**SPSRW-XX: Variable Constructed Riffle**

Version Date: 08/03/2023 Revision Date: XX/XX/XXXX by XXX

1. **DESCRIPTION**

The work covered by this section consists of furnishing, stockpiling, placing and maintaining approved stone, boulder, rip rap, earth, woody material, and coir fiber matting materials to be utilized to construct the Variable Constructed Riffle in the locations specified in the Contract Documents or as directed by the Engineer. Variable constructed riffles are used for grade control and providing 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.

1. **MATERIALS**

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

Riffle material shall consist of a well-mixed gradation of stone aggregate, rip rap, earth, and woody material. 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). Woody material shall include small logs (0.5” to 2.0” in diameter with logs no larger than 6”), brush, and woody shrubs and shall be sourced on site from stockpiled materials resulting from other construction activities.

The type, size and gradation of the riffle 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.

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.

Riffle stone 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.

Tree species for the woody material shall be either hardwoods or conifers, or combination of both, the percentage shall vary based on site variability, and those specified in the construction details. Woody material shall include limbs, small logs, tree tops, brush, and woody shrubs. Limbs may be a variety of sizes with or without leaves/needles depending on the season. Sources of logs/woody debris shall include on-site trees removed due to other construction activities. Off-site material will only be used if approved by the County and Engineer.

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

1. **METHODS**

Structure installation and channel grading sequences may vary based on structure function and design. Grade control structures such as variable constructed riffles shall be installed as grading operations progress downstream.

* 1. Stake the elevation control points shown on the plans, including the beginning (head) and end (tail) of the proposed Variable Constructed Riffle. The Contractor may install additional survey control, as needed, to complete the work in accordance with the Contract Documents. The riffle stakeout shall be approved by the Engineer prior to proceeding with the work.
	2. Place riffle material at the elevation and/or depth specified on the plans. The riffle material placement shall be reviewed and approved by the Engineer prior to proceeding with the work.
	3. Riffle Material shall be placed and graded in a manner that creates a smooth profile, with no abrupt “jump” (transition) between upstream and pool-glide and the riffle, and likewise no abrupt “drop” (transition) between the Variable Constructed Riffle and the downstream run-pool.
	4. Bucket, rake and/or otherwise adjust placed riffle material, as needed, to create a thalweg within the Variable Constructed Riffle width, so that the finished cross section(s) of the riffle material matches the shape and dimensions shown on the riffle typical section.
	5. Existing and/or proposed utility crossings within the Variable Constructed Riffle area shall be protected during the placement of the backfill and/or riffle material. Utility crossings shall be incorporated into the Variable Constructed Riffle, as shown on the plans. If an existing utility crossing is present but not shown on the plans, the Engineer may adjust the Variable Constructed Riffle dimensions (length, width, and depth) to incorporate or avoid the utility crossing.
	6. Finish grade the adjacent streambed, channel banks, and/or floodplain to provide a smooth even grade transition between project structure components (riffle material, logs, woody material, etc.) and the existing and/or proposed ground surface.
	7. Place Coir fiber matting as shown on the detail per the Erosion Control Matting 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 feature extends to and/or within the limits of the proposed work, the Variable Constructed 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 feature is 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.

1. **MEASUREMENT**

The quantity of Variable Constructed Riffle structures to be measured for payment will be the actual linear feet of structures installed and accepted by the Engineer.

1. **PAYMENT**

The quantity of Variable Constructed Riffle structures, measured as provided above, will be paid for at the contract unit price per linear foot of Variable Constructed Riffle installed and accepted, as measured from the head of riffle to the tail of riffle. The riffle material and placement extended beyond the head of riffle and tail of riffle as shown on the detail will be incidental to the measurement indicated above. The payment will be considered as full compensation for all work covered in this special provision, including, but not limited to grading, installation of materials, excavating, adjusting, placing backfill, glide and pool transitions, installing matting, 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.

Payment will be made under:

**Riffle, Variable Constructed 4’ wide**  **LF**

**Riffle, Variable Constructed 5’ wide**  **LF**

**Riffle, Variable Constructed 6’ wide**  **LF**