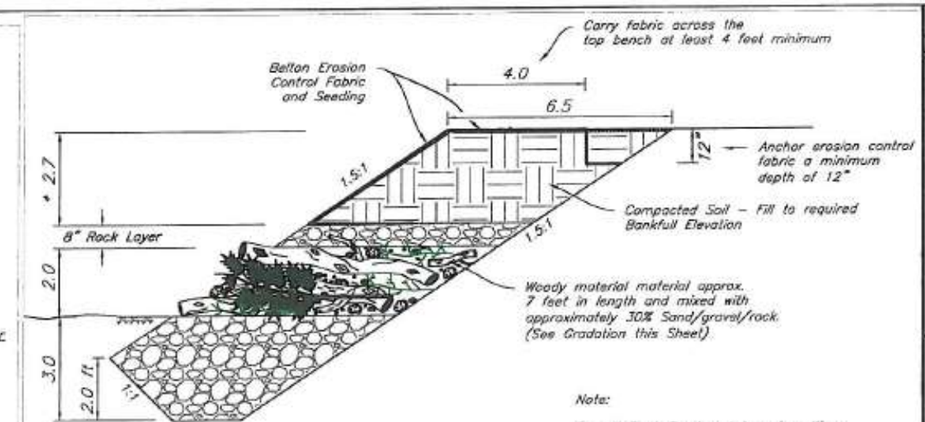
Type II Bank Treatment is a transition section between riffles and pools. The exposed side slope varies between 2:1 within the riffle to 1.5:1 within the pool sections.

GRADATION – ROCK TOE

Size	% Passing
9"	100%
6.75"	60–100
4.5"	35–50
2.25"	10–35
1.25"	0–25

GRADATION – BRUSH

Size	% Smaller Diameter
8"	90%
5"	50%
4"	20%
2"	<10%



TYPE II BANK PROTECTION
WOODY TOE DETAIL FOR
GLIDE AND RUN SECTIONS
N.T.S.

Note:

Type II Bank Treatment is a transition section between riffles and pools. The exposed side slope varies between 2:1 within the riffle to 1.5:1 within the pool sections.

BANK PROTECTION CONSTRUCTION NOTES

TYPE I BANK PROTECTION – LOG BOULDER

Materials:

1. Trees to be utilized for bank protection shall be Douglas Fir, Ponderosa Pine, and/or Ledgepole Pine in sound condition and without substantial defects. Minimum diameter at breast height (4.5 ft above ground level) will be 18 inches. The NRCS Inspector will approve the trees onsite prior to the commencement of hauling.

2. It is the responsibility of the Contractor to procure full trees, with rootwads and limbs largely intact, and deliver them to the project site without damage.

3. Trees will be topped at a diameter of 6", and limbed, to produce material to be utilized for Type II bank protection. Carefully stockpile limbs and tops at the project site to ensure full utilization of the material.

4. Each Type I structure will require 3 to 4 full trees to construct: 3 trees shall have intact rootwads plus 20–25 ft length logs. Approximately 2 additional tree lengths are needed for header and footer logs.

5. Pinned connections will consist of 3/4" rebar, with a minimum length of 8" longer than the combined diameter of logs members to be connected.

6. Boulders to be utilized for ballast will have a minimum weight of 27 pounds each. The total ballast weight for each structure will be 8100 pounds. Typical boulder size for this weight would be 3 to 3.5 foot diameter where the least dimension is at least half of the maximum dimension.

7. It is the responsibility of the Contractor to procure live willow clumps for transplant with the project. Each Type I structure will require 3 willow clump transplants. Clumps will be at least 30" diameter at their base. Refer to construction specifications for details regarding harvest and transplanting.

Installation:

8. The NRCS Inspector will stake locations of structures, and be onsite to direct their installation.

9. Pin logs together as shown utilizing 3/4" rebar and a pneumatic post driver. Following placement of rebar, cut end off 8–12" above the top of the log, and bend over to be flush with log.

10. Place ballast boulders over logs, ensuring they are placed behind the header logs and in good contact with the lower logs.

11. Backfill the Type I structure with Sand and Gravel except where shown as Earthfill. Place Sand and Gravel in 8" lifts and compact with the excavator bucket to the extent possible.

12. Provide toe rock of the same gradation at utilized in the Type II and Type III installations to a hei

13. Replace soil over the top of the logs and boulders, and compact with the excavator bucket in 12" loose lifts.

14. Following installation of all Type I and Type II bank protection elements, transplant willow clumps as directed by the NRCS Inspector.

TYPE II BANK PROTECTION – VEGETATED TOE

Materials:

1. The NRCS Inspector will stake the start and end points of bank protection locations and be onsite in order to direct installation. Limbs and tops of conifer trees utilized for Type I bank protection work will be utilized for the brush toe component of Type II bank protection. Branches from on-site cleared from the site are also acceptable.

2. Rock shall be be graded as shown and is the same gradation as used for Bank Treatment III.

Installation:

1. The NRCS Inspector will stake the start and end points of bank protection locations, and be onsite to direct installation.

2. A trench approximately 3' deep with a 2' bottom will be dug for protective rock that will serve as a key and base for the Woody Toe.

3. Woody toe material consisting of 2"–8" diameter and approximately 7 feet in length tog and branch material shall be placed and pressed into place with a backhoe bucket to assure a dense compact section. Less than 10% of the woody material shall be less than 2-inch diameter.

4. Woody toe material shall be mixed with sand/gravel and rock material approved by the Engineer. Sand and gravel volume shall be sufficient to fill the voids between the woody materials.

5. Rock riprap with the same gradation as the rock toe shall be placed in an 8" thick layer above the vegetative toe.

6. Soil shall be placed over the rock riprap and compacted with a backhoe bucket in six inch lifts to assure compact layer.

