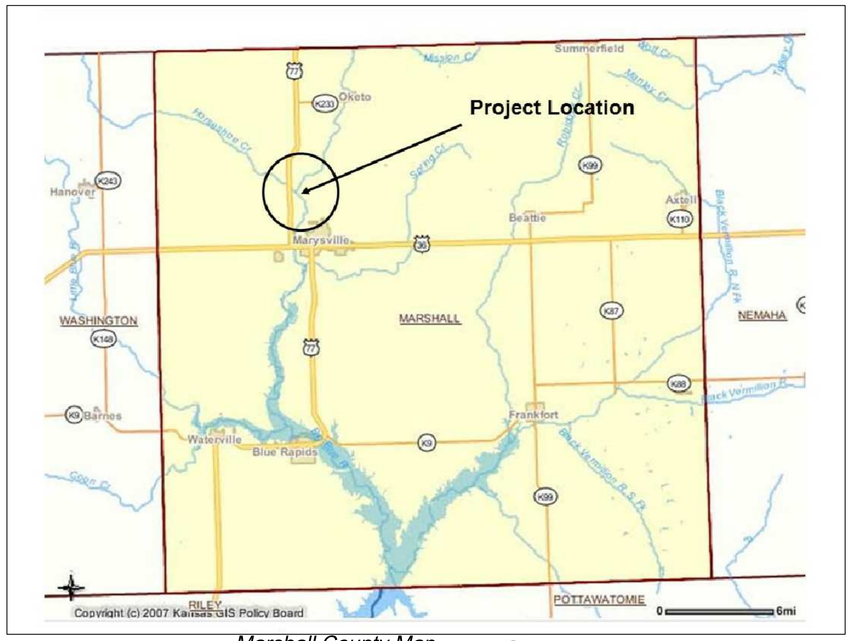
Big Blue River

Site No. BBR 50

Marshall County, Kansas



Marshall County Map
NTS

Sheet Index

Sheet No.	Sheet Title
1	Cover Sheet
2	General Layout
3–5	Plan Sheet
6	Details
7	Cross Section Sheet

Site Location Map
NTS

Quantities

Item	Unit	Total
Rock 18"	Tons	1288
Rock 24"	Tons	2064
Soil Moving	C.Y.	23636
Bare Root Trees	Each	750
Live Stakes	Each	815
Temporary Seeding	Acres	1.08
Native Grass Seeding	Acres	1.08
Mulching	Acres	1.08
Riparian Buffer Ripping	Acres	3.31

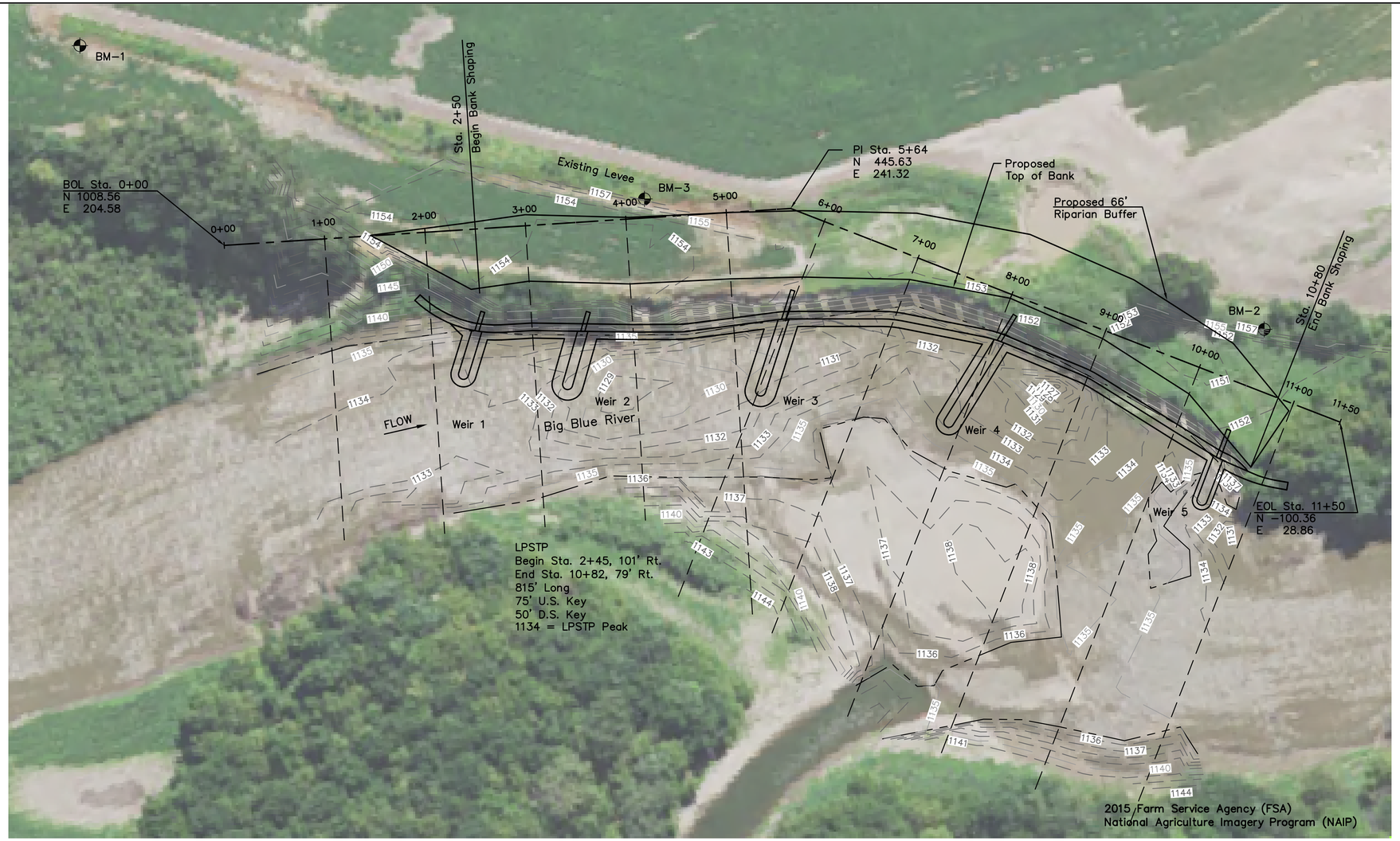
(For specific detailed information on tree, shrub, temporary and native seeding, see NRCS Forms ECS–4 and ECS–5)

Wildhorse Riverworks Inc.
11821 NW 13th Street – Topeka, Kansas 66615
785–213–3778

Water Resources Solutions
8800 Linden Drive Prairie Village, Kansas 66207
913–302–1030

DONALD W. BAKER
LICENSED
14258
KANSAS
PROFESSIONAL ENGINEER
11-06-2017

To the best of my professional knowledge, judgment, and belief, these plans meet applicable NRCS standards.



LEGEND

- Benchmark
- Control Point
- Existing 1 Foot Contour
- Existing 5 Foot Contour
- New Improvements

GENERAL NOTES

1. Structure locations to be field located and staked by Wildhorse Riverworks, Inc.
2. Before any construction activity, the contractor is responsible for calling Kansas One Call at 800-344-7233 (800-DIG-SAFE)
3. Accepted Erosion Control practices will be applied to all disturbed areas.
4. All applicable permits will be obtained by others prior to project construction.
5. The information shown in these plans concerning type and location of underground utilities is not guaranteed to be accurate or all inclusive. Existing utilities and their locations, as shown on the plans, represent the best information obtained for the design. Location information has been obtained from the various utility companies and is either from company record drawings or company provide field locations. The plans locations shown are not guaranteed. Additional existing utilities may also be encountered. The contractor is responsible for making the determinations as to the type and location of underground utilities as may be necessary to avoid damage thereto.
6. Contractor shall maintain construction limits within the existing and/or proposed rights-of-way and easements.
7. The engineer has not performed property or right-of-way surveys for any of the locations shown on this project. Right-of-way or property lines shown on the plans are approximate and are shown for general orientation only. Property corners or other survey markers have not been located, unless specifically called out on the plans.
8. Coordinates for this project are not associated with any known survey or coordinate system.
9. Do not remove any trees larger than 12" DBH or over 50' in height without permission of the Engineer.
10. Soil moving calculations are based on available information. Contractor shall inspect the site and make an evaluation of existing conditions.
11. Contractor shall shape top of bank such that the gradient slopes away from the graded bank.
12. Contractor is responsible for planting from top of LPSTP or water level to top of bank. Buffer field by others.
13. If construction is completed between July 1 and Feb. 1: Before leaving the site, contractor shall rip the entire 66' buffer area to a 20-inch depth.

