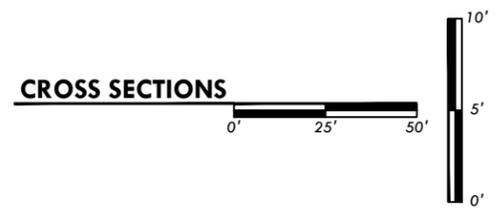
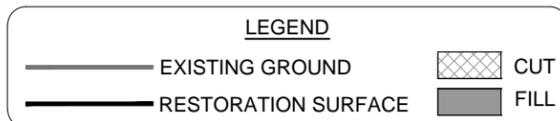
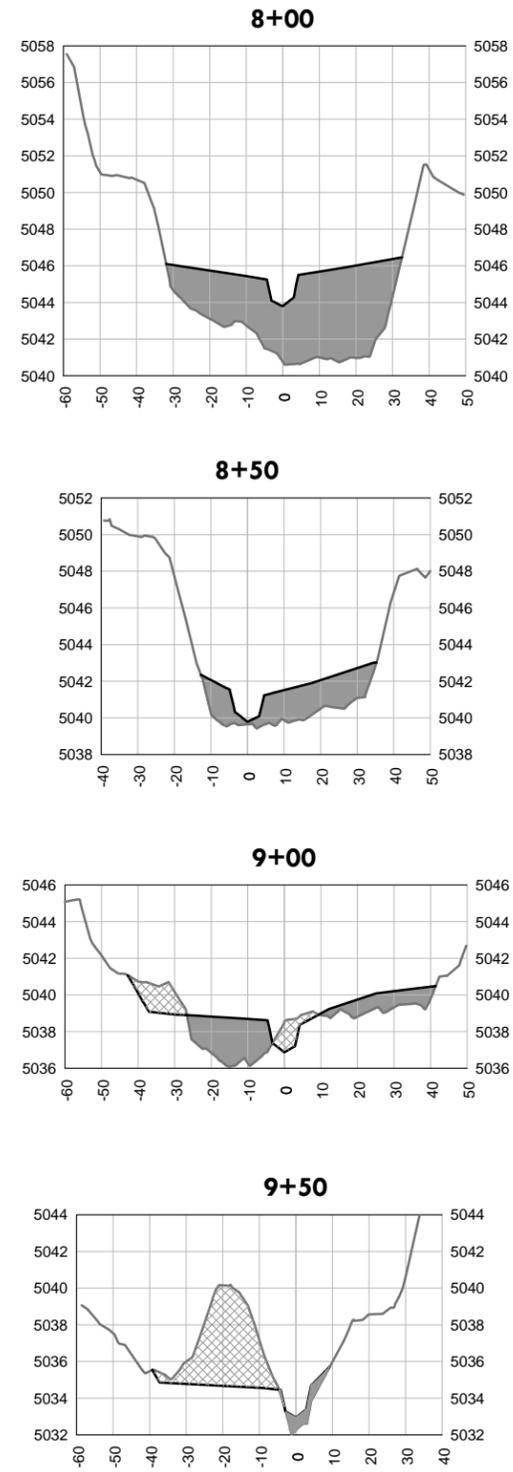
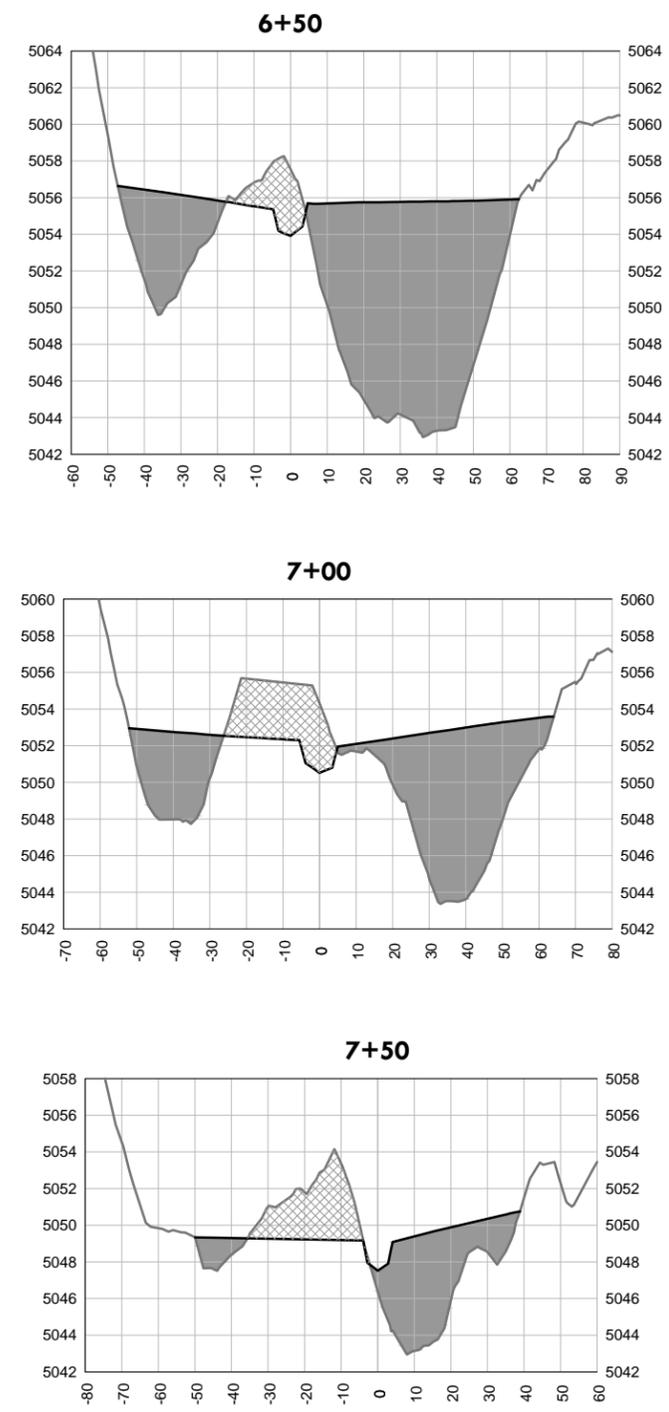
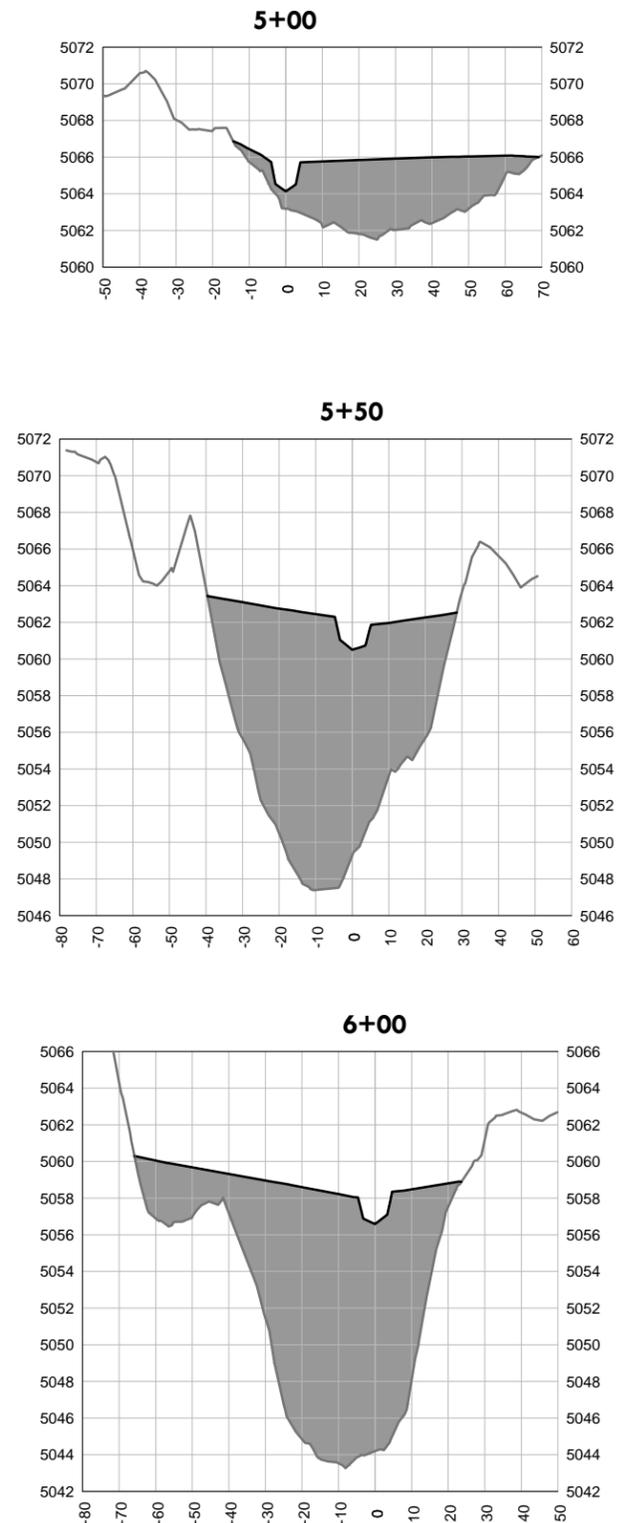
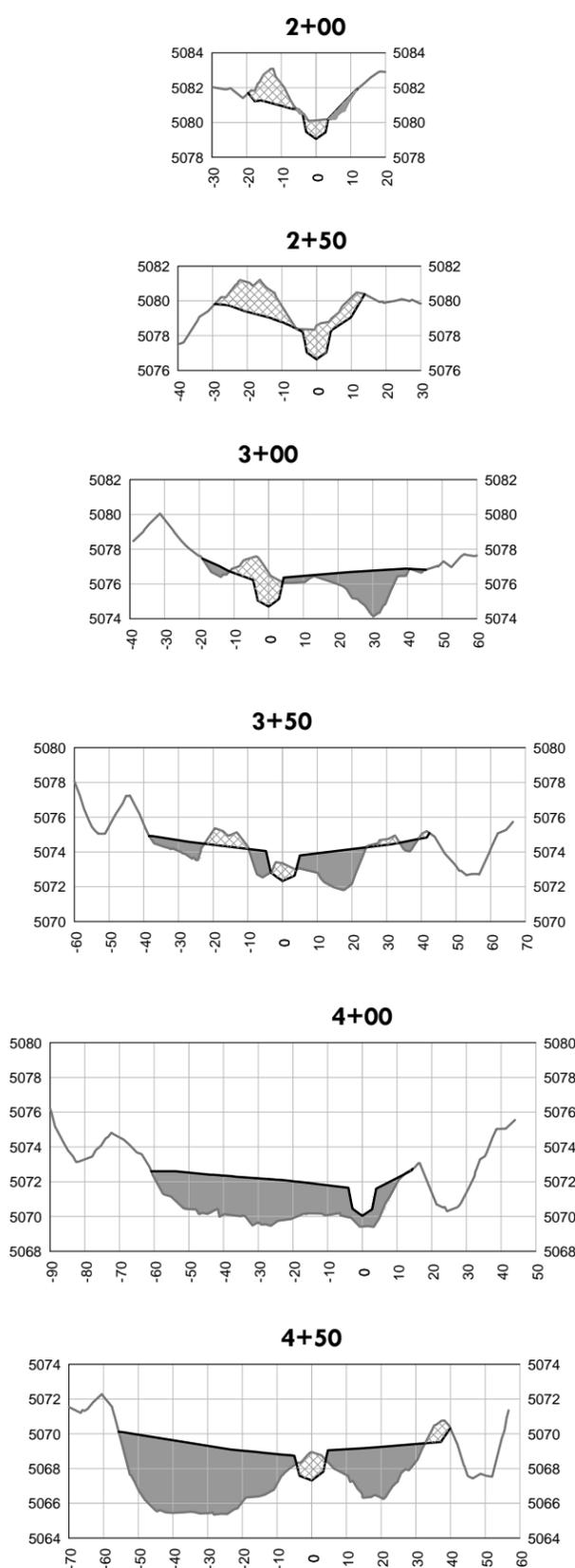