7. Once the Soil is placed and compacted, the top of the bank shall be seeded in accordance with Critical Area Seeding (MT-342)

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TYPE II BANK PROTECTION
REACH LOCATION

DNSTREAM CL STA.*	UPSTREAM CL STA.*	REACH LENGTH
100+89 R	102+25 R	136'
101+95 R	102+25 R	30'
102+25 L	102+91 L	66'
103+80 L	104+24 L	44'
107+10 R	107+84 R	74'
108+60 R	108+87 R	27'
110+30 R	110+54 R	24'
111+54 R	111+80 R	26'
112+80 L	113+42 L	62'
116+10 L	116+64 L	54'
117+59 L	117+91 L	32'
119+20 R	119+61 R	41'
120+60 R	120+90 R	30'
123+70 R	123+94 R	24'
127+49 L	127+79 L	30'
129+80 L	130+72 L	92'
131+52 L	132+02 L	50'
132+57 R	132+82 R	25'

*NOTE: "L" or "R" on Stations denote Left Bank or Right Bank location when looking downstream.

Designed K Hoffman 7/2014
Drawn D Baker 7/2014
Checked
Approved

TYPE II BANK PROTECTION
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

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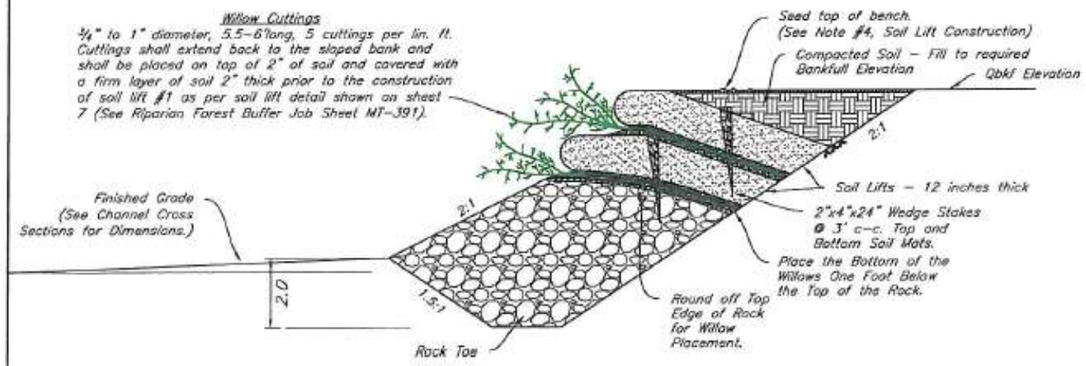
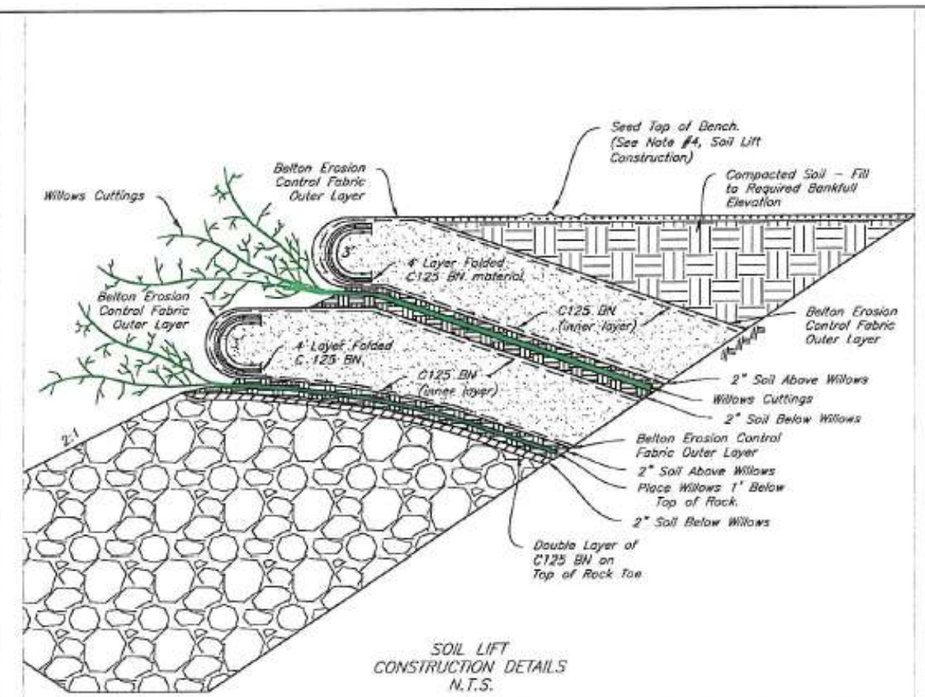
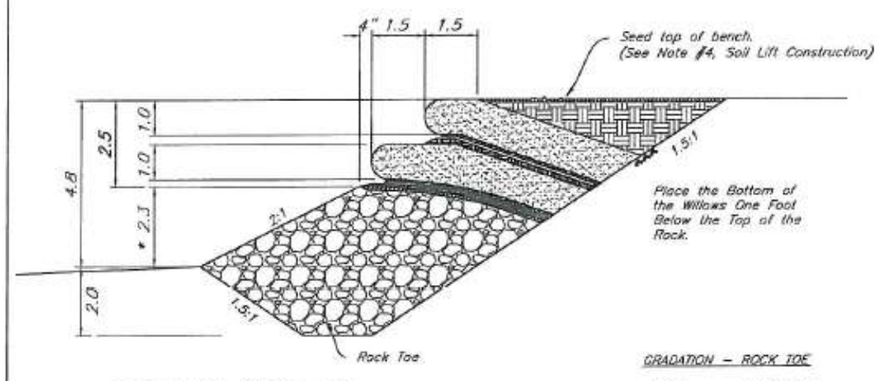


TYPE III BANK PROTECTION
VEGETATIVE DETAILS FOR SOIL LIFTS
THROUGH THE POOLS
N.T.S.