BENCHMARKS

BM-1	BM-2	BM-3
Iron Bar w/Cap	Iron Bar w/Cap	Iron Bar w/Cap
Sta. -1+30.13	Sta. 10+46.29	Sta. 4+19.78
207.48 Lt.	58.64 Lt.	18.92 Lt.
N 1151.93	N -24.97	N 590.91
E 403.14	E 121.12	E 250.80
EL. 1159.00	EL. 1115.25	EL. 1157.87

0 30 60 120
SCALE: 1" = 60'-0"

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Designed By: PGB
Drawn By: MEM
Checked By: DWB
Date: 7/19/17
Scale: 1"=60'

Wildhorse Riverworks Inc.
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11-06-2017

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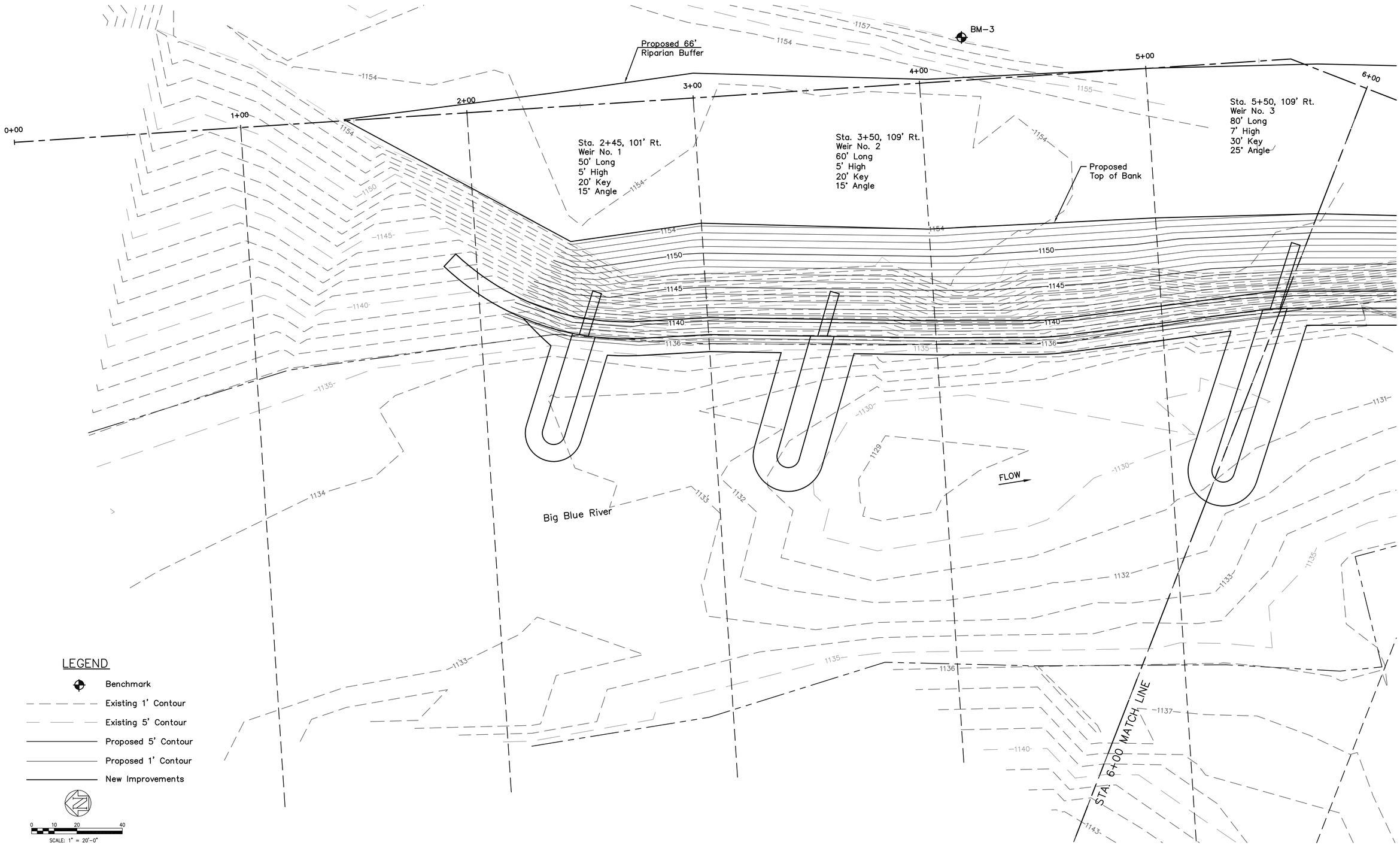
Marshall County, Kansas
Big Blue River

Plan View



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Marshall County, Kansas
Big Blue River

Plan View

3 SHEET OF 7

Date	Comment	No.	BY	CK	APP
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Big Blue River

Plan View

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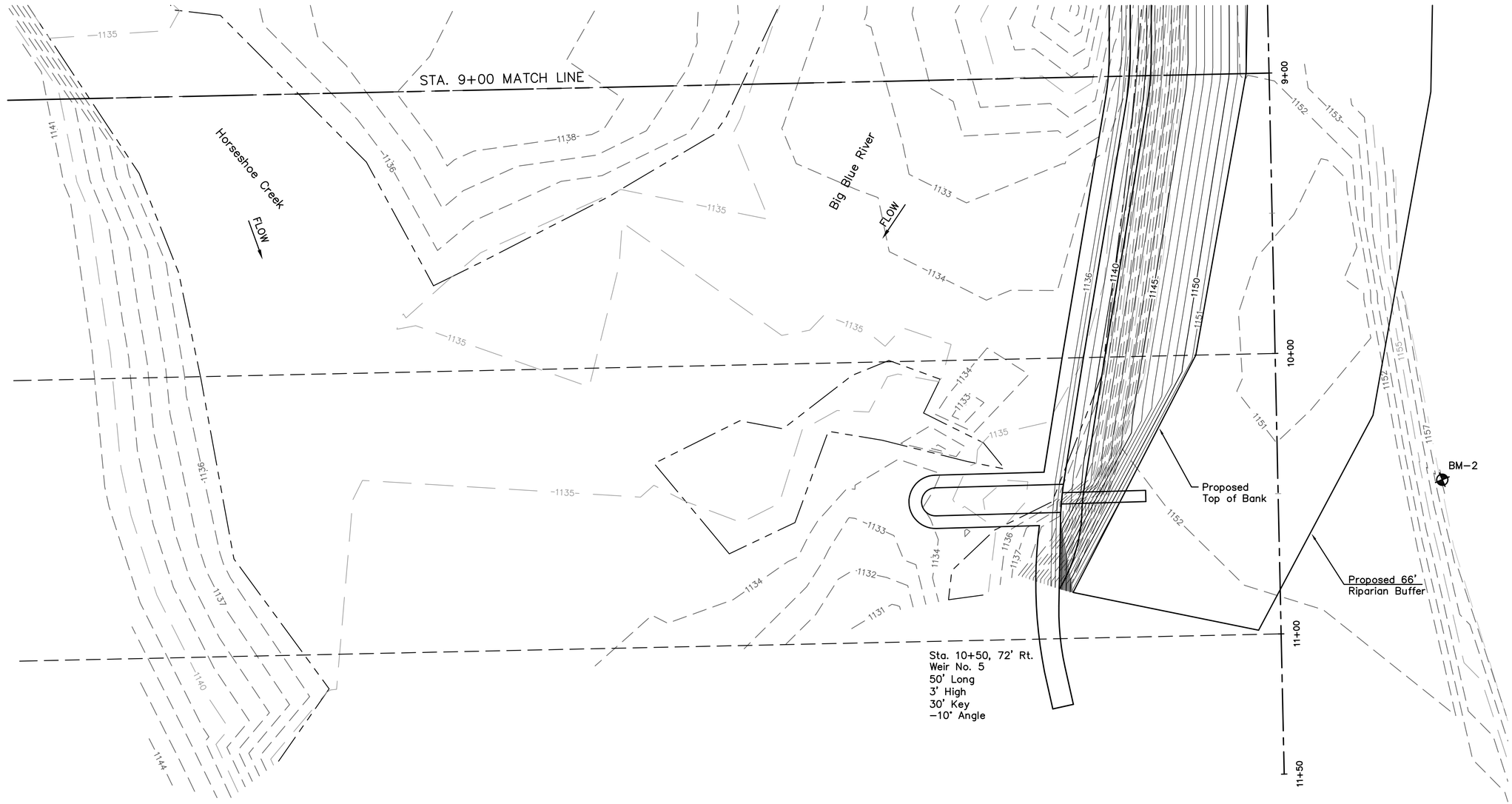

LEGEND

- Benchmark
- Existing 1' Contour
- Existing 5' Contour
- Proposed 5' Contour
- Proposed 1' Contour
- New Improvements

SCALE: 1" = 20'-0"