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CROSS SECTIONS



NOTE: CROSS SECTIONS ARE SHOWN LOOKING DOWNSTREAM PERPENDICULAR TO THE VALLEY ALONG THE CHANNEL ALIGNMENT.

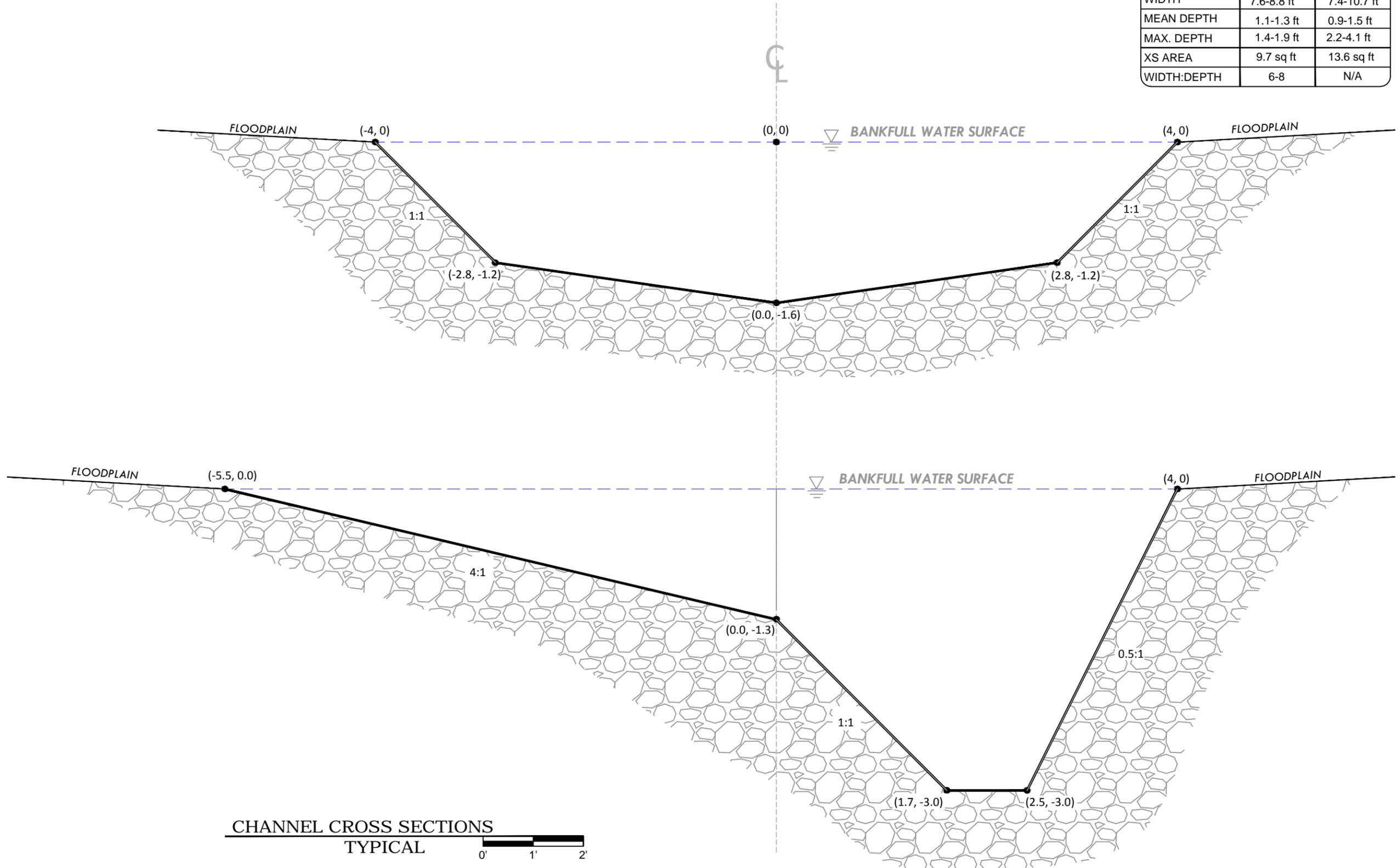
NO.	DATE	BY	DESCRIPTION	CHK
1	02-15-14	NW	FINAL DESIGN	JM

PROJECT NUMBER
RDG-12-067

SHEET NUMBER
9.0

BANKFULL CHANNEL DESIGN CRITERIA		
STREAM TYPE	B4	
DISCHARGE	25 CFS	
VALLEY SLOPE	0.055-0.09 FT/FT	
SINUOSITY	1.17	
CHANNEL SLOPE	0.05-0.08 FT/FT	
PARAMETER	RIFFLE	POOL
WIDTH	7.6-8.8 ft	7.4-10.7 ft
MEAN DEPTH	1.1-1.3 ft	0.9-1.5 ft
MAX. DEPTH	1.4-1.9 ft	2.2-4.1 ft
XS AREA	9.7 sq ft	13.6 sq ft
WIDTH:DEPTH	6-8	N/A