SOIL LIFT
CONSTRUCTION DETAILS
N.T.S.



* Rock Height of 2.3 feet varies depending on Location.

GRADATION – ROCK TOE

Size	% Passing
9"	100%
6.75"	60–100
4.5"	35–50
2.25"	10–35
1.25"	0–25

DIMENSION DETAILS FOR SOIL LIFTS
N.T.S.

TYPE III BANK PROTECTION REACH LOCATION

DNSTREAM CL STA.*	UPSTREAM CL STA.*	REACH LENGTH
104+43 R	105+58 R	115
105+87 L	106+98 L	111'
109+15 L	110+26 L	111'
121+20 L	122+35 L	115'
122+12 R	123+18 R	106' 1/
123+05 R	123+51 R	46' 2/
124+52 L	125+82 L	130'
128+05 R	129+58 R	135'

*NOTE: "L" or "R" on Stations denote Left Bank or Right Bank location when looking downstream.

1/ Stationing measured from 122+12 upstream and up into Bread Creek.

2/ Stationing measured from 123+05 downstream and up into Bread Creek.

DRAFT

CONSTRUCTION NOTES

1. The Contractor shall build the rock toe as shown. The Engineer shall inspect and approve the rock toe prior to the construction of the soil lifts.
2. A double layer of BioD–OCF shall be placed on top of the rock toe followed by the willow cuttings. 2" of soil shall be placed over the willow cuttings before constructing the first soil lift.

SOIL LIFT CONSTRUCTION

1. The Contractor shall place the outer layer of Belton Erosion Contol Fabric (or equivalent) material on top of the 2" of soil with the front and top portion of the mat width extending toward the channel. All Erosion Control Fabricshall overlap at least three (3) feet longitudinally from upstream to downstream. The inner layer of C125 BN material shall be placed on top of the Belton Erosion Control Fabric. An additional layer of C125 BN will be folded into four (4) layers having a finished width of 3 ft and placed as shown on the drawings.
2. The contractor shall place soil or other fine–textured material generated from on–site excavations and approved by the Engineer, to fill the soil lift. The first soil lift will be bucket–compacted.
3. The contractor shall then wrap the inner and outer layers, tension the two layers to remove slack, and anchor in place prior to the construction of the 2nd soil lift. The contractor shall anchor the first soil mat with 2–inch by 4–inch by 24 inch wedge stakes spaced 3 ft c–c through the BioD–mat material and into the bank along the top of the first soil lift. The contractor shall secure the Belton Erosion Control fabric and the C125 BN material ends tightly by folding the material with the top edge of folds going with the direction of stream flow.
4. The above sequence shall be repeated for the second soil lift to be constructed on top of the first soil lift as specified in the drawings. The material used to construct the 2nd soil lift shall covered with bucket–compacted soil and seeded with grass according to the Critical Area Planting Job Sheet MT–342 prior to anchoring the final layers of the Erosion Control fabric on the 2nd soil lift. Following completion of the 2nd soil lift, the contractor shall anchor the Erosion Control Fabric into the first soil lift with 2–inch by 4–inch by 24 inch wedge stakes spaced 3 ft c–c along the top of the second soil lift.
5. When fabric joining is needed, overlap the fabric a minimum of 18" and stake each seam at 2 ft intervals.

		Date
Designed	K Hoffman	7/2014
Drawn	D Baker	7/2014
Checked		
Approved		

TYPE III BANK PROTECTION
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

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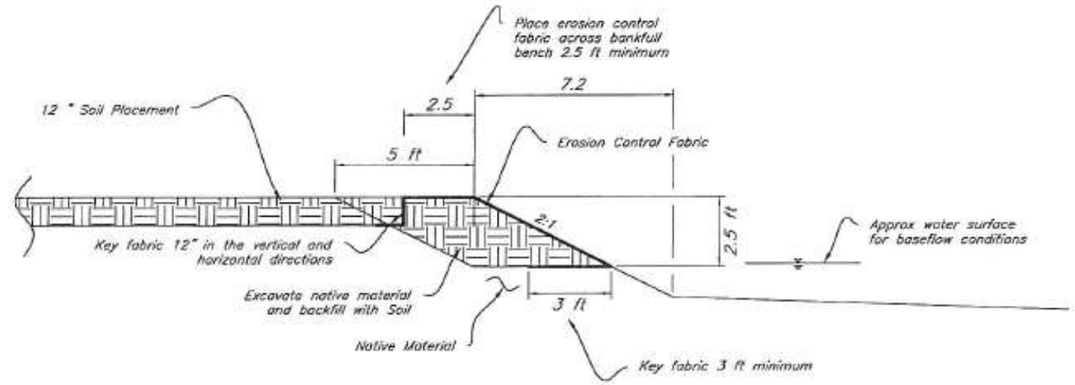
RIFFLE BANK PROTECTION REACH LOCATION		
DNSTREAM CL STA.*	UPSTREAM CL STA.*	REACH LENGTH
102+25 R	102+75 R	50'
103+95 R	104+43 R	48'
104+24 L	104+65 L	40'
105+58 R	106+05 R	47'
105+70 L	105+87 L	17'
106+98 L	107+70 L	72'
108+87 R	110+30 R	143'
111+80 R	113+10 R	130'
112+10 L	112+80 L	70'
114+83 L	116+09 L	126'
115+00 R	116+29 R	129'
117+91 L	119+20 L	129'
118+19 R	119+20 R	101'
120+90 R	122+12 R	122'
123+94 R	124+69.5 R	75.5'
124+10 L	124+52 L	42'
125+82 L	126+73 L	91'
125+99.5 R	126+49 R	49.5'
127+79 R	128+05 R	26'
127+79 L	128+60 L	81'
129+58 R	130+57 R	99'
131+67 R	132+15 R	48'

*NOTE: Bank Treatment is the same on the left and right side of the stream.



