

(Use this Section on projects that require work on and near waterways. Be sure all permits and all conditions are met before using this Section.)

SECTION 01091 - WATERWAY ENHANCEMENTS

(Follow all instructions and make all edits with "Track Changes" turned on. This Section is not published in the Oregon Standard. If there are no instructions [orange text] above a subsection, paragraph, sentence, or bullet, then include it in the Project, unless the item(s) that are included in the subsection, paragraph, sentence, or bullet are not required on the Project and then they should be deleted. In general do not re-number or re-letter subsections when item(s) are deleted. Delete all orange text before preparing the final document. All other modifications to this Section will require ODOT Technical Resource and State Specifications Engineer approval.)

Section 01091, which is not a Standard Specification, is included in this Project by Special Provision.

Description

01091.00 Scope - This Work consists of constructing waterway enhancements such as fish Rocks, large woody Material (LWM), engineered streambed Material, and other types of waterway items as shown or directed.

01091.05 Pre-Work Meeting - Attend a pre-work meeting at the Project Site with the Engineer, at a mutually agreed upon time, at least 8 Calendar Days prior to implementation of any waterway enhancement work. Required attendees include:

- Engineer
- Contractor
- Waterway Enhancement Subcontractors
- ODOT Region Environmental Coordinator
- ODOT Hydraulics Designer

The pre-work meeting agenda typically includes the methods of accomplishing all phases of the waterway enhancement work, including:

- temporary water management (TWM)
- fish salvage plan and strategy
- environmental risks discussion
- turbidity monitoring
- energy dissipation
- dewatering and re-watering plan and strategy
- existing streambed Material salvage
- site clean-up expectations
- circumstances under which contacting the Engineer is required

Representatives from interested permitting agencies will be invited by the Agency.

Materials

01091.10 Material - Furnish Materials meeting the following requirements:

(When native streambed Material is to be excavated, salvage and stockpile native Material to be used as a streambed sediment within the constructed channel.)

Streambed Gravels are classified as follows:

- Salvaged streambed Material
- Streambed Sand
- Streambed sediment
- Streambed Cobbles 4 in.
- Streambed Cobbles 6 in.
- Streambed Cobbles 8 in.
- Streambed Cobbles 10 in.
- Streambed Cobbles 12 in.

Provide a streambed Material mix of the following streambed Gravels with the associated ratios:

(Use the engineered streambed list below for the Project mix design. Add or remove Materials to match Project design needs.)

Engineered Streambed Material:

Salvaged streambed Material	X% by volume
Streambed sediment:	X% by volume
Streambed Cobbles X in.	X% by volume
Streambed Sand:	X% by volume

Thoroughly blend streambed Gravels before placement. Acceptance of the Engineered Streambed Material will be based upon visual inspection by the Engineer.

Components of the salvaged streambed Material which meet the criteria for the specific Material may be used to supplement the streambed sediment and streambed Cobbles and will be based upon visual acceptance by the Engineer.

(a) Loose Riprap - Provide loose riprap meeting the requirements of Section 00390.

(b) Engineered Streambed Material - Provide uncrushed, free of deleterious Material, hard, durable Material that is well graded from the maximum size to the minimum size meeting the following test requirements for quality:

Aggregate Property	Test Method	Requirement
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Degradation Factor	ODOT TM 208	15 min,
L.A. Wear, 500 Rev.	AASHTO T 96	50% max
Bulk Specific Gravity	ODOT TM 203	2.55 min.

- **Streambed Sand:** Grade Sand to meet the following requirements expressed as a percentage by weight:

Sieve	Percent Passing			
	Natural Sand		Manufactured Sand	
	Min.	Max.	Min.	Max.
No. 4	99	100	99	100
No. 8	90	100	90	100
No. 16	60	90	60	90
No. 30	35	70	35	70
No. 50	10	30	20	40
No. 100	0	5	10	25
No. 200	0	3	0	10

- **Streambed Sediment** - Grade streambed sediments according to the following requirements expressed as a percentage by weight:

Sieve Size	Percent Passing
2 1/2" square	100
2" square	65 - 100
1" square	50 - 85
U.S. No. 4	26 - 44
U.S. No. 40	16 max.
U.S. No. 200	5.0 - 9.0

- **Streambed Cobbles** - Grade streambed Cobbles according to the following requirements expressed as a percentage by weight:

Percent Passing					
Approx. Size ¹	4" Cobbles	6" Cobbles	8" Cobbles	10" Cobbles	12" Cobbles
12"					99-100
10"				99-100	70-90
8"			99-100	70-90	
6"		99-100	70-90		
5"		70-90			30-60
4"	99-100			30-60	
3"	70-90		30-60		
2"		30-60			
1 1/2"	20-50				
3/4"	10 max.	10 max.	10 max.	10 max.	10 max.

¹Approximate size can be determined by taking the average dimension of the three axes of the Rock, length, width, and thickness, by use of the following calculation:

$$\frac{\text{Length} + \text{Width} + \text{Thickness}}{3} = \text{Approximate Size}$$

Length is the longest axis, width is the second longest axis, and thickness is the shortest axis.

The grading of the Cobbles will be determined by the Engineer by visual inspection of the load before it is placed.

(c) Fish Rocks:

Type 1 - 700 pounds to 900 pounds size, hard, durable, angular shaped Rock. Furnish a single Rock with a thickness of not less than one-third its length. Round Rock, non-durable Rock, shale, or Rock with shale seams will not be accepted.