CHANNEL CROSS SECTION DIMENSIONS



CHANNEL CROSS SECTIONS
 TYPICAL

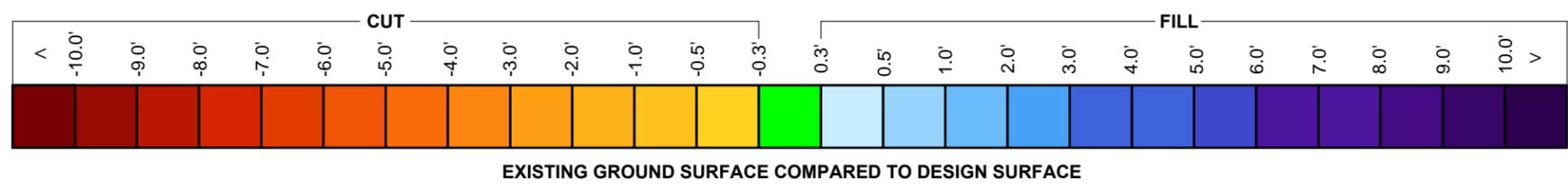
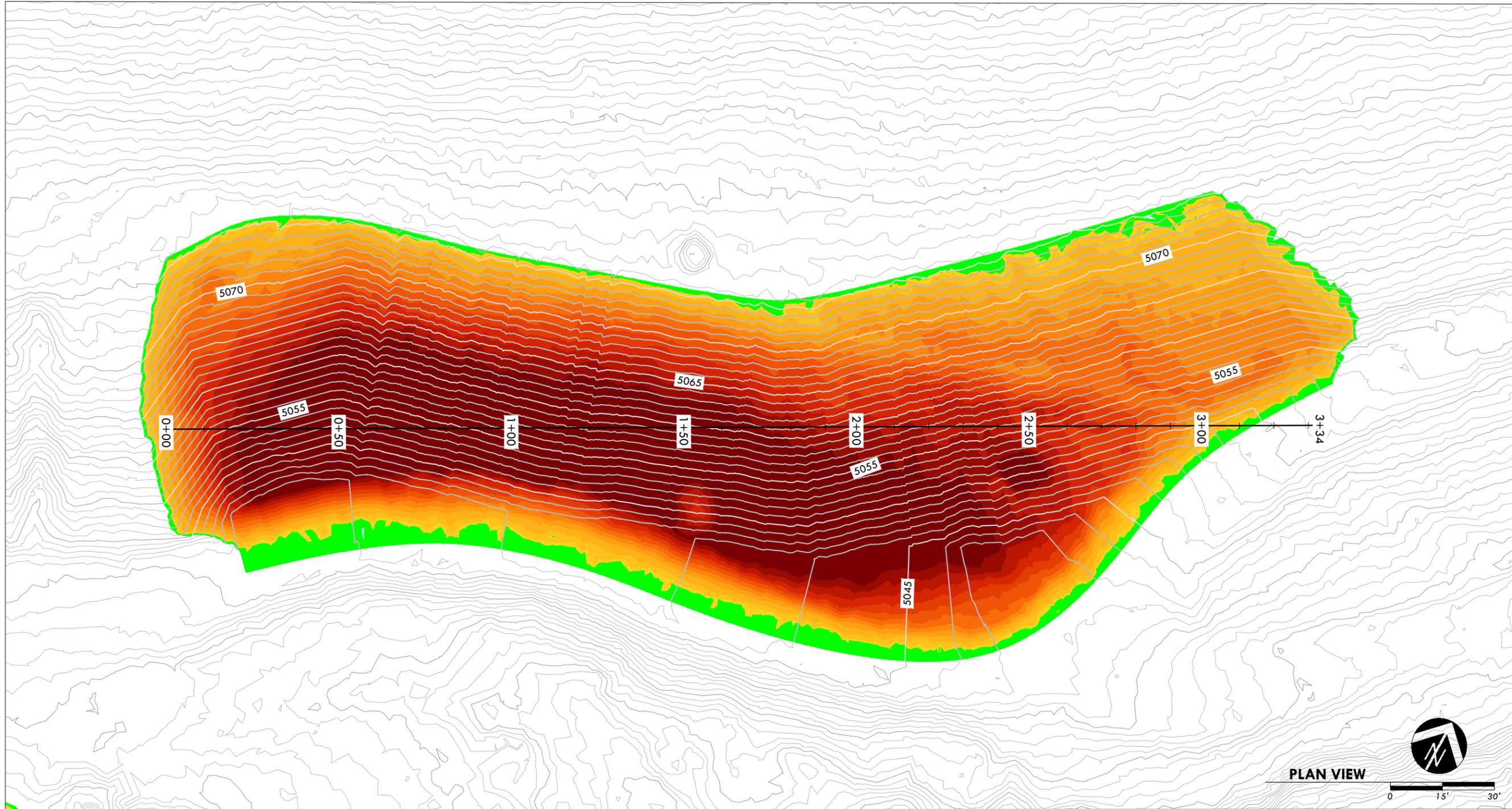