TYPICAL SECTION (LEFT BANK)
(NTS)
RIFFLE

DRAFT

Designed K Hoffman 7/2014
Drawn K Hoffman 01/2015
Checked -
Approved -

RIFFLE BANK PROTECTION
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

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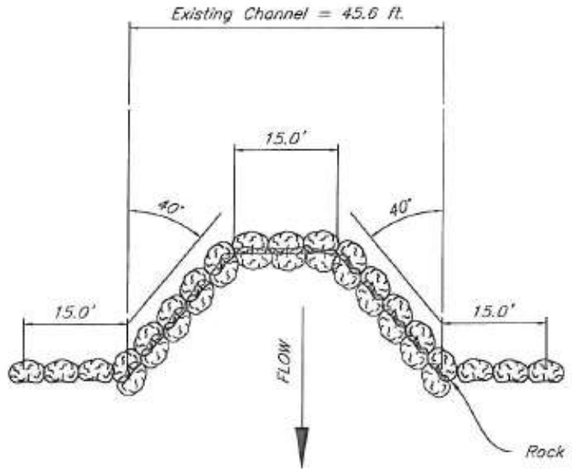
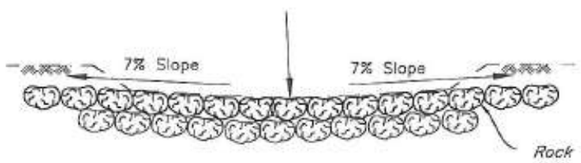


TYPICAL CROSS-VANE PLAN VIEW

(NTS)

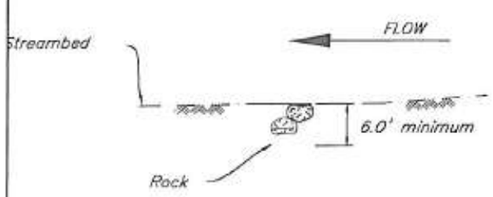
Set top of weir level with existing channel bottom at center (low point of Cross Vane)



TYPICAL CROSS-VANE ELEVATION VIEW

LOOKING DOWNSTREAM

(NTS)



TYPICAL CROSS-VANE CL PROFILE

(NTS)

CROSS VANE NOTES:

1) Boulders to be used for rock cross vanes on this project will be angular shot rock, of a generally rectangular shape. The source will be approved by the NRCS engineer prior to use as meeting project specifications.

2) Typical boulder dimensions will be approximately 5' x 3' x 3' for construction of the vane. Use a mixture of smaller sizes to fill voids between the boulders for the instream portion of the vane (no more than ~10% by volume of the structure). Smaller size rock may be used in the portion of the weir outside the constructed channel. The least dimension of any one boulder should not be less than 1/2 of the greatest dimension of the boulder. Overall requirements:

Dmax = 7.0 ft
D50 = 5.0
Dmin = 4.0

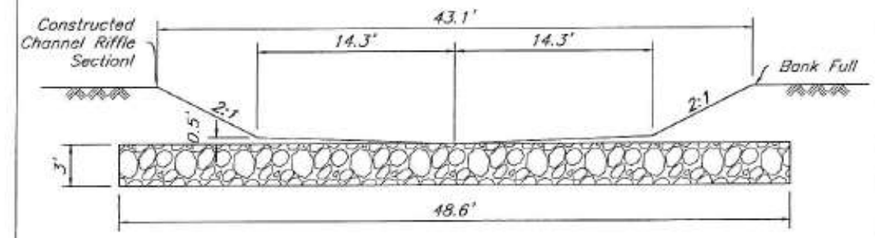
*to be read as: at least 50% of boulders will have one dimension of at least 5 ft.

2) Vanes will be constructed with the NRCS Inspector present. Boulders will be placed by an excavator with careful attention to ensure they are stable and gaps are reduced to a minimum. Each boulder should bear against it's downstream neighbor so that the force of streamflow is transferred through the weir to the bank. As each boulder is placed, give a trial push in the downstream direction to ensure it will not tip under load.

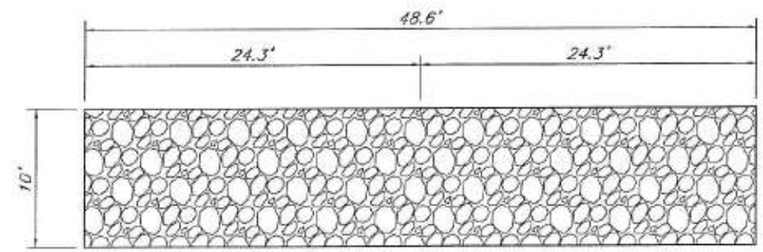
IN-STREAM STRUCTURE LOCATION CHART

STRUCTURE	CL STN	*NORTHING ℄	*EASTING ℄	C.Y./STR.
Rock Cross Vane Downstream	133+35	17108479.63	2029573.28	
Rock Cross Vane Upstream	133+35	17108565.25	2031565.00	

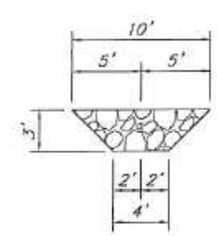
*NOTE: Easting and Northing coordinates reference the stream channel ℄ Station of the Cross Vane Structures and the center profile of the Permanent Plugs on the right bank (looking downstream).