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Big Blue River

Plan View

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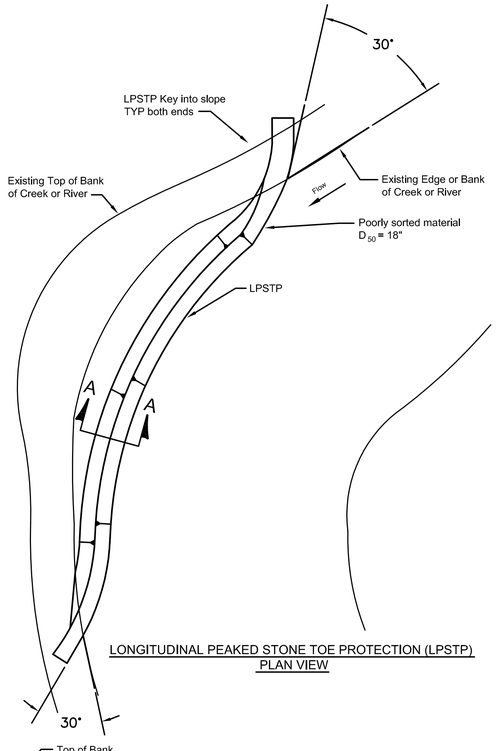
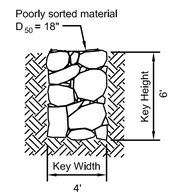
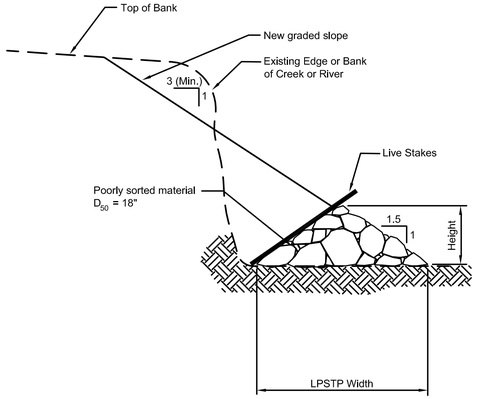


LONGITUDINAL PEAKED STONE TOE PROTECTION (LPSTP)
PLAN VIEW



ROCK KEY SECTION VIEW
LPSTP



LPSTP CROSS SECTION A-A

Project Name		Stream	County	State	Bank		
Claeys Brothers BBR 50-62.5		Big Blue River	Marshall	Kansas	Length		Height
					Shaped	Total	18
					830	1,150	

Structure									Key		
#	Type	Spacing	Angle	Area	Height	Length	Key Length	Yards3	yds3	Tons	Material Specifications
		ft.	(Degrees)	sq. ft.	ft.	ft.	ft.				
1	LPSTP	N/A	N/A	9780	4	815	125	733.5	125	1287.8	Poorly Sorted Limestone Rock
1	Weir	105	15	1250	5	50	20	172	20	288.0	Poorly Sorted Limestone Rock
2	Weir	200	15	1500	5	60	20	196	20	324.0	Poorly Sorted Limestone Rock
3	Weir	217	25	2480	7	80	30	447	30	715.5	Poorly Sorted Limestone Rock
4	Weir	250	20	2500	5	100	30	344	30	561.0	Poorly Sorted Limestone Rock
5	Weir	N/A	-10	950	3	50	30	87	30	175.5	Poorly Sorted Limestone Rock
				8680				1980	255	3352	
							Total yds3	2235			

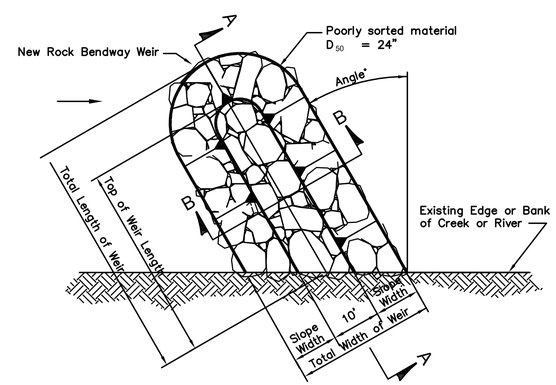
Site Information					
Structure Height / ft.		Cord Length / ft.		990	
Crest Width / ft.	10	Mid Ord / ft.		130	
Finished Slope Grade/H:V	3.00	BkF Elev	1144	At Station	5+00
Schumm Channel Stage	5	Rosgen Classification		C5c-	
Radius of Curvature / ft.	1,007.404	Channel Width / ft.		230.00	
Max. Structure Spacing/ ft.	342.474	Tortuousity		4.380	
Reg. Structure Spacing / ft.	196.042	Critical Shear Stress		0.350	lbs./sq.ft.
Hydraulic Radius / ft.	8.344	Slope = ft./ ft.		0	3.55 ft./mile
Cross Sectional Area / sq. ft.	2395.5	Wetted Perimeter/ ft.		287.1	
Bank Full Discharge / cfs	11,993	Manning's n		0.032	Calculated
		Mean Velocity / fps		5.01	

Quantities List	
Shot Rock Rock / Cubic Yards	2,235
Shot Rock / Tons	3,352
Soil moving/ Cubic Yds.	23,636
Bare Root Trees	750
Live Stakes	815
Temporary Seeding / acres	1.08
Native Grass Seeding / acres	1.08
Mulching / acres	1.08
Riparian Buffer Area / acres	3.31

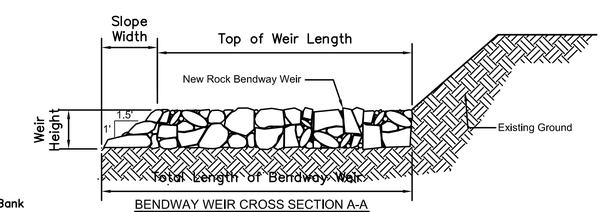
Channel Bank Vegetation - Practice Code 322	
Vegetation Type	Quantity
Bare Root Seedlings / ea.	750.00
Live Stakes / ea.	815.00
Seeding/ acres	1.08
Mulching - Practice Code 484	
Mulching / acres	1.08

Five Year Flood Frequency -	
Discharge / cfs	31,200
4,695.93	Sq. Mi.

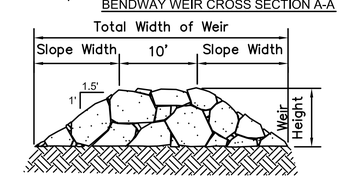
Landowner	Kenny and Dave Claeys
DBA	Claeys Brothers
Address	304 N. 17th St.
City, State Zip	Marysville, KS 66506
Phone	785-562-3304
Legal	NE 1/4, Section 8, T2S, R7E
Date	10/20/2017



BENDWAY WEIR PLAN VIEW



BENDWAY WEIR CROSS SECTION A-A



BENDWAY WEIR CROSS SECTION B-B

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Drawn By: MEM
Checked By: PGB
Date: 9/2/17
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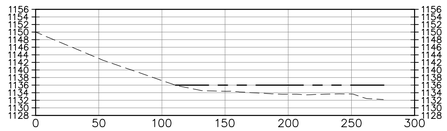
Marshall County, Kansas
Big Blue River

Plan View



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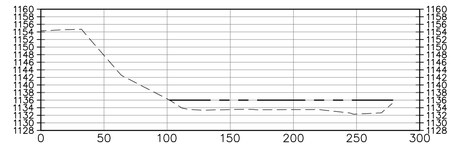

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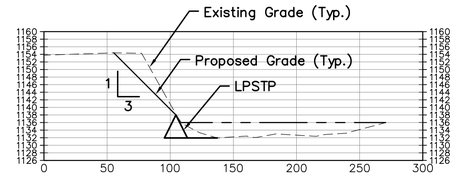

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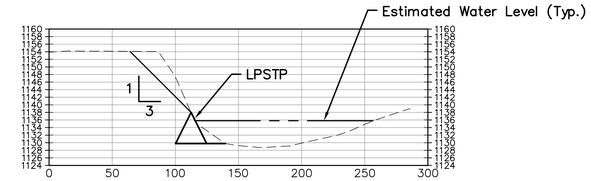

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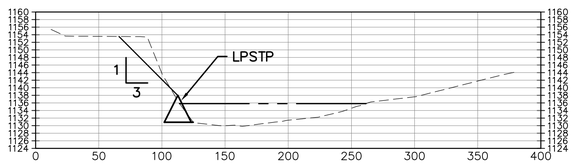

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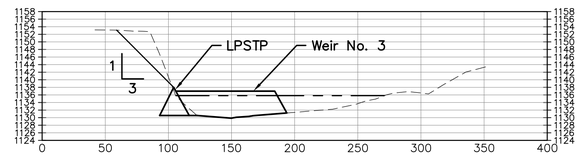