NOTE: COORDINATES ARE REFERENCED FROM TOP OF BANK CENTERLINE

NO.	DATE	BY	DESCRIPTION	CHK
1	02-15-14	NW	FINAL DESIGN	JM

PROJECT NUMBER
 RDG-13-001

SHEET NUMBER
10.0



EARTHWORK VOLUMES
7,127 CY NET CUT
 NOTE: REPORTED VOLUMES ARE NEATLINE

**MATERIAL BORROW
 SOURCE GRADING PLAN**

NO.	DATE	BY	DESCRIPTION	CHK
1	02-15-14	NW	FINAL DESIGN	JM

PROJECT NUMBER
 RDG-14-002

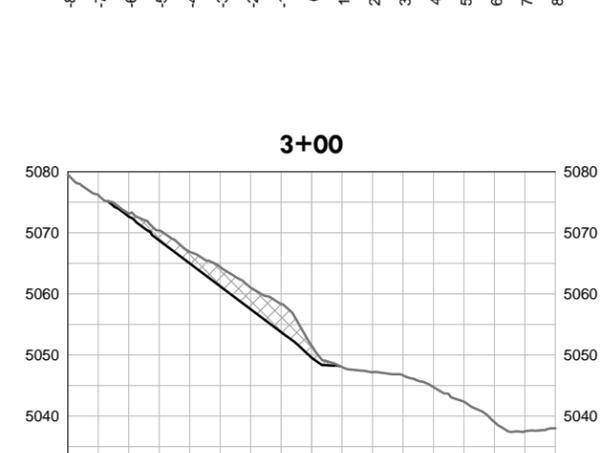
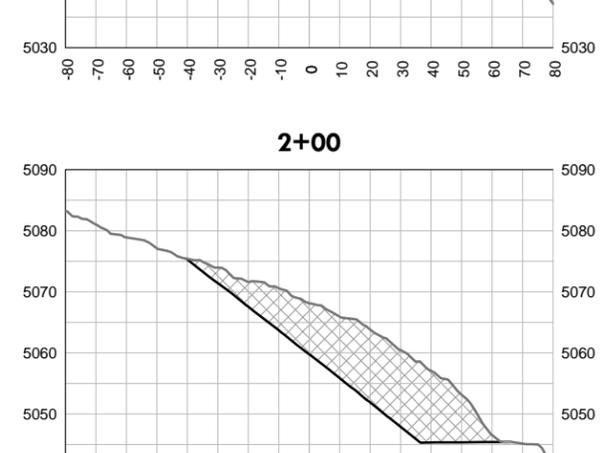
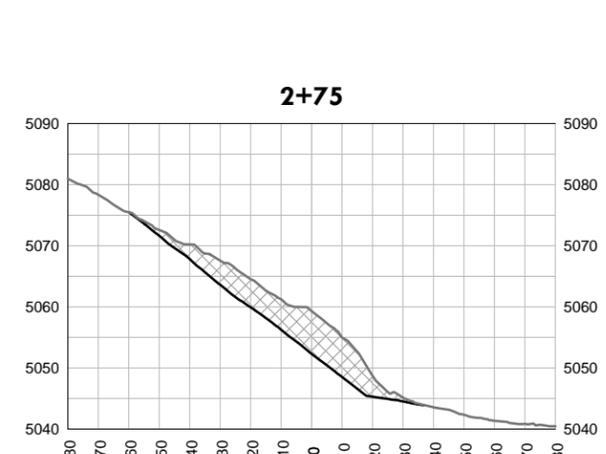
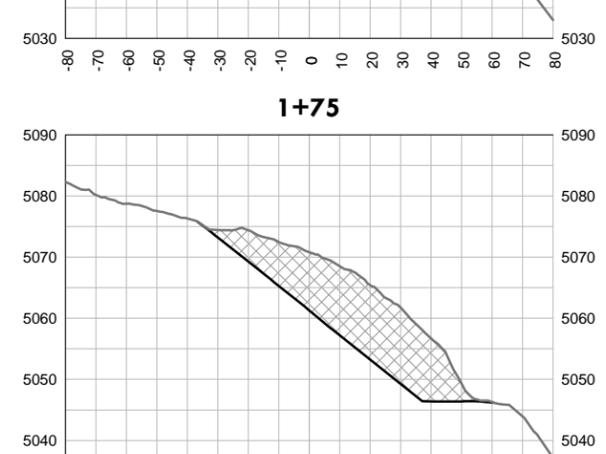
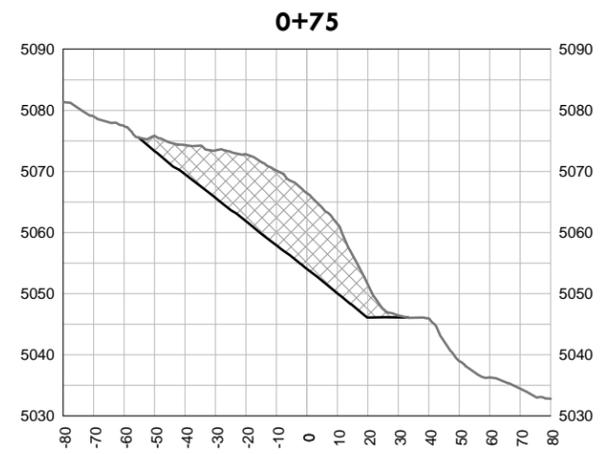
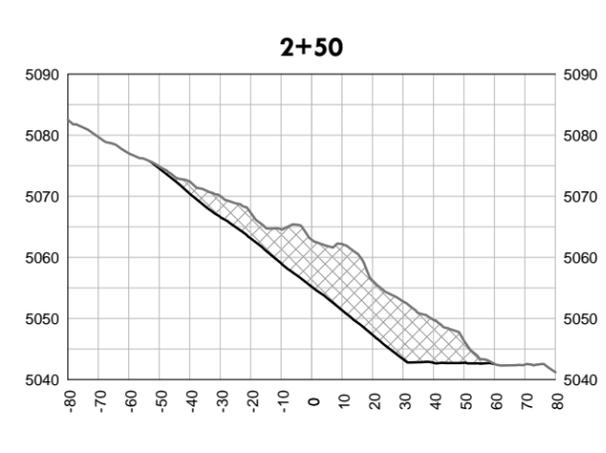
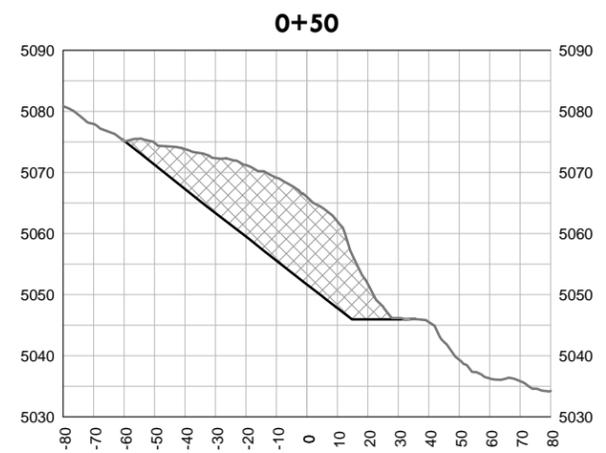
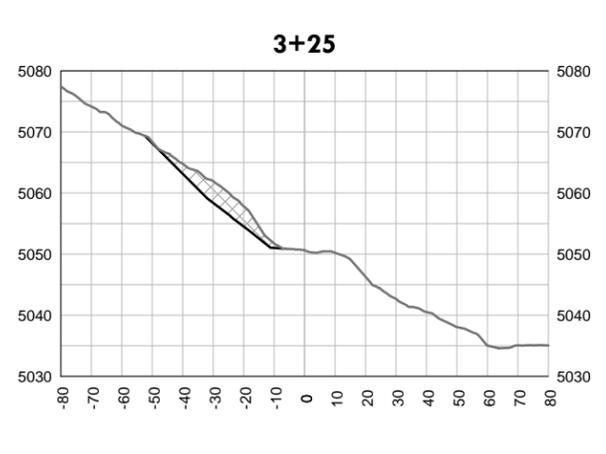
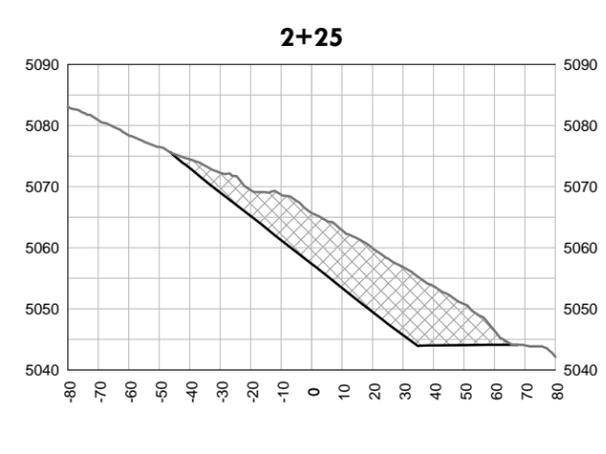
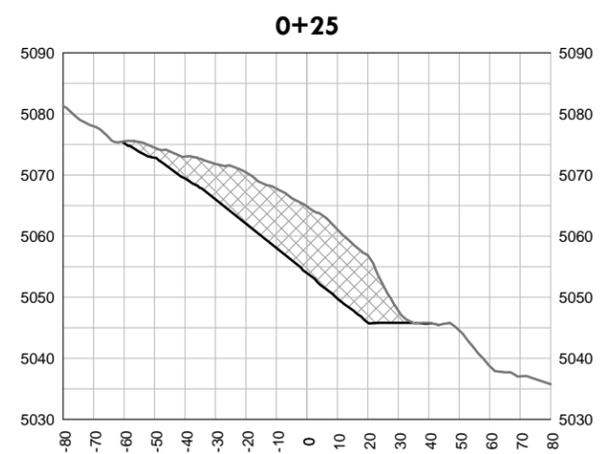
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MATERIAL BORROW SOURCE CROSS SECTIONS



LEGEND

— EXISTING GROUND

— FINISHED GRADE

▨ CUT

CROSS SECTIONS

NO.	DATE	BY	DESCRIPTION	CHK
1	02-15-14	NW	FINAL DESIGN	JM

PROJECT NUMBER
RDG-14-002

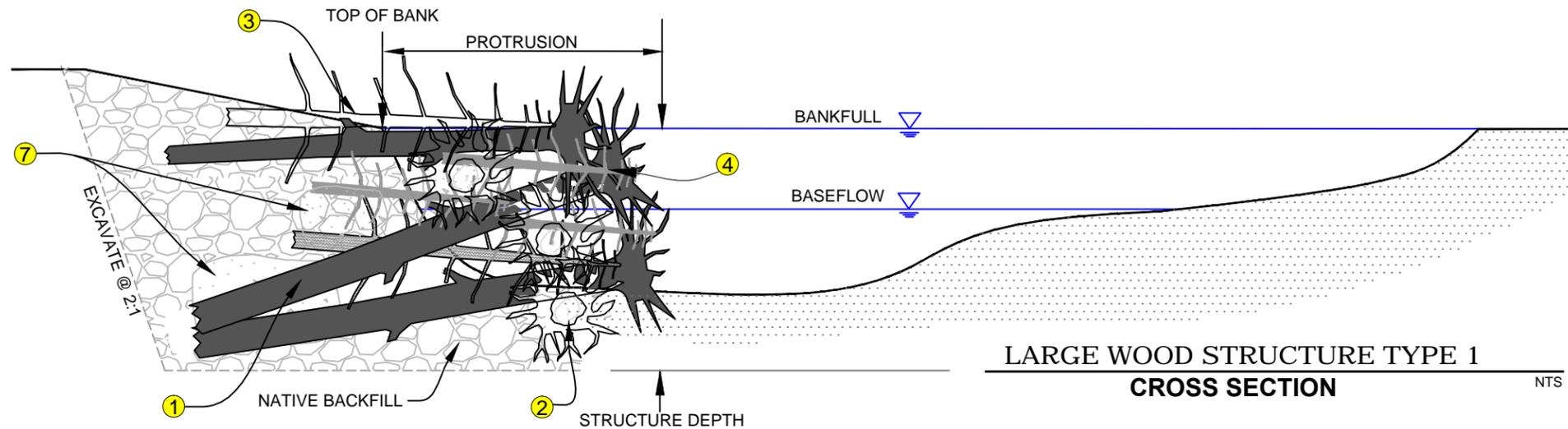
SHEET NUMBER

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NOTE: CROSS SECTIONS ARE SHOWN LOOKING DOWN VALLEY PERPENDICULAR TO THE BORROW SITE ALIGNMENT.



