## SPSRW-XX: Angled Log Riffle

Version Date: 1/28/2022 Revision Date: MM/DD/YYY by XXX

### **DESCRIPTION**

The work covered by this section consists of furnishing, stockpiling, placing and maintaining approved stone, boulders, earth, wood material, logs, mulch, and filter fabric to be utilized to construct the angled log riffle, as specified in the Contract Document or as directed by the Engineer. Angled log riffles are structures used in relatively straight, high gradient stream-type channels to create a step-pool channel. These structures are used to prevent channel incision and provide habitat.

The quantity of structures may be adjusted during construction due to site conditions and at the direction of the Engineer. The type and quantity of this structure may be increased or decreased at the direction of the Engineer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

### **MATERIALS**

ENGINEER TO UPDATE IF THEY FEEL THAT THIS SPECIFICATION IS INADEQUATE FOR SITE CONDITIONS.

Backfill Material shall consist of a well-mixed gradation of, stone aggregate, rip rap, earth, and wood/mulch. Earth material shall be sourced on site from stockpiled materials resulting from bank and/or channel bed excavations from channel construction activities. Earth material from channel bed excavation is preferable for well-mixed gradation placed in the channel and bank(s). Wood/mulch material shall include small logs (less than 1” in diameter), brush, and woody shrubs and shall be sourced on site from stockpiled materials resulting from other construction activities.

Stone aggregate and rip rap backfill material shall meet the material requirements of NCDOT section 1005 General Requirements for Aggregate and NCDOT section 1042 Rip Rap Materials.

Stone Backfill Material shall consist of durable field or quarry stone that is sound, hard, dense, slightly rounded, resistant to the action of air and water, and free of seams, cracks, or other structural defects. **The Contractor cannot use limestone or concrete waste for stone**.

The type, size and gradation of the Backfill Material shall be specified by the Engineer to be mobile or non-mobile as the conditions in the channel warrant, and in accordance with the construction documents.

Logs must be from a hardwood species, relatively straight, 8 to 12 inches in diameter along their entire length and shall meet the material requirements specified in the Contract Documents. All limbs and branches shall be removed from the log. Sources for logs shall include trees removed due to construction activities as well as off-site timber. All logs shall be relatively solid (hard) and free of visible rot and/or animal damage.

Boulders shall consist of flat-sided, durable field or quarry stone that is sound, hard, dense, angular, and resistant to the action of air and water, and free of seams, cracks, or other structural defects. The Contractor shall use stone pieces with a “shape factor” greater than two (length and width more than twice the thickness). **The Contractor cannot use limestone or concrete waste for boulders**. Boulders shall be approved by the Engineer.

The size (length, width and depth (thickness)) of the boulder material shall as specified by the Engineer in accordance with the construction documents.

Filter fabric for sealing structures shall meet the Type 2 material requirements of NCDOT Section 1056 Geosynthetics. Galvanized steel roofing nails of durable quality with an umbrella head shall be used to fasten filter fabric to the logs.

Coir fiber matting shall meet the material requirements of SPSRW-XX Erosion Control Matting.

### **METHODS**

ENGINEER TO UPDATE IF THEY FEEL THAT THIS SPECIFICATION IS INADEQUATE FOR SITE CONDITIONS.

Structure installation and channel grading sequences may vary based on structure function and design. Grade control structures, such as angled log riffles, shall be installed as grading operations progress downstream. Begin construction of the angled log riffle structure from the proposed downstream end of the structure and progress upstream with the increase in elevation until the structure is completed and tied into the specified upstream elevation.

Prior to construction of the structure, establish elevations at each angled log and design pool invert. The Contractor may install additional survey control, as needed, to complete the work in accordance with the Contract Documents.

* 1. Over-excavate/trench the stream bed to a depth equal to the total thickness of the angled logs.
	2. Place the angled log(s) in the trench excavated at the desired angle. Review, survey (measure), and adjust the alignment and/or height of the angled log, as needed. The angled log shall extend the entire design length plus the length needed to provide anchoring and a smooth transition into the stream bank. The angled log shall be reviewed by the Engineer prior to proceeding with the work.
	3. Install an anchor boulder against the angled log at the upstream and downstream ends prior to backfilling. The boulder shall be installed such that the face of the streambank is smooth.
	4. Install filter fabric per the Contract Documents. Nail filter fabric to upstream side of the log(s). Nails shall be below finished grade and spaced at one-foot (1-ft) intervals horizontally. Drape filter fabric over the upstream side of the log(s), down the upstream face of the sill, extending three to four inches (3” – 4”) below grade. Fabric reaching the excavated stream bed/bank soil face may be folded and/or trimmed, in accordance with the Contract Documents. The fabric installation shall be reviewed by the Engineer prior to proceeding with the work.
	5. Place Backfill Material on top of the filter fabric and between the upstream side of the log and the excavated stream bed/bank soil face. The Backfill Material shall be level with the top surface of the log. After installing all of the Backfill Material, inspect the structure and trim/cut any loose and/or visible fabric.
	6. Finish grade the adjacent streambed, channel banks, and/or floodplain to provide a smooth even grade transition between project structure components (arms, sills, inverts, floodplain sills, etc.) and the existing and/or proposed ground surface.
	7. Place Coir fiber matting as shown on the detail per the Coir Matting Bank Stabilization specification and Construction Detail. Extend Coir fiber matting below toe of slope as shown on the detail prior to placing riffle material above the toe of slope.

In locations where exposed bedrock and/or other existing features extend to and/or within the limits of the proposed work, the angled log riffle installation shall be field adjusted to incorporate the bedrock/existing feature, into the finished work. The Engineer shall be contacted as soon as the presence of bedrock and/or other existing features are field identified to determine the appropriate method of incorporation. Site conditions may require slight deviation from the plan and shall be approved by the Engineer.

### **MEASUREMENT**

The quantity of angled log riffle to be paid for shall be the actual number of square yards “Angled Log Riffle” completed and accepted into the final work. The length shall be measured along the stream centerline from begin to end as show on plans, and the width will be measured from bankful to bankful as shown on the plans.

No separate measurement of materials shall be made under this item for logs, boulders, backfill material, fabric, and/or other incidental items.

### **PAYMENT**

The work covered by this section shall be paid for at the contract per square yard price for “Angled Log Riffle” will be full compensation for all work covered in this special provision, including, but not limited to grading, installation of materials, adjusting, excavating, excavated design pool, placing backfill, maintaining the feature through acceptance, and for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the work as specified in the Contract Documents, or as directed by the Engineer. Pool excavation beyond measurement limits of angled log riffle as shown on the detail will be incidental to the measurement indicated above.

There shall be no separate payment for furnishing trees meeting the requirements of this specification.

No separate payment shall be made for subsidiary items.

Payment shall be made under:

**RIFFLE, ANGLED LOG………………………………………………………………………………………………………………………………………..SY**