TYPICAL COBBLE PATCH STRUCTURE PLAN VIEW



TYPICAL COBBLE PATCH STRUCTURE PLAN VIEW



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TYPICAL COBBLE PATCH STRUCTURE PLAN VIEW

COBBLE PATCH LOCATIONS

Number	℄ Station	Number	℄ Station
1	102+25	8	118+19
2	103+95	9	121+20
3	105+05	10	124+10
4	107+10	11	125+99.5
5	109+15	12	127+79
6	112+10	13	129+80
7	115+00		

Designed K Hoffman 7/2014
Drawn D Baker 7/2014
Checked
Approved

IN-STREAM STRUCTURE DETAILS
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

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Natural Resources Conservation Service

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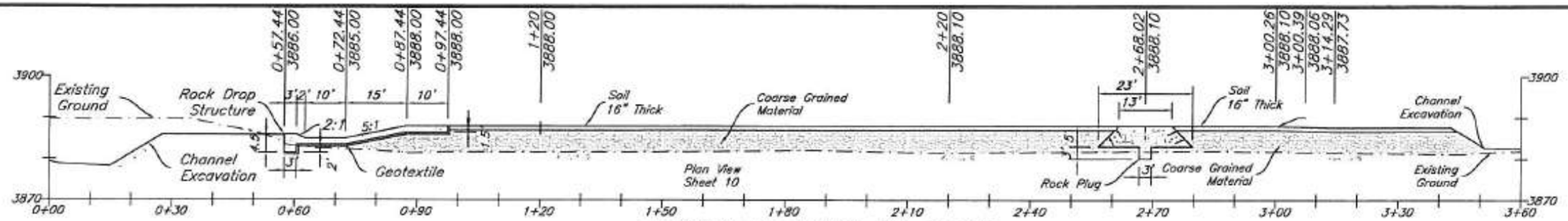
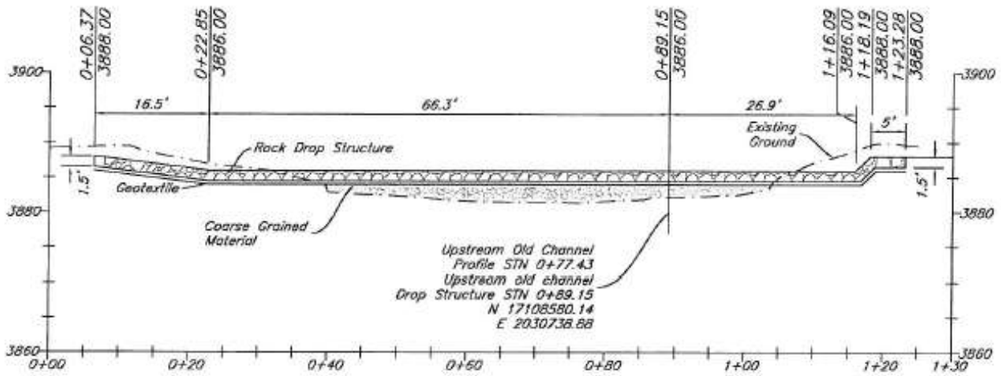
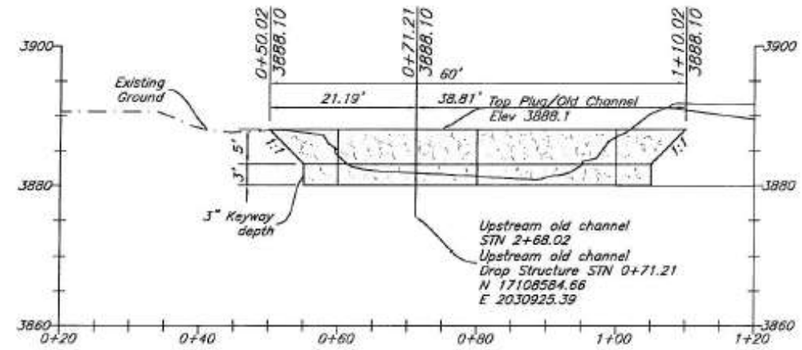