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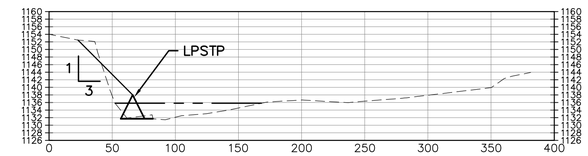

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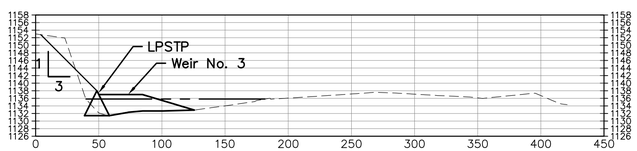

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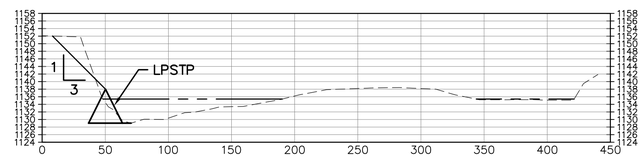

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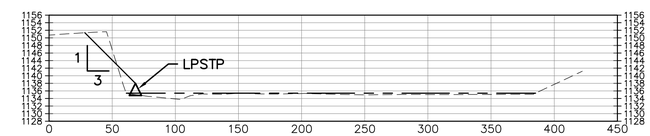

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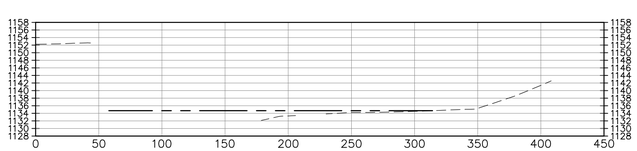

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SCALE:
1"=20' VERT.
1"=60' HORZ.

Date	Comment	No.	BY	CK	APP
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Drawn By: MEM
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Marshall County, Kansas
Big Blue River

Cross Sections

7 SHEET OF 7

CONSTRUCTION SPECIFICATIONS
INDEX

STREAM REHABILITATION
CONSTRUCTION

Kansas Department of Agriculture- Division of Conservation

Site BBR 50

Big Blue River

Marshall County, Kansas

November 6, 2017

Prepared By:

Wildhorse Riverworks, Inc.
11821 NW 13th Street
Topeka, Kansas 66615
785-213-3778

&

Water Resource Solutions, LLC.
8800 Linden Drive
Prairie Village, Kansas 66207
913-302-1030

11-06-2017

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01001 – General Requirements
01002 – Special Conditions
01003 – Summary
01004 – Mobilization and Demobilization

DIVISION 2 – SITEWORK

02102 – Clearing and Grubbing
02200 – Excavation, Filling, and Grading
02900 – Protection of Soil and Plants
02901 – Channel Bank Vegetation – NRCS Practice Code 322
02906 – Mulching – NRCS Practice Code 484

DIVISION 3 – CONCRETE AND ROCK STABILIZATION STRUCTURES

03162 – Bendway Weirs & LPSTP

DIVISION 4 THROUGH 16 NOT USED

SECTION 01001 – GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 GENERAL

A. These General Requirements are incorporated herein to clarify and expand the provisions previously set forth in the Contract Documents which these specifications and drawings are a part thereof.

B. In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

1. The Agreement
2. Addenda, with those of later date having precedence over those of earlier date
3. The Supplemental General Conditions
4. The General Conditions of the Contract for Construction
5. Drawings and Specifications
6. Latest version of the NRCS Specifications

C. In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the more stringent condition shall be provided in accordance with the Engineer's interpretation.

D. The quality of workmanship shall be an important consideration in acceptance or rejection of work. It is expected that the Contractor shall provide qualified workmen who can produce a first quality project, as defined by approved samples. Work that fails to achieve a first quality standard may be considered defective and rejected. Such work shall be removed and replaced with new work of first quality, as defined by approved samples.

E. The Contractor, being experienced in his trade, prior to submitting his bid, having made an inspection of the existing facilities and conditions; a thorough review of the Contract Documents; understanding that all systems are new; acknowledges that the installation of these systems must be complete and operational. Accordingly, all necessary parts, equipment, accessories and components must be supplied and installed, and must pass all final testing and operations. If a system component is missing in the Contract Documents, notify Engineer for clarification.

1.2 DRAWINGS AND SPECIFICATIONS

A. Do not scale drawings for dimensions. Accurately layout such work from dimensions indicated on engineering drawings or by use of field verified dimensions. Consult the Engineer for interpretations concerning locations of equipment.

B. Where drawings indicate a portion of the work and the remainder is shown in outline, the parts drawn out apply to other like portions of the work. Where detail is indicated by starting only, such detail shall continue to apply throughout the courses or parts in which it occurs and apply to similar parts of work unless otherwise indicated.

C. Unless otherwise indicated, a detail indicates the general application of work at all locations where it logically applies, and other related work incident thereto shall be provided as

required to fully complete the work in a manner consistent in the detail and other related details, and as approved by Engineer.

1.3 ENGINEER'S SELECTION AND APPROVAL OF MATERIALS

A. Where approval of Engineer for material or equipment is required, secure such approval prior to bidding in a written request.

B. The aesthetic values of every material and installation, such as shape, proportion, texture, finish and color, will be an important consideration to Engineer and his decisions concerning same shall be final, within the scope of the Contract Documents.

1.4 APPROPRIATE MATERIALS AND INSTALLATIONS

A. Furnish materials and equipment that have been properly inspected and tested in accordance with accepted industry standards. Make field laboratory test where specified herein, the cost of such being paid for by the Contractor, unless otherwise specified.

B. Before submitting any bids, the Contractor, and the Contractor's subcontractors and material suppliers shall observe the drawings and project manual and should any material and/or its installation be indicated or specified in a manner not approved by the material manufacturer, notify the Engineer and receive his instructions.

1.5 SITE ACCESS

A. Contractor shall provide adequate access to the site at the locations shown on the attached map, or other access routes that may be negotiated with individual homeowners by the contractor with approval of the Sponsor or Contracting Officer.

1.6 USE OF SITE

A. Site storage shall be confined to areas indicated on the site plan or as directed by Sponsor.

B. The Contractor shall obtain and pay for any additional storage or work areas needed for construction operations.

C. The Contractor shall be responsible for site maintenance within the construction area. Site maintenance includes trash pickup, and other actions that are required to maintain a neat and orderly site.

D. The Contractor shall be responsible for maintenance beyond the construction area for areas affected by construction operations. Maintenance includes removal of trash, mud, gravel, and other debris.

E. The Contractor is responsible for the security of the work area and for any building materials and equipment stored on the site. Maintain security of existing buildings where affected by work of this Contract.

1.7 PROTECTION OF WORK AND PROPERTY

A. The Contractor shall take charge of and assume full responsibility for proper protection of the construction areas.

B. Protect existing buildings and previously placed work by suitable coverings or other protections during installation of subsequent work. Clean off any foreign materials accidentally deposited on finish surfaces and, where such would stain, corrode or otherwise disfigure, clean it immediately with material that will not damage finished work.

C. Protect work in place requiring job finishing until such finishing has been completed. In cold weather, protect work form damage from frost and freezing. In hot weather, protect work from rapid drying.

D. Dumping on site of any liquid wastes including oils, fuels, concrete or mortar cleaning activities, paint, etc., is prohibited.

1.8 INSTALLATION

The Contractor shall:

A. Furnish, apply, install, connect, erect, clean and condition manufactured articles, materials and equipment per manufacturer's printed directions, unless otherwise indicated or specified.

B. The manufacturer's printed directions must be on job prior to and during installation of materials and equipment.

C. Make field check of actual dimensions before fabricating products.

D. Install materials only when conditions of temperature, moisture, humidity, and condition of adjacent components are conducive to achieving best installation results.

E. Handle materials in a manner to prevent scratching, abrading, distortion, chipping, breaking or other disfigurement.

F. Fabricate and install materials true to line, plumb and level, unless indicated otherwise. Leave finished surfaces smooth and flat or of smooth contour where indicated, free from wrinkles, warps, scratches, dents and other imperfections.

G. Conduct work in a manner to avoid injury to previously placed work.

1.9 CLOSING-IN WORK

A. Notify the Engineer to inspect any work when placing of subsequent work would prevent observation of previous work.

1.10 DEFECTIVE WORK

A. Unless the Engineer grants permission to repair any defective work, remove defective work from project and replace with new work in accordance with Contract Documents. If permission is granted, repair according to Engineer's direction. Permission to repair any such work shall not constitute a waiver of Engineer's right to require complete replacement of defective work if repair operation does not restore quality and appearance of member or surface to Engineer's satisfaction.

1.11 UNSUITABLE CONSTRUCTION CONDITIONS

A. During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine operations to work which will not be affected adversely thereby. No portion of the work shall be constructed under conditions which would adversely affect the quality of efficiency thereof, unless special means of precautions are taken by the Contractor to perform the work in a proper and satisfactory manner.