Type 2 - Greater than 900 pounds to 1,800 pounds size, hard, durable, angular shaped Rock. Furnish a single Rock with a thickness of not less than one-third its length. Round Rock, non-durable Rock, shale, or Rock with shale seams will not be accepted.

Type 3 - Greater than 1,800 pounds to 2,200 pounds size, hard, durable, subangular Rock. Furnish a single Rock with a thickness of not less than three-fourths its length. Non-durable Rock, shale or Rock with shale seams will not be accepted.

(d) Large Woody Material - Furnish 18 inch minimum diameter by 20 to 32 feet long conifer trees with rootwad. Furnish structurally sound logs that are free of rot and disease.

(e) Boulder Weirs - Furnish fish Rocks used in the construction of boulder weirs as follows:

(Fill in the blank with the Type of fish Rock required. Obtain information from the hydraulic engineer.)

Type _____ and Type _____ fish Rocks as shown and placed as directed.

Construction

01091.40 General - Obtain all permits and perform Work in and around water according to Section 00290, Section 00245 and the following:

(a) Streambed Excavation - Excavate the foundation for streambed Materials to the elevations and grades as shown. As directed by the Engineer, excavate scour holes in the approximate locations as shown.

(b) Salvaged Streambed Materials - During streambed excavation, salvage and stockpile the existing streambed Materials as directed for re-use.

(c) Loose Riprap - Place loose riprap Material within the stream channel as shown or as directed.

(d) Engineered Streambed Material - Place engineered streambed Material in the stream channel as shown or directed. Place the streambed Material in lifts no thicker than 12 inches. Provide streambed Material in its final location with a well graded mix of streambed sediments and streambed Cobbles.

Construct streambed Material to ensure that low stream flows are conveyed above the finished channel. Pressure apply water to each placed layer to facilitate filling the interstitial voids of the streambed Materials with streambed Sand. The voids are satisfactorily filled when water equivalent to the flow rate of the stream does not go subsurface and there is visual acceptance by the Engineer. If water is not present in the stream, apply water to the stream channel for visual acceptance by the Engineer.

(e) Streambed Sand - Place streambed Sand in the streambed lifts as directed. Do not change the finished channel elevation or affect the channel shape as shown.

(f) Fish Rocks - Place Rocks as shown or as directed.

(g) Large Woody Material - Place LWM as shown or as directed. Place LWM with the rootwad end projecting into the water with the trunk placed at a 45 degree horizontal angle to the bank. Bury the trunk end approximately two-thirds the total length into the embankment.

(h) Boulder Weirs - Install boulder weirs as shown or directed. Arch boulder weirs into the stream flow as shown. Seal weirs with streambed sediments as shown or directed. Acceptance will be based on water flowing over the boulder weirs and not through the Boulders.

Measurement

(Use one of the following options as instructed. Delete the option that does not apply.)

(Option 1 - Use this subsection .80 when streambed enhancement will be measured and paid using a single Streambed Enhancement Pay Item.)

[Begin Option 1]

01091.80 Measurement - No measurement of quantities will be made for Work performed under this Section.

The estimated quantities of Materials required for streambed enhancement are:

(Complete the following for lump sum items. Delete items that are not required on the Project. Obtain quantities from the Designer.)

Item	Quantity
Excavation.....	____ cu. yd.
Loose riprap, Class _____	____ cu. yd.
Salvaged Streambed Material	____ cu. yd.
Engineered Streambed Materials	____ cu. yd.

Fish Rocks, Type 1.....	_____	each
Fish Rocks, Type 2.....	_____	each
Fish Rocks, Type 3.....	_____	each
Large Woody Material	_____	each

[End Option 1]

(Option 2 - Use this subsection .80 when streambed enhancement will be measured and paid using the individual streambed excavation, LWM, and streambed Material Pay Items.)

[Begin Option 2]

01091.80 Measurement - Work performed under this Section will be measured according to the following:

(a) Fish Rocks and Large Woody Material - The quantities of fish Rocks and LWM will be measured on the unit basis.

(b) Streambed Excavation and Streambed Materials - The quantities of streambed excavation, salvaged streambed Materials and engineered streambed Materials will be measured on the volume basis.

[End Option 2]

Payment

(Use one of the following options as instructed. Delete the option that does not apply.)

(Option 1 - Use this subsection .90 when streambed enhancement will be measured and paid using a single Streambed Enhancement Pay Item.)

[Begin Option 1]

01091.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract lump sum amount for the item "Streambed Enhancement".

[End Option 1]

(Option 2 - Use this subsection .90 when streambed enhancement will be measured and paid using the individual streambed excavation, LWM, and streambed Material Pay Items.)

[Begin Option 2]

01091.90 Payment - The accepted quantities of waterway enhancement items will be paid for at the Contract unit price, per unit of measurement, for the following items:

(Delete Pay Item(s) from the list that are not included in the Schedule of Items, but do not change the alpha characters next to the Pay Items.)

Pay Item	Unit of Measurement
(a) Streambed Excavation.....	Cubic Yard
(b) Salvaged Streambed Material.....	Cubic Yard
(c) Engineered Streambed Materials.....	Cubic Yard
(d) Fish Rocks, _____	Each
(e) Large Woody Material.....	Each

(Use the following paragraph when Pay Item (d) is included in the Pay Item list above.)

In item (d), the type of fish Rocks will be inserted in the blank.

Loose riprap will be paid for according to 00390.90.

[End Option 2]

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.