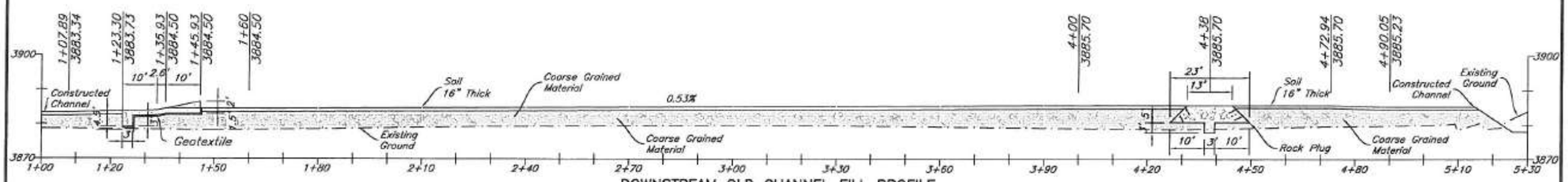
UPSTREAM OLD CHANNEL FILL PROFILE



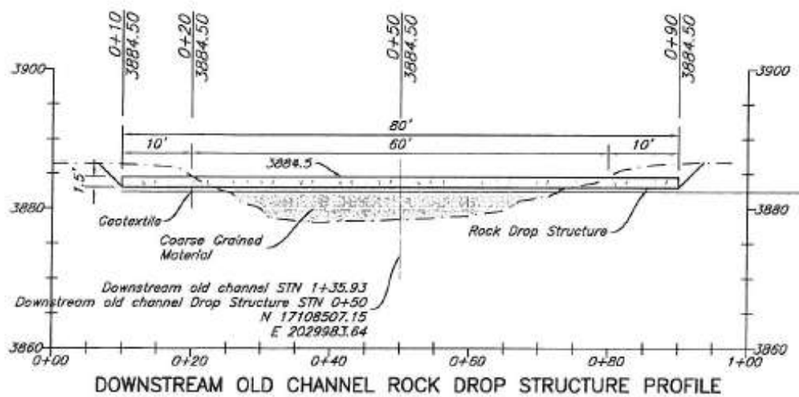
UPSTREAM OLD CHANNEL ROCK DROP STRUCTURE PROFILE



UPSTREAM OLD CHANNEL ROCK PLUG PROFILE



DOWNSTREAM OLD CHANNEL FILL PROFILE



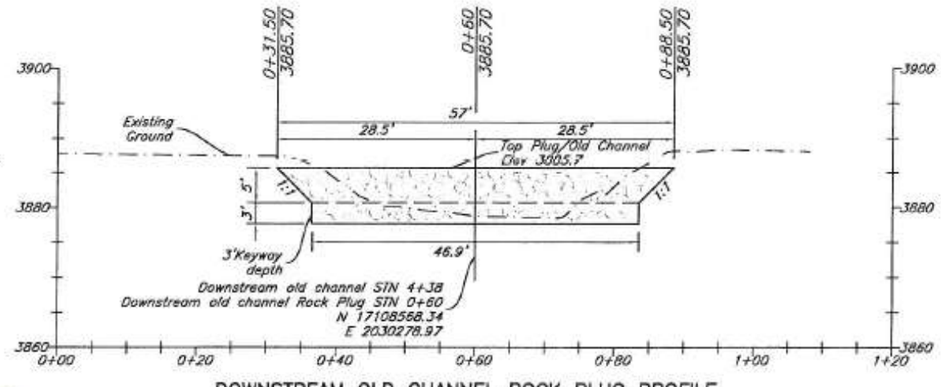
DOWNSTREAM OLD CHANNEL ROCK DROP STRUCTURE PROFILE

PERMANENT DROP STRUCTURE & PLUG NOTES:

1) Riprap to be used for construction of the permanent rock plugs and drop structures in the old stream channel will be angular shot rock. The source will be approved by the NRCS engineer prior to use as meeting project specifications.

2) The drop structures and plugs will be constructed with the NRCS inspector present. See construction specifications for rock gradation and additional requirements.

3) Rock Plugs shall be enveloped with 2 feet minimum, coarse granular material.



DOWNSTREAM OLD CHANNEL ROCK PLUG PROFILE

DRAFT

		Date
Designed	K Hoffman	7/2014
Drawn	B Krueger	7/2014
Checked	K Hoffman	7/2014
Approved		

OLD CHANNEL DETAILS

BIG SPRING CREEK RESTORATION PROJECT

MACHLER, ADAMS And MT FISH WILDLIFE & PARKS

FERGUS COUNTY MONTANA

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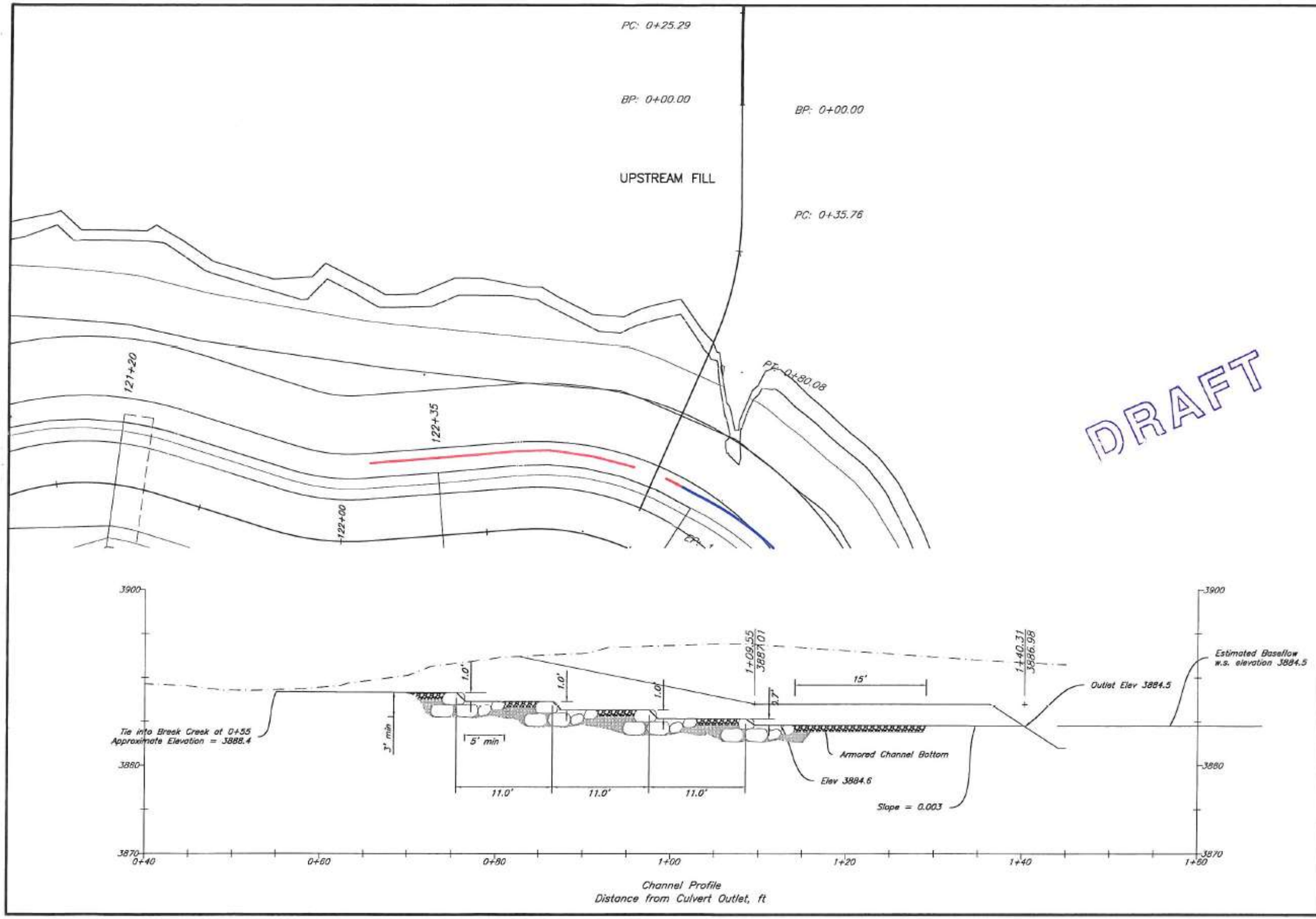