1.12 PERFORMANCE

A. Where Drawings and/or Specifications designate a standard of performance, the completed installation shall perform at least to the designated standard.

1.13 TESTS OF MATERIALS

A. Furnish materials and equipment that have been properly inspected and tested in accordance with accepted industry standards. Make field or laboratory tests where specified herein, the costs of such being paid for by Contractor, unless otherwise specified.

B. Should such tests or visual observation indicate failure of materials or construction to meet requirements of the Drawings and/or Specifications, Contractor shall make and pay for additional tests, as directed by Engineer until compliance has been proven, and should such work fail to comply, Contractor shall replace it at his expense.

1.14 RECEIVING AND STORING MATERIALS

A. On receipt of materials, check for in-transit damage in ample time to replace any damaged materials prior to installation time.

B. Store materials in a manner to prevent deterioration, staining, soiling and intrusion of foreign materials. Provide waterproof, well-ventilated enclosures for materials subject to deteriorating by dampness. Adequately protect those materials subject to damage by freezing and frost.

C. Remove from premises and replace with new, any materials showing deterioration or damage.

1.15 EXISTING UNDERGROUND INSTALLATIONS

A. Existing underground installations such as water mains, gas mains, oil pipelines, sewers, telephone lines, power lines, and buried structures in the vicinity of the work to be done hereunder are indicated on the drawings only to the extent such information has been made available to or discovered by the Engineer in preparing the Drawings. There is no guarantee as to the accuracy or completeness of such information, and all responsibility for the accuracy or completeness thereof is expressly disclaimed. Generally, service connections are not indicated on the Drawings.

B. It is the Contractor's responsibility to contact 1-800-DIG-SAFE. The Contractor shall be solely responsible for contacting all utility companies and locating all existing underground installations, including service connections, in advance of excavating or trenching, by contacting the owners thereof and prospecting. The Contractor shall use his own information

and shall not rely upon any information shown on the drawings concerning existing underground installations.

C. Any delay, additional work, or extra cost to the Contractor caused by existing underground installations shall not constitute a claim for extra work, additional payment, or damages.

1.16 PRESERVATION OF MONUMENTS AND STAKES

A. The Contractor shall carefully preserve all monuments, benchmarks, property markers, reference points, and stakes. In case of his destruction thereof, the Contractor will be charged with the expense of replacement and shall be responsible for any mistake or loss of time that may be caused. In the cases of permanent monuments or benchmarks which must be removed or disturbed, the Contractor shall furnish material and assistance for the proper replacement of such monuments or benchmarks.

1.17 APPROPRIATE MATERIALS AND INSTALLATIONS

A. Before submitting bid, Contractor, his subcontractors, and material suppliers shall observe existing conditions, Specifications, Drawings, and Addenda thereto and should any material and/or its installation be indicated or specified in a manner not approved by the material manufacturer, notify Engineer and receive his instructions. Failing to do so, Contractor shall provide other equivalent materials, suitable for the installation, as selected by Engineer or if not discovered until after installation, Contractor shall replace materials with such other equivalent suitable materials as approved by Engineer, and in either event at no added cost. If additional or other types of work are required for desired satisfactory results and specified guarantee, the additional or other work shall be included in bid amount and shall not constitute a basis of claim for “extra work” during or upon completion of this project.

1.18 CONSTRUCTION REQUIREMENTS

A. Staking: A survey with benchmarks located is included in Drawings for Contractor’s use. All other surveying and staking will be the responsibility of the Contractor at his own expense.

B. Geotechnical Reports: Subsurface data has not been obtained for design purposes. The bidder shall make his own interpretations of existing conditions and shall be expected to obtain additional data at his own expense if required to satisfy himself as to the conditions to be encountered.

C. Storage: All equipment and materials to be incorporated into the work shall be stored in a manner to prevent damage from the elements, work, or handling. No damaged or deteriorated materials will be accepted. All storage, to include Owner-provided items, will be at the expense of the Contractor.

1.19 ADMINISTRATIVE REQUIREMENTS

A. Coordination: The Contractor shall perform the activities necessary to properly coordinate the material and equipment procurement and the work provided by him and his subcontractors. The Contractor also shall coordinate his work with the Sponsor when required for the best overall coordination of the project.

B. Progress Meetings: The Contractor shall hold progress meetings on the site with the Sponsor and Engineer, to discuss job-related problems. Persons designated by the Contractor to attend and participate in the meetings shall have all required authority to commit the Contractor to solutions agreed upon in the project meeting.

C. Progress Schedule: The Contractor shall submit to the Sponsor, prior to construction, a progress schedule. The schedule shall be detailed enough to reasonably allow the Sponsor to follow the progress of the work. The schedule shall be updated periodically as required by the work and as requested by the Sponsor.

D. All materials resulting from clearing and grubbing activities shall be removed and disposed of in an acceptable manner at an acceptable facility conforming to all applicable regulations.

END OF SECTION 01001

SECTION 01002 – SPECIAL CONDITIONS

PART 1 – GENERAL

1.1 RELATIONSHIP TO GENERAL CONDITIONS

A. Should conflict occur between these Special Conditions and the General Requirements, these Special Conditions shall take precedence. When these Special Conditions modify a portion of the General Conditions, the unaltered portions of the General Conditions shall remain in effect.

1.2 LOCATIONS, LINES AND LEVELS

A. Contractor shall establish location of new work on property and establish and maintain all other grades, lines, levels, and benchmarks; check and compare all drawings, verifying grades, lines, levels, and dimensions indicated thereon, and report all inconsistencies to Engineer and receive Engineer's instructions before commencing work.

1.3 DOCUMENTS FURNISHED

A. Contractor will be responsible for obtaining all necessary Drawings and Project Manuals, including all modifications thereof, as required, including distribution to subcontractors and suppliers.

B. Contractor shall pay the actual cost of reproduction for all additional sets requested by him.

1.4 LAWS TO BE OBSERVED

A. The Contractor shall at all times observe and comply with all federal and state laws, local laws, ordinances, orders, decrees and regulations existing or enacted subsequent to the execution of the Contract, which in any manner affect the prosecution of the work. The Contractor and his Surety shall indemnify and save harmless the Sponsor, the Sponsor's Architects, Engineers, and their representatives, agents, and employees against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself, his employees or his subcontractors.

1.5 CONSTRUCTION OBSERVATION

A. The undertaking of periodic site visits by the Engineer or representative shall not be construed as supervision of actual construction nor make him responsible for providing a safe place for the performance of work by contractors or contractor's employees, or those of suppliers or subcontractors, or for access, visits, use, work, travel, or occupancy by any person.

1.6 CONSTRUCTION COORDINATION

A. Before starting any construction, a meeting shall be held with Sponsor, Contractor, Subcontractors, and Engineer to plan and coordinate the schedule of construction and to review intent of Contract Documents. Contractor and Subcontractor shall follow instructions received at this meeting in prosecuting the work.

END OF SECTION 01002

SECTION 01003 – SUMMARY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents
2. Type of Contract
3. Use of premises
4. Owner's occupancy requirements
5. Work restrictions
6. Specification formats and conventions

B. Related Sections include the following:

1. Division1 Section "General Requirements" for limitations and procedures governing temporary use of Sponsor's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work consists of the following:

1. The site work including addition of wooden, soil bioengineering, and rock structures, reconfiguration of existing streambank, planting of cover crop, mulching, and native plantings.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.5 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings.

B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1.6 OWNER'S OCCUPANCY REQUIREMENTS

A. Partial Owner Occupancy: Homeowners will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Homeowners during construction operations to minimize conflicts and facilitate homeowner’s usage. Perform the Work so as not to interfere with Homeowners’ operations.

1. Provide not less than 72 hours' notice to homeowner of activities that will affect Homeowner's operations.

1.7 WORK RESTRICTIONS

A. On-Site Work Hours: Contractor’s normal working hours are acceptable. Any work expected during evenings or weekends should be coordinated with Homeowner’s schedule.

1. Provide not less than 72 hours' notice to Homeowners of activities outside normal working hours.

B. Existing Utility Interruptions:

1. Notify Engineer and Sponsor not less than three days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer’s written permission.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

3. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

END OF SECTION 01003

SECTION 02102 – CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 WORK INCLUDED IN THIS SECTION:

A. Clearing and grubbing required for this work includes, but is not necessarily limited to:

1 Removal of trees, stumps, debris, and brush.
2 Trimming and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal.
3 Removal and disposal of miscellaneous abandoned subsurface structures and debris that may be discovered during the work.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Excavating, Filling and Grading Section B

1.3 JOB CONDITIONS:

A. Dust Control:

1. Use all means necessary to control dust on and near the work and on and near all borrow areas.

1.4 LINES AND GRADES:

A. All clearing and grubbing shall be done within the lines and grades shown on the drawings.

PART 2 – INSTALLATION

2.1 CLEARING:

A. Contractor shall only clear trees, stumps, brush, snags and other vegetation when necessary for the installation of the overall project. All other trees and vegetation shall be left standing. Trees and vegetation to be left standing shall be protected from damage during the completion of the work.