LARGE WOOD STRUCTURE TYPE 1
PLAN VIEW NTS



LARGE WOOD STRUCTURE TYPE 1
CROSS SECTION NTS

DESIGN INTENT

THE INTENT OF THE LARGE WOOD STRUCTURE IS TO PROVIDE SHORT-TERM STREAMBANK PROTECTION AND STABILIZATION BY RE-DIRECTING FLOW AWAY FROM THE CHANNEL MARGINS, DISSIPATING ENERGY, REDUCING NEAR-BANK STRESS, AND MAINTAINING LATERAL SCOUR POOLS. THE STRUCTURE ALSO PROVIDES BANK STRENGTH TO SUPPORT RIPARIAN VEGETATION ESTABLISHMENT ALONG OUTSIDE MEANDER STREAMBANKS. THE STRUCTURE INCORPORATES SEVERAL TIERS OF BRUSH AND WOOD TO INCREASE CHANNEL MARGIN ROUGHNESS AND PROVIDE NEAR-BANK AQUATIC HABITAT COMPLEXITY. THE STRUCTURE INCLUDES A CONSTRUCTED TOE TO PROVIDE STREAMBANK STABILITY FOR DESIGN EVENT NEAR-BANK SHEAR STRESS CONDITIONS. THE STRUCTURE IS USED IN A SEQUENCE WITH OTHER STREAMBANK STRUCTURES AND IS NOT USED AS A STAND-ALONE TREATMENT.

THE LARGE WOOD STRUCTURE IS USED IN AREAS OF HIGH SHEAR STRESS ALONG THE CHANNEL PLANFORM, SPECIFICALLY OUTSIDE MEANDER STREAMBANKS ALONG POOL AND RUN CHANNEL UNITS. OVER TIME, THE STRUCTURE WILL ACCUMULATE ADDITIONAL COARSE WOOD AND DEFORM AS THE CHANNEL MIGRATES ACROSS THE FLOODPLAIN.

CONSTRUCTION NOTES

EXCAVATE TRENCH AND SET FOOTER LOGS AT SPECIFIED DEPTH. USE FOOTER LOGS WITH MINIMUM DIAMETER AND STEM LENGTH AS SPECIFIED. FOOTER LOGS SHALL NOT HAVE A ROOTFAN. IF POSSIBLE, BACKFILL UP TO TOP OF FOOTER LOGS WITH SPECIFIED ALLUVIAL BACKFILL. DOUSE BACKFILL PERIODICALLY WITH WATER TO IMPROVE COMPACTION AND MINIMIZE VOID SPACES.

SET ROOTWAD LOGS ON FOOTER LOGS. PLACE LOGS STEMS SLOPING DOWNWARD INTO BANK FROM EDGE OF WATER. USE ROOTWADS WITH MINIMUM ROOTFAN DIAMETER AND STEM LENGTH AS SPECIFIED. BACKFILL UP TO TOP OF ROOTWAD LOGS AND PLACE BALLAST ROCKS ON TOP OF ROOTWAD LOGS AT LOCATIONS WHERE ROOTWAD LOGS INTERSECT FOOTER LOGS. DOUSE BACKFILL PERIODICALLY WITH WATER TO IMPROVE COMPACTION AND MINIMIZE VOID SPACES.

ADD ADDITIONAL TIER OF FOOTER LOGS AND ROOTWAD LOGS AS SHOWN AND DESCRIBED ABOVE. COVER BALLAST ROCKS AND TOP OF STRUCTURE WITH ALLUVIUM AS APPROVED BY THE CONSTRUCTION MANAGER. PLACE DEFLECTOR LOGS AND BRUSH ON TOP TIERS AS SHOWN.

THE CONSTRUCTION MANAGER SHALL INSPECT AND APPROVE ALL FOOTER LOGS AND ROOTWAD LOGS PRIOR TO BACKFILLING. NOTIFY CONSTRUCTION MANAGER OF ANY PROPOSED CHANGES PRIOR TO IMPLEMENTATION. THE CONSTRUCTION MANAGER RESERVES THE RIGHT TO MODIFY STRUCTURE DESIGN SPECIFICATIONS DURING CONSTRUCTION IF WARRANTED DUE TO UNFORESEEN CONDITIONS.

MATERIAL SCHEDULE (PER STRUCTURE)

	ITEM	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	LIMBS	QUANTITY
②	CATEGORY 2 WOOD	12-18	18-20	YES	NO	8
③	CATEGORY 3 WOOD	6-12	10-12	OPTIONAL	YES	4
④	CATEGORY 4 WOOD	6-MINUS	8-12	OPTIONAL	YES	4
⑦	CATEGORY 2 ROCK	12-24				6