		Date
Designed	K Hoffman	7/2014
Drawn	B Krueger	7/2014
Checked	K Hoffman	7/2014
Approved		

PLAN & PROFILE BREED CREEK

BIG SPRING CREEK RESTORATION PROJECT

MACHLER, ADAMS And MT FISH WILDLIFE & PARKS

FERGUS COUNTY MONTANA

USDA United States Department of Agriculture

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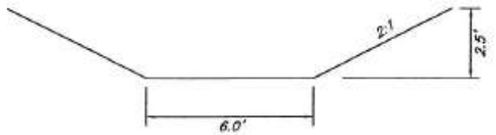
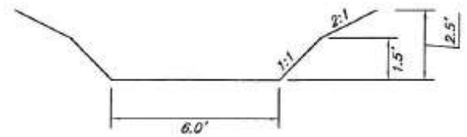
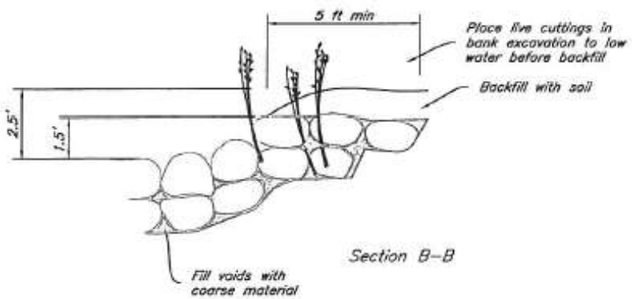


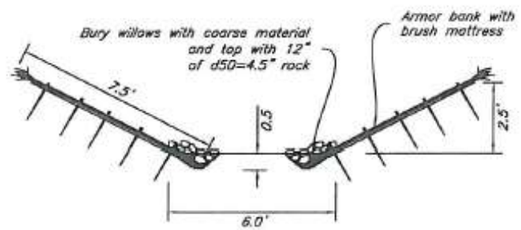
Typical Section
Upstream and Downstream
of Stone Drops