2.2 GRUBBING:

A. In areas requiring excavation, Contractor shall grub and remove material to a depth necessary to complete excavation to the limits indicated and complete required work. Material to be grubbed shall include stumps, roots larger than one inch in diameter, matted roots, and any miscellaneous subsurface structures and debris that may be encountered. Trees shall be Trees and plants to be relocated: Any tree or plants moved shall be done in a timely manner so as not to delay construction progress. The Contractor shall take extra measures to protect trees during the relocation by erecting barricades, staking, trimming, etc. as required. Trees shall be completely removed with stump ground down to a minimum depth below the grade of six (6) inches.

2.3 PROTECTION:

A. Contractor shall take precautions to protect any trees, vegetation, structures, benchmarks and survey stakes, and utilities not intended to be removed. Prior to beginning work, Contractor shall be responsible for field verifying that there are no utilities within the work area. Contractor shall be responsible for repairing and/or replacing, at no additional cost to the Sponsor, items that are damaged during construction that were not intended to be removed.

2.4 DISPOSAL OF MATERIAL:

A. All materials resulting from clearing and grubbing activities shall be removed and disposed of in an acceptable manner at an acceptable facility conforming to all applicable regulations. Materials suitable for use as aquatic habitat enhancement (stumps, logs, etc.) shall be stockpiled as directed by the Engineer.

PART 3 – MEASUREMENT AND PAYMENT

3.1 METHOD OF MEASUREMENT:

A. The quantity of Clearing and Grubbing will not be measured for payment unless the construction limits are changed. Clearing and Grubbing shall be considered subsidiary to Excavating, Filling, and Grading. No adjustment will be made for changes involving less than 0.1 acre (0.04 ha).

3.2 BASIS OF PAYMENT:

A. The amount of work completed and approved, as stated above, shall be paid for as part of the contract lump sum price. Such payment shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to completion of the work.

B. In the event of a change in construction limits, the Contractor shall submit a unit price for Clearing and Grubbing to be approved by the Engineer.

END OF SECTION 02102

SECTION 02200 – EXCAVATING, FILLING AND GRADING

PART 1 – GENERAL

A.1 WORK INCLUDED IN THIS SECTION:

A. Excavating, filling and grading required for this work includes, but is not necessarily limited to:

1. Excavating, filling and backfilling for streambank stabilization.

2. Rough and finish grading of streambank.

3. Preparation of sub-grade for areas to be seeded, planted with trees and shrubs, and/or mulched.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Clear and Grubbing: Section 02101

1.3 JOB CONDITIONS:

A. Dust Control:

1. Use all means necessary to control dust on and near the work and on and near all offsite borrow areas, if such dust is caused by the Contractor's operations during performance of the work, or if resulting from the condition in which the Contractor leaves the site.

B. Protection: Use all means necessary to protect all materials of this section before, during, and after installation, and to protect all objects designated to remain. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Sponsor. Protect tops, trunks and roots of existing trees on project site which are to remain.

C. Notification: The Contractor shall notify the Engineer prior to installation of specified portions of the work to allow the inspector sufficient time to inspect the work and shall obtain approval of all material prior to commencing construction. Any portion of the work installed without inspection may be removed to allow for inspection. Any eventual difficulty or loss of time caused by the Contractor failing to meet permit requirements shall be borne solely by the Contractor.

1.4 LINES AND GRADES:

A. All excavation, filling and backfill shall be done to the lines and grades shown on the drawings.

1.5 BENCH MARKS AND MONUMENTS:

A. Maintain carefully all bench marks and reference points, which are shown on the drawings. The Contractor shall pay for the replacement of such reference points if disturbed by the Contractor during construction.

1.6 REFERENCES:

A. The publications listed below form a part of this specification. The latest revision of the following standards shall apply to work hereunder:

Associated General Contractors of America, Inc.
"Manual of Accident Prevention in Construction"

PART 2 – PRODUCTS

2.1 FILL MATERIAL, GENERAL:

A. All fill material for embankment construction shall come from onsite unless otherwise specified by the engineer. All fill material shall be subject to approval of the Engineer.

2.2 IMPORTED FILL MATERIAL:

A. If imported fill material is required to finish embankments or subgrade. The Contractor shall be responsible for providing a borrow area for imported fill.

2.3 TOPSOIL:

A. All areas disturbed by construction operations, which are not to be paved or rocked under this contract, shall be provided with a 6-inch compacted layer of topsoil approved by the Engineer. Topsoil from areas within the project limits may be stockpiled and used where such topsoil is considered satisfactory to sustain plant growth. Additional materials, if required, shall be brought to final grade, as shown on the drawings, and shall be lightly compacted.

2.4 OTHER MATERIAL:

A. All other materials not specifically described, but required for proper completion of the work of this section, shall be as selected by the Contractor, subject to the approval of the Engineer.

PART 3 – INSTALLATION

3.1 GENERAL:

A. Familiarization: Prior to all work in this section, become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this section.

B. Backfilling Prior to Approval

1. Do not allow or cause any of the work installed to be covered up or enclosed by work of this section prior to all required inspections, tests, and approval.

2. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at no additional cost to the Sponsor.

C. Site Drainage: During construction, excavation and fill shall be performed in a manner and sequence that will provide drainage at all times.

3.2 EXCAVATION AND FILLING:

A. General: Excavation, as hereinafter specified, shall comprise the satisfactory removal and disposition of all material. After topsoil removal has been done, excavation of every description and of whatever substances encountered, shall be performed to the lines and grades indicated on the drawings. After backfilling of key trenches has been completed, any surplus of excavated material shall be known as "waste" and shall be disposed of at the location approved by the Engineer. Any additional fill material required, that is not available from excavation within the immediate project area, shall be obtained from borrow area locations approved by the Engineer. During construction, excavation, key trenching, and backfilling shall be performed in a manner and sequence that will provide drainage at all times.

1. Classification of Excavation: Excavation shall be unclassified.

2. Earth and Rock Excavation shall be unclassified. Earth and Rock Excavation shall include earth, clay, silt, sand, gravel, hard pan, loose shale, loose stone masses, boulders, rock material in ledges, bedded deposits, unstratified masses, and conglomerate deposits so firmly cemented that they possess the characteristics of solid rock, which cannot be removed without systematic drilling.

B. Depressions Resulting from Removal of Obstructions: Where depressions result from, or have resulted from, the removal of surface or subsurface obstructions, open the depression to equipment working width and remove all debris and soft material, as directed by the Engineer.

C. Sloped Surfaces: Sloped ground surfaces steeper than 1 vertical to 4 horizontal, on which fill is to be placed, shall be plowed, stepped (benched) or broken up, in such manner that the fill material will bond with the existing surface.

D. Fill and Backfill: All fill or backfill material shall consist of earth or other approved material with all undesirable material removed. Unless otherwise specified, all fill shall be uniformly placed uniform layers to achieve a 3H:1V slope and then compacted by equipment.

E. Over-excavation: Backfill and compact all over-excavation areas, as specified for fill, at no additional cost to the Sponsor.

F. Unfavorable Weather: Ground frozen or too wet - do not place, spread, or roll any fill material during unfavorable weather conditions. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

G. Overbank flow: To prevent erosion of finished slopes from overland flow, provide berms and rock chutes or slope drain devices along sections of disturbed bank where drainage is towards the disturbed bank.

H. Soften Sub-grade: Where soil has been softened or eroded by flooding or placement during unfavorable weather, remove all damaged areas and re-compact as specified for fill and compaction below.

I. Dewatering: Provide and maintain at all times during construction, ample means and devices with which to promptly remove and dispose of all water from every source entering the

excavations or other parts of the work. Dewater by means, which will insure dry excavation and the preservation of the final lines and grades of bottoms of excavation.

3.3 BACKFILLING:

A. General Backfill: Unless otherwise specified, all channel slopes shall be shaped to a 3H:1V slope which smoothly transitions into the existing slope at each end of the project.

B. Responsibility of Contractor for Backfill Settlement:

1. The Contractor shall be responsible for the satisfactory compaction and maintenance of all backfill of any description required under this contract. If, prior to the final acceptance of this entire contract, any backfilled areas are found to have settled, they shall immediately be reworked by the Contractor and restored to the specified grades.

3.4 FINISH GRADING

A. The finishing of side slopes, cuts and fills shall be to reasonably smooth uniform surfaces that will merge with the adjacent terrain without noticeable break. Finishing shall be done in accordance with grades shown on the drawings, and without variations that are readily discernible.