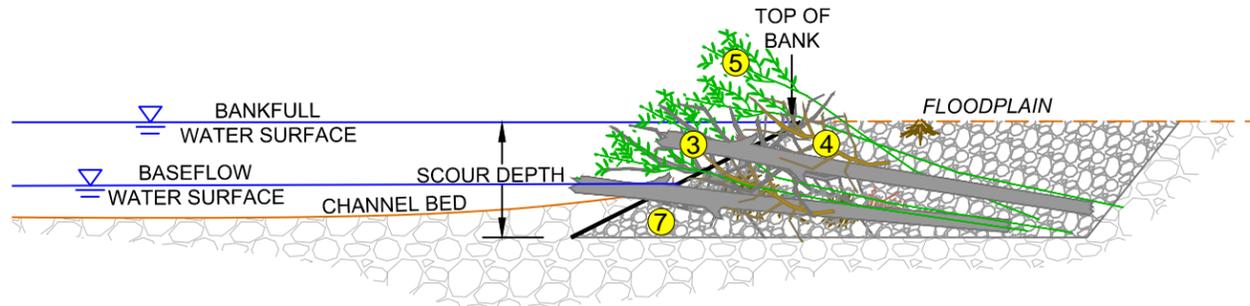
EXAMPLE OF A LARGE WOOD STRUCTURE

NO.	DATE	BY	DESCRIPTION	CHK
1	02-15-14	NW	FINAL DESIGN	JM

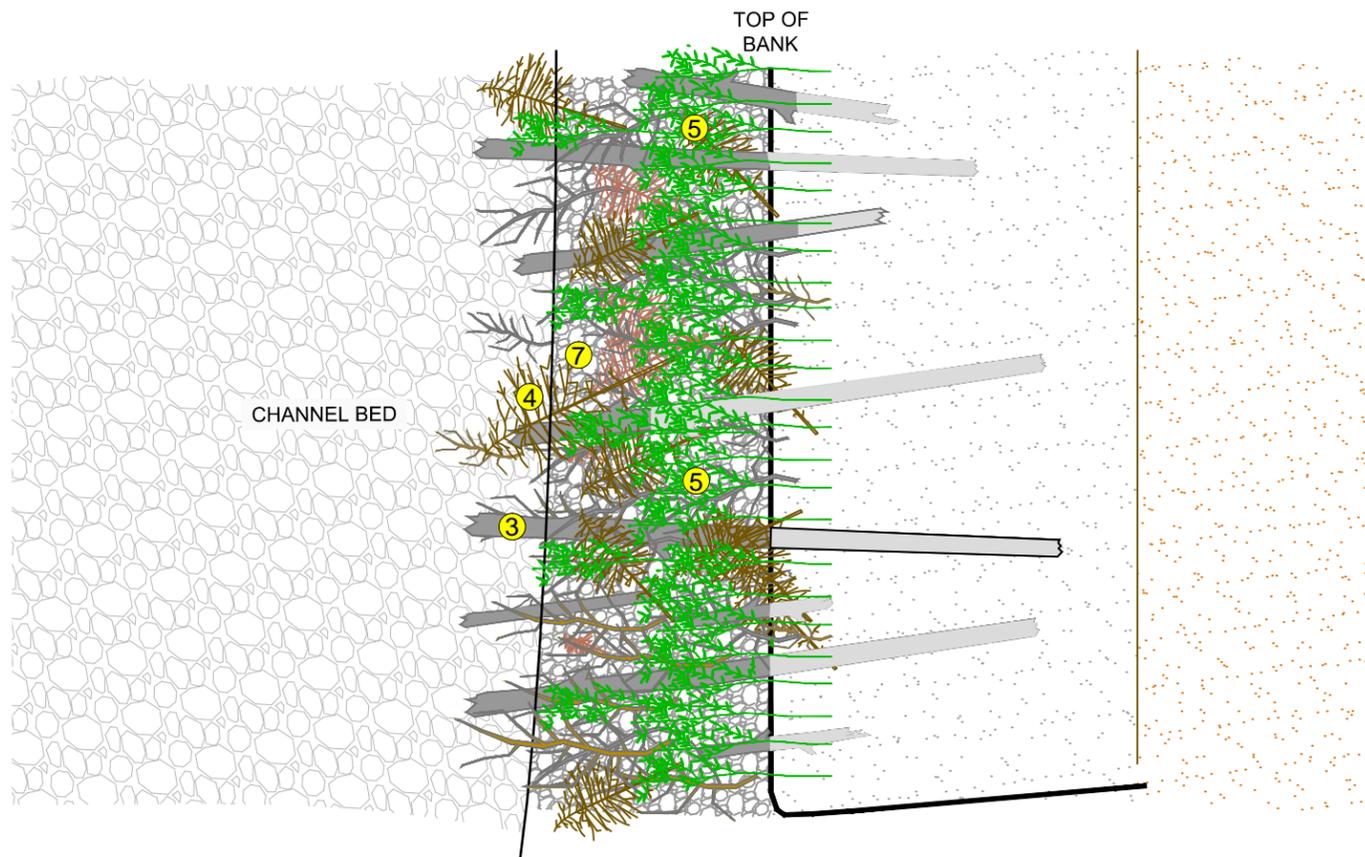
PROJECT NUMBER
RDG-14-002

SHEET NUMBER

12.0



VEGETATED WOOD AND BRUSH FASCINE TYPE 1
SECTION VIEW NTS



VEGETATED WOOD AND BRUSH FASCINE TYPE 1
PLAN VIEW NTS

DESIGN INTENT

THE INTENT OF THE VEGETATED WOOD AND BRUSH FASCINE STRUCTURE IS TO PROVIDE SITE CONDITIONS DIRECTLY ALONG THE CHANNEL BOUNDARIES (STREAMBANKS) THAT ARE SUITABLE FOR GROWING RIPARIAN VEGETATION. THE VEGETATED WOOD AND BRUSH FASCINE STRUCTURE PROVIDES BANK STRENGTH IN THE SHORT-TERM UNTIL MATURE RIPARIAN VEGETATION ESTABLISHES AND PROVIDES LONG-TERM STREAMBANK STABILITY. THE STRUCTURE ALSO PROVIDES CHANNEL MARGIN ROUGHNESS AND NEAR-BANK AQUATIC HABITAT COMPLEXITY.

THE TYPE 1 STRUCTURE IS USED IN ZONES OF HIGH SHEAR STRESS ALONG THE CHANNEL PLANFORM INCLUDING OUTSIDE MEANDER STREAMBANKS, RIFFLE CHANNEL UNITS, AND RUN AND GLIDE CHANNEL UNIT TRANSITIONS. THE STRUCTURE IS USED IN A SEQUENCE WITH OTHER STREAMBANK STABILIZATION STRUCTURES AND IS NOT USED AS A STAND-ALONE TREATMENT. THE TYPE 1 STRUCTURE INCLUDES A CONSTRUCTED TOE TO PROVIDE STREAMBANK STABILITY FOR DESIGN EVENT NEAR-BANK SHEAR STRESS CONDITIONS.

CONSTRUCTION NOTES

VEGETATED WOOD AND BRUSH FASCINE TYPE 1 SHALL BE BUILT ON IMPORTED ALLUVIUM AS SPECIFIED. THE CONSTRUCTION MANAGER SHALL VIEW AND APPROVE FOUNDATION LAYER. BRUSH TOE SHALL BE PLACED IN CONJUNCTION WITH NATIVE ROCK AND LAYERED TO AT A 1:1 SLOPE TO CREATE THE TOE OF THE STRUCTURE. MATERIAL AND SHALL BE STABILIZED DOWN TO THE MAXIMUM ANTICIPATED RUN SCOUR DEPTH.

INTERLACE LIVE CUTTINGS WITH BRUSH, WOOD AND NATIVE ALLUVIUM TO CREATE THE DESIGN BANK. CUTTINGS SHALL BE A MIN. LENGTH OF 8' AND MIN. WIDTH OF 0.25" WITH A MAXIMUM OF 2' FEET EXPOSED. INSTALL WHILE VEGETATION IS DORMANT.

NOTIFY CONSTRUCTION MANAGER OF ANY PROPOSED CHANGES PRIOR TO IMPLEMENTATION. THE CONSTRUCTION MANAGER RESERVES THE RIGHT TO MODIFY STRUCTURE DESIGN SPECIFICATIONS DURING CONSTRUCTION IF WARRANTED DUE TO UNFORESEEN CONDITIONS.

MATERIAL SCHEDULE (PER LINEAR FOOT)

ITEM	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	LIMBS	QUANTITY
③	CATEGORY 3 WOOD	6-12	10-12	OPTIONAL YES	1
④	CATEGORY 4 WOOD	6-MINUS	8-12	OPTIONAL YES	2
⑤	RIPARIAN CUTTINGS	0.25	6-8	YES	7
⑦	CATEGORY 2 ROCK	8-PLUS			0.25