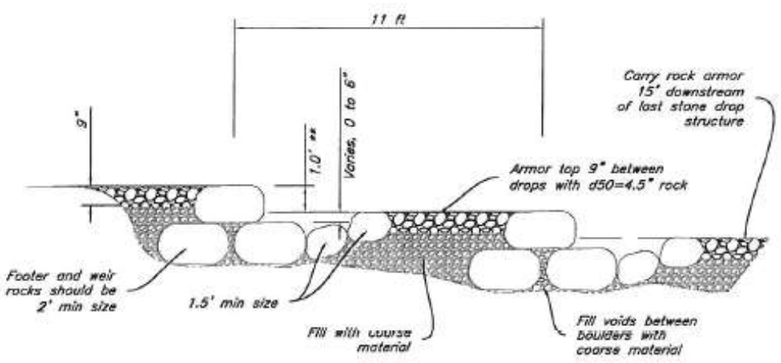
Typical Section
Sta 0+75 to 1+08



Section B–B

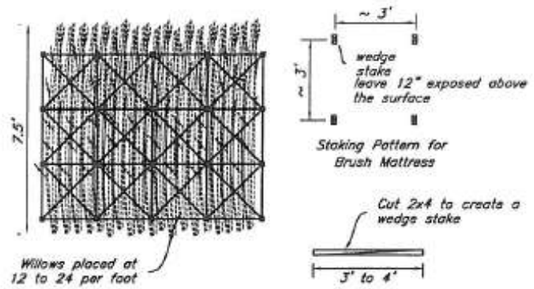


Bank Protection
Upstream and Downstream
of Stone Drops

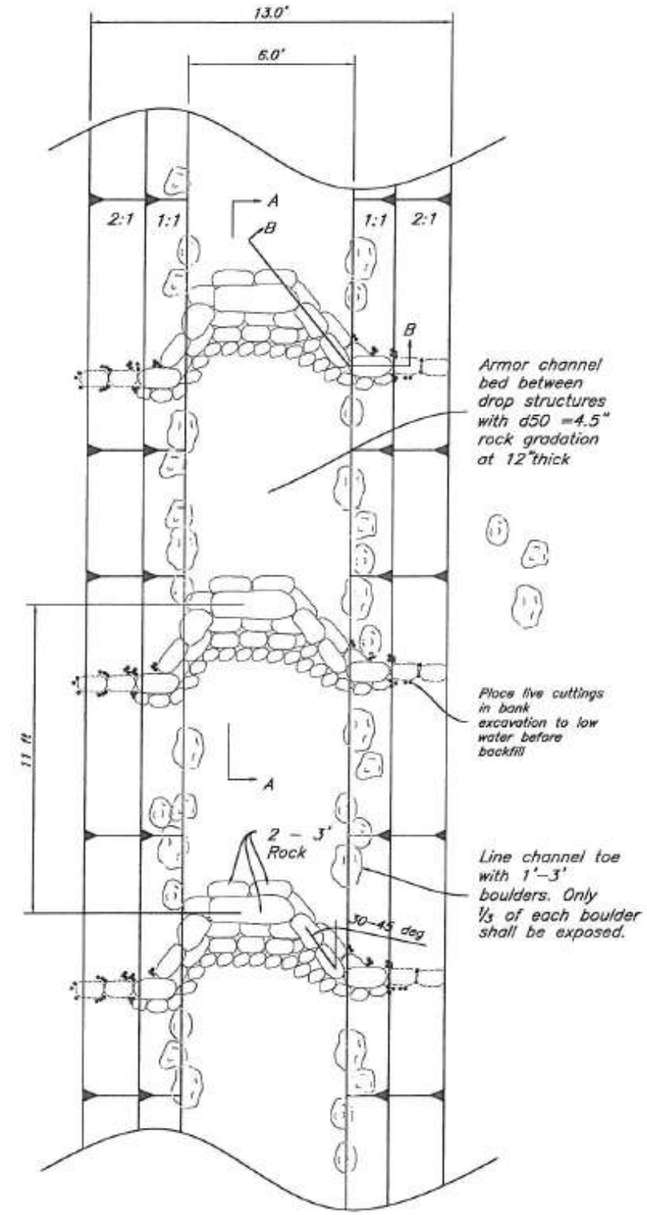


** The last drop is 0.7'

Section A–A



Details for Brush Mattress



Plan View
Stone Drop Structures

DRAFT

		Date
Designed	K Hoffman	7/2014
Drawn	B Krueger	7/2014
Checked	K Hoffman	7/2014
Approved:		

BREED CREEK DETAILS
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

USDA United States Department of Agriculture
Natural Resources Conservation Service

File No. BigSpPlanBreed CreekK021615.dwg
Drawing No. ----

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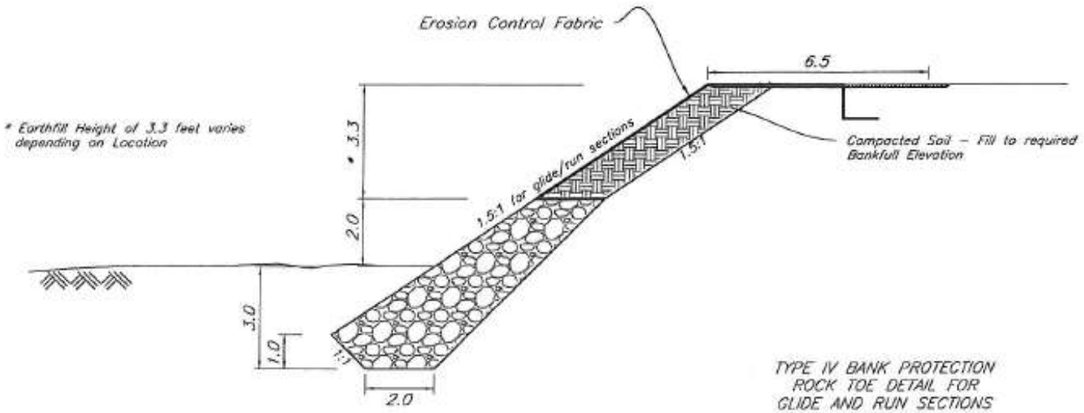
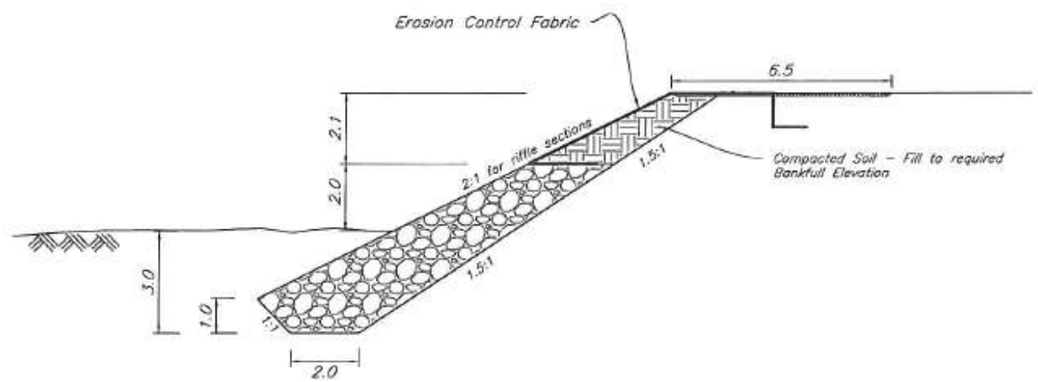


GRADATION - ROCK TOE

Size	% Passing
9"	100%
6 3/4"	60-100
4 1/2"	35-50
2 1/4"	10-35
1 1/4"	0-25

TYPE IV BANK PROTECTION
ROCK TOE DETAIL FOR
GLIDE AND RUN SECTIONS
N.T.S.



GRADATION - ROCK TOE

Size	% Passing
9"	100%
6 3/4"	60-100
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1 1/4"	0-25

TYPE IV BANK PROTECTION
ROCK TOE DETAIL FOR
RIFFLE SECTIONS
N.T.S.

DRAFT

		Date
Designed	K Hoffman	7/2014
Drawn	D Baker	7/2014
Checked		
Approved		

TYPE IV BANK PROTECTION
BIG SPRING CREEK RESTORATION PROJECT
MACHLER, ADAMS And MT FISH WILDLIFE & PARKS
FERGUS COUNTY MONTANA

United States Department of Agriculture
Natural Resources Conservation Service

File No. BigSpCr_Details.dwg

Drawing No. #

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