B. Finish grading shall be performed to the lines and grades shown on the drawings. All areas disturbed by the Contractor during construction operations shall be bladed smooth, shaped, and compacted, as specified herein before. The finished grade shall provide for topsoil that is free from perennial vegetation and is loosened to depth of twelve (12) inches for areas disturbed under this contract.

C. Newly graded areas shall be protected from traffic, erosion, and any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes. Damaged areas shall be revegetated, if necessary.

D. Haul roads into the work sites shall be ripped to loosen compacted soils prior to removing equipment from the project site.

3.5 BORROW AND SPOIL AREAS:

A. Borrow and spoil areas shall be graded to promote positive drainage at the completion of the work. No borrow or spoil slopes shall be greater than 3 horizontal to 1 vertical.

B. Erosion controls shall be implemented to prevent erosion into waterways.

C. Borrow and spoil areas shall be seeded and mulching shall be applied at the completion of construction.

3.6 CLEANING UP:

A. Upon completion of the work of this section, immediately remove all debris and excess earth materials from the site.

PART 4 – MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. Work will be measured by bid quantity of cubic yards of soil. Contractor shall maintain weight tickets for soil trucked to the site. Material moved on site by earth moving equipment will be paid at the contract unit price and units indicated.

4.2 Basis of Payment:

A. The amount of work completed and approved, as stated above, shall be paid for at the contract unit price. Such payment shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental for the completion of the work.

END OF SECTION 02200

SECTION 02901 – CHANNEL BANK VEGETATION – NRCS PRACTICE CODE 322

SUMMARY: The work described herein consists of furnishing, transporting, and installing seeds, trees, and other materials as required for the rehabilitation and establishment of stream side vegetation. It is the Contractor's responsibility to perform soil preparation, native grass planting, bare root seedling planting, management, and such additional extra and incidental work as may be necessary to complete the work in accordance with the specification and plans. The Contractor shall furnish required materials, equipment, tools, labor, and incidentals, unless otherwise provided in the specifications or Drawings.

PART 1 – GENERAL

1.1 DESCRIPTION:

A. Planting required—both native grass and trees—is indicated as plantings. Plantings on the Drawings and, in general, include, but are not limited to:

1. Procurement, storage and protection of listed grass seed.

2. Preparation of planting sites.

3. Planting areas.

4. Contractor maintenance of plantings installed by Contractor.

B. Related Work in Other Sections:

1. Clearing and Grubbing: Section 02102

2. Excavating, Filling and Grading Section: Section 02200

1.2 QUALITY ASSURANCE–NATIVE GRASS SEEDING

A. Qualification of Workmen: Provide at least one person who shall be present during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct work performed under this Section.

B. Standards:

1. Seeds shall meet or exceed the specification of Federal, State, and County laws requiring inspection for plant disease and insect control.

2. All seeds shall be true to species and shall be tagged with the name and percent pure live seed in accordance with accepted industry standards for grass seed.

3. Seed shall meet or exceed specifications of Federal, State and County laws requiring inspection for plant disease and insect control and shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act.

1.3 QUALITY ASSURANCE–TREE PLANTING

A Qualification of Workmen: Provide at least one person who shall be present during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct work performed under this Section.

B Standards:

1. Bare root seedlings and cuttings must be grown from locally adapted seed or cuttings of known origin and meet height and caliper standards listed in the NRCS Kansas Forestry Technical Note KS-9.

1.4 JOB CONDITIONS:

A. Time of Planting:

1. The Contractor shall complete native grass seeding immediately following construction during favorable weather conditions.

2. The Contractor shall complete tree plantings during normal and accepted planting seasons listed in the NRCS Kansas Forestry Technical Note KS-9 and during favorable weather conditions.

1.5 SUBMITTALS:

A. Materials list include, but not limited to, the following:

1. Quantities, Signed and Dated by Supplier(s).

1.6 DELIVERY, STORAGE AND HANDLING:

A. Delivery, Storage and Handling:

1. The Contractor shall deliver seed, bare root seedlings, and cuttings to the project site in good condition.

2. The Contractor shall use all means necessary to protect the seed, bare root seedlings, and cuttings before, during, and after installation and to protect the installed work and materials of other trades.

B. Replacement: In the event of damage during construction, the Contractor shall immediately make repairs and replant necessary to the approval of the Engineer and at no additional cost to the Sponsor.

1.7 SITE DISTURBANCES:

A. It is the Contractor's responsibility to take precautions insuring that equipment and vehicles do not disturb or damage existing grading, seeding, or other site improvements.

B. The Contractor shall repair and/or return to original condition any damage at no cost to Sponsor.

PART 2 – MATERIALS

2.1 PLANT MATERIALS:

A. General: Furnish seed that is true to name and type representative of the species or variety.

B. Plant materials

1. Native grass seeding shall follow recommendations in NRCS Critical Area Planting – Practice 342.

2. Bare Root seedlings and tree cuttings shall follow recommendations in Kansas Forestry Technical Note No. KS-9.

C. Mulching: Other materials not specifically described but required for a complete and proper planting installation shall be as selected by the Contractor, subject to the approval of the Engineer

2.2 WATER:

A. Water, hose, and other watering equipment required for the work shall be furnished by the Contractor.

2.3 HERBICIDE:

A. Herbicides shall be applied according to manufactures label instructions and adhere to State, Federal, and local laws.

PART 3 – INSTALLATION

3.1 SURFACE CONDITIONS:

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where these installations may properly commence.

2. Verify that planting, seeding and related construction work may be completed in accordance with the original design and the referenced standards.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Engineer.

2. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.2 SPREADING OF TOP SOIL:

A. Finish Grading: Finish grading will be performed according to Section 02002 of these Specifications, in graded areas.

3.3 PLANTING NATIVE GRASS SEED:

A. Preparation:

1. Roughly grade seed beds with equipment, leave few ridges and depressions and making areas into a continuous, firm plane that ensures proper drainage.

B. Planting:

1. Native grass seed shall be planted by hand broadcast method as approved by the Engineer. Seeding of native grass should follow recommendation in NRCS Critical Area Planting.

2. For site-specific native grass mix, reference the KS-ECS-4 form found in the design packet.

3.4 PLANTING BARE ROOT SEEDLING

A. Preparation

1. Roughly grade channel bank slope with equipment, leave few ridges and depressions and making areas into a continuous, firm plane that ensures proper drainage. The planting area must be free of living sod and perennial weeds before planting. Vegetation from native grass seeding is acceptable.

B. Planting

1. Cuttings and bare root seedlings should follow recommendations in Kansas Forestry Technical Note KS-9.

2. For site-specific information on cutting and bare root seedlings, reference the KS-ECS-5 form found in the design packet.

3.5 MULCHING:

A. Mulching shall immediately follow seed planting.

B. Mulch shall be an organic substance capable of eventual complete decay. The mulch shall be native prairie hay, brome hay, or straw and shall be applied at a rate of 4,000 pounds per acre. Native prairie hay is the preferred mulch.

C. Mulch shall be evenly distributed over the entire seeding area.

3.6 INSPECTION:

A. In addition to normal progress inspections, NRCS shall schedule and conduct the following formal inspections, giving the Engineer at least 24 hours prior notice of readiness for inspection:

1. Inspection of plant locations, to verify compliance with the Drawings.

2. Final inspection after completion of native grass seeding and final inspection after completion of cuttings and bare root seedling plantings; schedule these inspections sufficiently in advance, and in cooperation with the Engineer, so that final inspections may be conducted within 24 hours after completion of native grass seeding and tree planting.

3. Final inspection at the end of the maintenance period provided that previous deficiencies have been corrected. The maintenance period consists of the first three years following native grass seeding and tree planting.

3.6 CLEAN-UP:

A. During the progress of this work, and upon completion, the Contractor shall thoroughly clean the project area and remove and properly dispose of resultant dirt, debris and other waste materials.

PART 4 – MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. The quantity of seeding and mulching will be measured in pounds of pure live seed and mulch applied. Seeding and Mulching shall be considered subsidiary to grass planting and the overall construction project.

4.2 BASIS OF PAYMENT:

A. The amount of work completed and approved, as stated above, shall be paid in lump sum as part of the contract unit price. Such payment shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental for the completion of the work. Two payment requests should be made based on native grass seeding and tree planting complete. The first payment request shall follow native grass seeding and mulching. A separate payment request shall be made after the cuttings and bare root seedlings are planted.

END OF SECTION 02901

SECTION 02906 – MULCHING – NRCS PRACTICE CODE 484

PART 1 – GENERAL

1.1 DESCRIPTION:

A. Mulching is the application of organic material to the soil to protect it from raindrop and sheet flow erosion. Mulching shall be used on cover crop planted areas and tree plantings when so directed by the engineer. In general, mulching shall include, but is not limited to:

1. Procurement, storage and protection of all listed material

2. Maintaining plantings installed by Contractor.

B. Related Work in Other Sections:

1. Excavating, Filling and Grading Section: Section 02102

2. Channel Bank Vegetation: Section 02901

C. Purpose:

1. This practice shall be used to reduce soil erosion, aid in seed germination and establishment of plant cover, and conserve soil moisture.