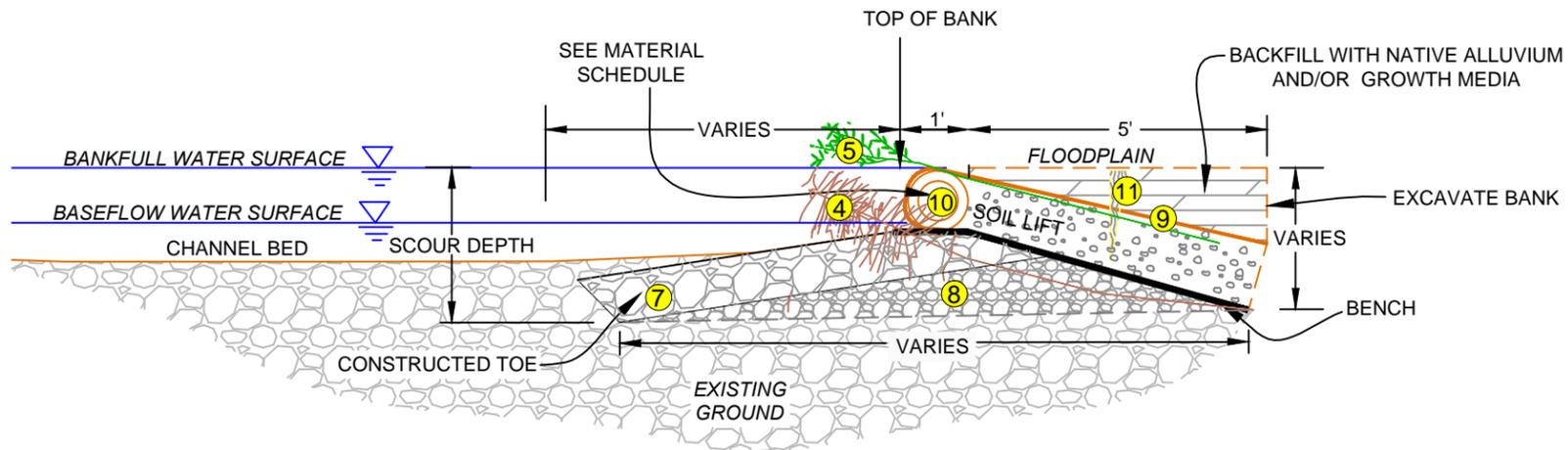
EXAMPLE OF A CONSTRUCTED VEGETATED WOOD AND BRUSH FASCINE

NO.	DATE	BY	DESCRIPTION	CHK
1	02-15-14	NW	FINAL DESIGN	JM

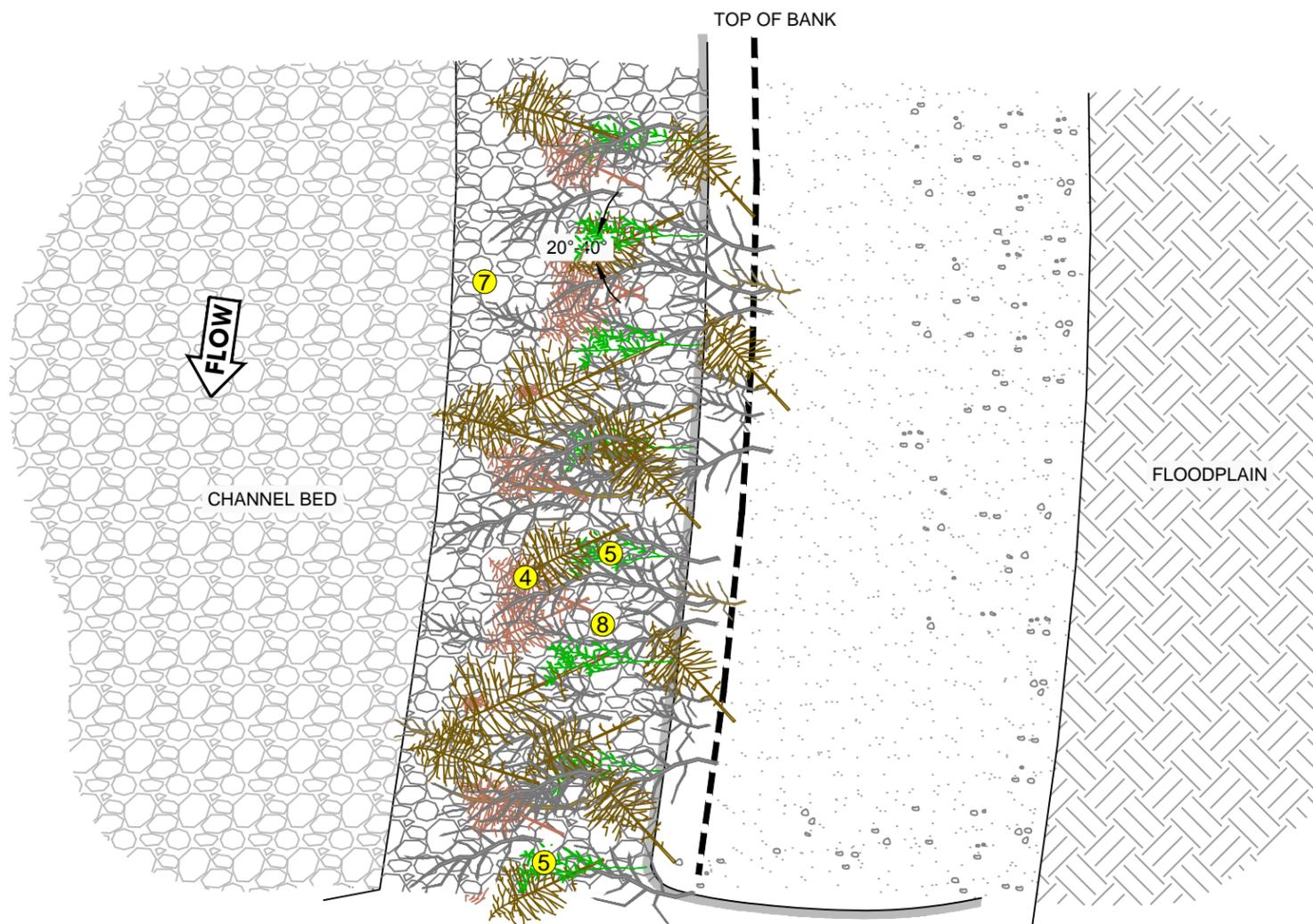
PROJECT NUMBER
RDG-14-002

SHEET NUMBER

12.1



VEGETATED SOIL LIFT TYPE 1
SECTION VIEW NTS



VEGETATED SOIL LIFT TYPE 1
PLAN VIEW NTS

DESIGN INTENT

THE INTENT OF THE VEGETATED SOIL LIFT TYPE 1 IS TO PROVIDE SITE CONDITIONS DIRECTLY ALONG THE CHANNEL BOUNDARIES (STREAMBANKS) THAT ARE SUITABLE FOR GROWING RIPARIAN VEGETATION. THE VEGETATED SOIL LIFT TYPE 1 PROVIDES BANK STRENGTH IN THE SHORT-TERM UNTIL MATURE RIPARIAN VEGETATION ESTABLISHES AND PROVIDES LONG-TERM STREAMBANK STABILITY. THE STRUCTURE INCORPORATES A HIGH DENSITY COIR LOG IN ONE LIFT TO SUPPORT THE BANK SHAPE, INCREASE MOISTURE RETENTION, AND EXTEND THE DURATION OF THE GROWING SEASON. THE STRUCTURE INCORPORATES WOOD AND BRUSH TO INCREASE CHANNEL MARGIN ROUGHNESS AND PROVIDE NEAR-BANK AQUATIC HABITAT COMPLEXITY. THE TYPE 1 STRUCTURE INCLUDES A CONSTRUCTED TOE TO PROVIDE STREAMBANK STABILITY FOR DESIGN EVENT NEAR-BANK SHEAR STRESS CONDITIONS. THE STRUCTURE IS USED IN A SEQUENCE WITH OTHER STREAMBANK STABILIZATION STRUCTURES AND IS NOT USED AS A STAND-ALONE TREATMENT.

THE VEGETATED SOIL LIFT TYPE 1 IS USED IN AREAS OF LOW TO MODERATE SHEAR STRESS ALONG THE CHANNEL PLANFORM INCLUDING RIFFLE CHANNEL UNITS, AND RUN AND GLIDE CHANNEL UNIT TRANSITIONS WHERE THE CHANNEL THALWEG MAXIMUM DEPTH IS TYPICALLY LESS THAN 18-INCHES RELATIVE TO BANKFULL. OVER A FIVE TO SEVEN YEAR PERIOD, THE FABRIC WILL DECOMPOSE AND THE ROOTING STRENGTH OF ESTABLISHED VEGETATION IS INTENDED TO MAINTAIN LOW BANK EROSION RATES.

CONSTRUCTION NOTES

VEGETATED SOIL LIFT TYPE 1 SHALL BE BUILT ON SUITABLE ALLUVIUM OR IMPORTED ALLUVIUM AS SPECIFIED. THE CONSTRUCTION MANAGER SHALL VIEW AND APPROVE FOUNDATION LAYER PRIOR TO CONSTRUCTING SOIL LIFTS. TOE WOOD SHALL BE CENTERED WITHIN THE TOE MATERIAL AND SHALL BE STABILIZED DOWN TO THE MAXIMUM ANTICIPATED RUN SCOUR DEPTH.

UPSTREAM AND DOWNSTREAM "TIE-IN" POINTS SHALL BE STABLE AREAS AND THE FABRIC SHALL BE STAKED TIGHTLY INTO THE STABLE AREA USING WOOD STAKES AT 1-FOOT O.C.

SLOPE SOIL LIFTS APPROXIMATELY 10-DEGREES ANGLED DOWN INTO THE BANK AS ILLUSTRATED ON THE SECTION DETAIL.

PLACE LIVE CUTTINGS ABOVE SOIL LIFT. CUTTINGS SHALL BE A MIN. LENGTH OF 8' AND MIN. WIDTH OF 0.5" WITH A MAXIMUM OF 2' FEET EXPOSED. INSTALL WHILE VEGETATION IS DORMANT.

NOTIFY CONSTRUCTION MANAGER OF ANY PROPOSED CHANGES PRIOR TO IMPLEMENTATION. THE CONSTRUCTION MANAGER RESERVES THE RIGHT TO MODIFY STRUCTURE DESIGN SPECIFICATIONS DURING CONSTRUCTION IF WARRANTED DUE TO UNFORESEEN CONDITIONS.

SOIL LIFT FILL AND BACKFILL:

- SOIL LIFTS SHALL BE FILLED WITH A MIXTURE OF NATIVE GRAVELS AND SOIL FROM ON-SITE SOURCES.
- EACH LIFT SHALL BE COMPACTED USING BUCKET COMPACTION OR EQUAL TO A MINIMUM OF 90% MAXIMUM RELATIVE DENSITY.
- WILLOW STAKES SHALL BE PLACED IN BETWEEN EACH SOIL LIFT AS SHOWN.
- APPLY NATIVE SEED MIX TO TOP OF EACH SOIL LIFT ON THE FRONT 2-FEET (EXPOSED AREA)
- AFTER CONSTRUCTION OF BOTH LIFTS, SOIL LIFTS SHALL BE BACKFILLED WITH NATIVE ALLUVIUM TO THE TOP OF BANK ELEVATION. SIX INCHES OF GROWTH MEDIA SHALL THEN BE PLACED ON TOP OF THE ALLUVIUM.
- VEGETATE TOP OF SOIL LIFTS PER PLANTING PLANS.
- DEEP WATER SOIL LIFTS AFTER BACKFILL IN PLACE.