1.2 QUALITY ASSURANCE:

A. Qualification of Workmen: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct all work performed under this Section.

B. Standards:

1. All mulch materials shall be native prairie hay, brome hay, or wheat straw. All materials should be of good quality and free from mold or decay.

1.3 JOB CONDITIONS:

A. Site preparations: Soil surface shall be prepared prior to the application of mulch in order to achieve optimum contact between soil and mulch. All areas to be mulched should be reasonably free from rills and gullies.

B. Time of mulching: All mulching shall be performed during favorable weather conditions immediately following final grading.

1.4 SUBMITTALS:

A. Materials list shall include, but not limited to, the following:

1. Hay or straw quantities by weight with scale ticket, Signed and Dated by Supplier(s).

2. As-Installed Plan: During course of the installation, carefully record in red outline on a print of the planting drawings actual mulching location.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Pick up materials in accordance with any special handling instructions and deliver to project site in good condition.

B. Use all means necessary to protect plant materials before, during, and after installation and to protect the installed work and materials of all other trades.

1.6 SITE DISTURBANCES:

A. Take precautions to insure that equipment and vehicles do not disturb or damage existing grading, seeding, plantings or other site improvements.

B. Repair and/or return to original condition any damage at no cost to Owner.

PART 2 – MATERIALS

2.1 MULCH MATERIALS.

A. General: Materials shall consist of natural, biodegradable material such as plant residue to include, but not limited to, the following:

1. Native Prairie Hay

2. Brome Hay

3. Wheat Straw

B. All materials shall be free from diseased plant residue and noxious weed seed.

C. Miscellaneous Materials: All other materials not specifically described but required for a complete and proper planting installation shall be as selected by the Contractor, subject to the approval of the Engineer

PART 3 – INSTALLATION

3.1 SURFACE CONDITIONS:

A. Inspection:

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where these installations may properly commence.

2. Verify that planting, seeding and related construction work is completed in accordance with the original design and referenced standards.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Engineer.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 GRADE SURFACE:

A. Finish Grading: All finish grading will be performed according to Section 02002 of these Specifications, in areas that are graded.

B. Fine Grading: Fine mechanical grading shall only be conducted on areas where it can be done safely without posing a danger or hazard to the equipment and operator.

3.3 APPLICATION TIMING:

A. Mulch shall be applied upon completion or within 24 hours of cover crop seeding.

3.4 APPLICATION RATE:

A. Mulch shall be applied at the rate of 4,000 pounds per surface acre.

3.5 CRIMPING:

A. If required by the engineer, mulch shall be crimped immediately after spreading with a mulch crimper or equivalent devise consisting of a series of dull flat blades with notched edges spaced approximately 8 inches apart. The mulch shall be crimped into the soil to a depth of 1 to 3 inches. Crimping shall only be performed in areas where it can be done safely, without posing a danger or hazard to the operator or equipment.

3.6 INSPECTION:

A. In addition to normal progress inspections, schedule and conduct the following formal inspections, giving the Engineer at least 24 hours prior notice of readiness for inspection:

1. Final inspection after completion of seeding, planting and mulching; schedule this inspection sufficiently in advance, and in cooperation with the Engineer, so that final inspection may be conducted within 48 hours after completion of mulching.

2. Final inspection at the end of the maintenance period provided that all previous deficiencies have been corrected.

3.7 MAINTENANCE:

A. General: The Contractor shall inspect the site within 48 hours of any precipitation event that produces 0.5 inches or more of rain in a 24 hour period. Mulch that is displaced shall be reapplied and anchored. Maintenance shall be completed as soon as possible with consideration of site conditions.

B. Maintain all seeding, planting, and mulching starting with the planting operations and continuing for 30 calendar days after all mulching is complete and approved by the Engineer.

C. Work Included:

1. Protect all planted areas against damage, including erosion, and drought by providing and maintaining proper safeguards such as periodic watering.

D. Extension of Maintenance Period: Continue the maintenance period at no additional cost to the Owner until all previously noted deficiencies have been corrected, at which time the final inspection shall be made.

3.8 CLEAN-UP:

A. During the progress of this work, and upon completion, thoroughly clean the project area and remove and properly dispose of all resultant dirt, debris and other waste materials.

END OF SECTION 02906

SECTION 03162 – CONCRETE AND ROCK STABILIZATION STRUCTURES

PART 1 – GENERAL

1.1 DESCRIPTION:

A. This section covers vanes, bendway weirs, longitudinal peaked stone toe protection (LPSTP), cross vanes, engineered rock riffles, and check dams to be used at various locations within the project area as shown on the project design sheet. Items include, but are not limited to:

1. Rock gradation, procurement, storage, and handling.

2. Sub-grade preparation prior to rock installation.

3. Rock installation.

B. Types of structures covered by this specification:

1. Vanes

2. Bendway Weirs

3. LPSTP

4. Cross Vanes

5. Engineered Rock Riffles

6. Check Dams

C. Related Work in Other Sections:

1. Excavating, Back Filling, and Grading: Section 02200

1.2 REFERENCES:

A. The publications listed below form a part of this specification to the extent referenced. The latest revision of the following standards shall apply to work hereunder:

1. ASTM C 88: Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

2. ASTM C 127-88: Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate

3. ASTM D 5312-92: Standard Test Method for Evaluation of Durability of Rock for Erosion Control under Freezing and Thawing Conditions

1.3 LINES AND GRADES:

A. Rock placement shall conform to the lines and grades shown on the technical drawings.

PART 2 – PRODUCTS

2.1 MATERIALS:

A. Material shall be reasonably free from dirt, clay, sand, rock fines and other materials not meeting the required gradation limits.

B. Except as otherwise specified, the rock shall be angular to sub rounded in shape. The rock shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The least dimension of an individual rock fragment shall not be less than one-third the greatest dimension of the fragment. Except as otherwise provided, the rock shall be tested and shall have the following properties:

1. Bulk Specific Gravity (saturated surface-dry basis) shall not be less than 2.4 when tested in accordance with ASTM C 127.

2. Absorption shall not be more than 4 percent when tested in accordance with ASTM C 127.

3. The weight loss in 5 cycles shall not be more than 20 percent when sodium sulfate is used or more than 25 percent when magnesium sulfate is used when tested in accordance with ASTM C 88 for soundness

4. Rock that fails to meet the requirements stated above in 1, 2, or 3 may be accepted only if similar rock from the same source has been demonstrated to be sound after 5 years or more of service under conditions of weather, wetting and drying, and erosive forces similar to those anticipated for the rock to be installed under this specification.

C. The rock materials shall be reasonably well graded by weight and poorly sorted by size, within the limits stated below or on the Drawings to meet the following requirements:

Aggregate Gradation A (D_{50} = 24 in.)

Size (lbs)	Percent Heavier
10	90
450	50
1000	10

Aggregate Gradation B (D_{50} = 18 in.)

Size (lbs)	Percent Heavier
10	85 - 100
100	60-80
250	30-60
600	0

Aggregate Gradation C (D_{50} = 12 in.)

Size (lbs)	Percent Heavier
5	85 - 100
50	50 - 70
100	5 - 15
400	0

PART 3 – INSTALLATION

3.1 INSTALLING ROCK STRUCTURES:

A. The sub-grade surfaces on which the rock, filter, bedding, or geotextile is to be placed shall be cut and graded to the lines and grades shown on technical drawings. The surface to which the rock is to be placed shall be reasonably smooth and free of mounds, dips, or windrows.

B. The rock shall be placed by equipment on the surfaces and to the depths specified. The rock shall be installed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying material. The rock shall be delivered and placed in a manner that will ensure the rock shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Rock shall be placed in a manner to prevent damage to existing structures. Hand placing will be required as necessary to prevent damage to any new and existing structures.

C. Side slopes should be the natural angle of repose, which approximates 1.5 ft. horizontal to 1 ft. vertical.

3.2 MAINTENANCE:

A. If, at any time before 12 months after the completion and acceptance of the work, there shall be any settlement requiring repairs to be made along the line of work, or should any defect appear in the work due to neglect, carelessness or improper construction on the part of the Contractor, the Contracting Officer will notify the Contactor to make such repairs and remedy any defects. The Contractor shall, within 5 days after such notice, begin and carry out such repairs at no additional cost to the owner.

PART 4 – MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT:

A. Work will be measured by tons of rock placed.

4.2 BASIS OF PAYMENT:

A. The amount of work completed and approved, as stated above, shall be paid for at the contract unit price.

END OF SECTION 03162