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	LIMBS	QUANTITY
4	CATEGORY 4 WOOD	6-MINUS	8-12	OPTIONAL	YES	1
5	RIPARIAN CUTTINGS	0.25	6-8		YES	5
7	CATEGORY 2 ROCK	8-PLUS				0.15
8	CATEGORY 3 ROCK	6-MINUS				0.15
9	COIR MAT	N/A				1.1
10	12" COIR LOG	12"	10			1
11	WOODEN WEDGE STAKES	2" X 24"	2			0.5



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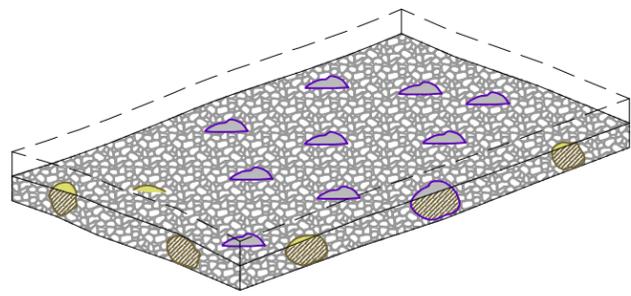
VEGETATED SOIL LIFT TYPE 1

NO.	DATE	BY	DESCRIPTION	CHK
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PROJECT NUMBER
RDG-14-002

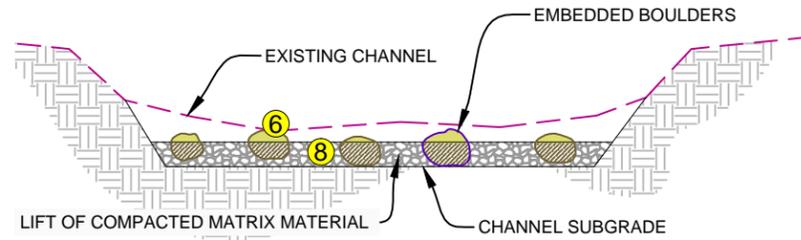
SHEET NUMBER

12.2



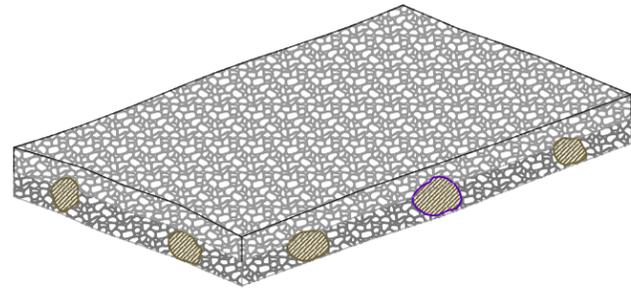
**CHANNEL PREPARATION AND BASE LIFT
INSTALLATION CROSS SECTION**

3-D VIEW NTS



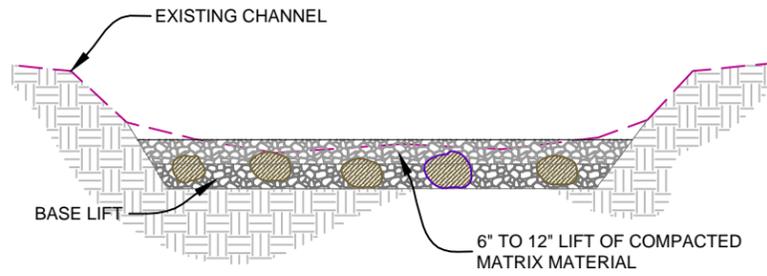
**CHANNEL PREPARATION AND BASE LIFT
INSTALLATION CROSS SECTION**

SECTION VIEW NTS



TOP LIFT INSTALLATION

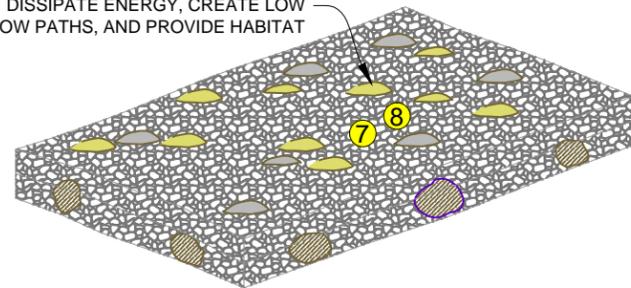
3-D VIEW NTS



TOP LIFT INSTALLATION

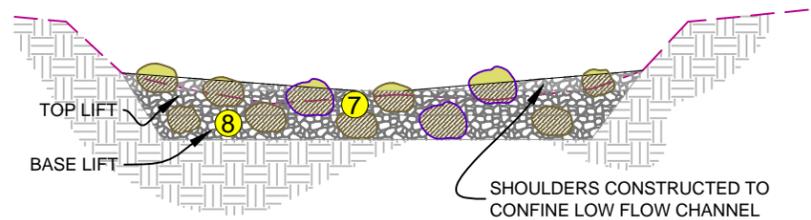
SECTION VIEW NTS

⑥ BOULDERS ARRANGED TO DISSIPATE ENERGY, CREATE LOW FLOW PATHS, AND PROVIDE HABITAT



FINISHED GRADE

3-D VIEW NTS



FINISHED GRADE

SECTION VIEW NTS

DESIGN INTENT

THE INTENT OF THE CONSTRUCTED RIFFLE IS TO PROVIDE A STABLE CONSTRUCTED SURFACE COMPRISED OF NATIVE AND IMPORTED (WHEN NECESSARY) SUBSTRATE. THE ENGINEERED FILL IS USED TO INCREASE THE RIVER CHANNEL BED ELEVATION AND IS TYPICALLY CONSTRUCTED TO FORM RIFFLE, RUN, AND GLIDE HABITAT UNITS. THE FILL COMPOSITION INCLUDES THREE PRIMARY SUBSTRATE CLASSIFICATIONS INCLUDING GRAVELS, COBBLES, BOULDERS, AND FINES. GRAVELS AND COBBLES FORM THE ENGINEERED FILL MATRIX. BOULDERS PROVIDE SCOUR RESISTANCE, INFLUENCE LOW FLOW STREAM FLOW PATTERNS AND HYDRAULICS, AND CREATE HABITAT. FINES ARE WASHED INTO THE MATRIX MATERIAL TO SEAL THE STREAMBED TO REDUCE PERCOLATION LOSSES AND BED MATERIAL MOVEMENT. BOULDERS PROTRUDE FROM THE ENGINEERED FILL SURFACE TO PROMOTE DIVERSE FLOW PATHS, PROVIDE ENERGY DISSIPATION, AND CREATE AQUATIC HABITAT.

CONSTRUCTION NOTES

1. CONTRACTOR TO STOCKPILE ENGINEERED FILL MATERIAL PER DESIGN SPECIFICATIONS. MATERIALS ARE TO BE STOCKPILED IN THE IMMEDIATE PROJECT AREA.
2. TREAT EXISTING CHANNEL BED BY REMOVING ORGANICS AND CREATING A PRISMATIC WORKING SURFACE.
3. IMPORT ENGINEERED MATRIX MATERIAL. BUCKET COMPACT MATRIX MATERIAL IN 6 INCH TO 12 INCH LIFTS AND PRESSURE WASH FINES INTO MATRIX MATERIAL USING A TRASH PUMP AND 2 INCH FIRE HOSE WITH NOZEL.
4. EXCAVATE POCKETS INTO MATRIX MATERIAL AND SET BOULDERS TO 50% EMBEDMENT. PRESSURE WASH FINES INTO MATRIX SURROUNDING BOULDERS AND COMPACT WITH EXCAVATOR BUCKET.
5. REPEAT MATRIX CONSTRUCTION AND BOULDER PLACEMENT IN 6 INCH TO 12 INCH LIFTS TO THE DESIGN CHANNEL THALWEG BED ELEVATION.
6. CONTINUE WITH MATRIX CONSTRUCTION AND BOULDER PLACEMENT IN 6 INCH TO 12 INCH LIFTS TO BUILD CHANNEL SHOULDERS.
7. BOULDERS OF VARIOUS SIZES ARE TO BE ADDED TO THE TOP MATRIX LIFT TO CREATE DIVERSE FLOW PATHS AND HABITAT. EACH BOULDER IS TO BE EMBEDDED TO 50% OF THE BOULDER DIAMETER.
8. TOP DRESS COMPLETED ENGINEERED FILL WITH MATRIX MATERIAL.

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	DIAMETER (IN)	QUANTITY
⑥	CATEGORY 1 ROCK	12-24	0.4 EA
⑦	CATEGORY 2 ROCK	8-PLUS	0.2 CY
⑧	CATEGORY 3 ROCK	6-MINUS	0.2 CY



PRISMATIC CHANNEL CLEANED OF DEBRIS



WASHING FINES INTO COMPACTED MATRIX



ADDING MATRIX MATERIAL TO CONSTRUCT LIFT



CONSTRUCTED RIFFLE - FINISH GRADE CHANNEL



EXAMPLE OF A CONSTRUCTED RIFFLE



EXAMPLE OF A CONSTRUCTED RIFFLE

CONSTRUCTED RIFFLE DETAIL

NO.	DATE	BY	DESCRIPTION	CHK
1	02-15-14	NW	FINAL DESIGN	JM

PROJECT NUMBER
RDG-14-002

SHEET NUMBER

12.3