

3.11 Contract Specifications

The following activities are organized by sections in the ODOT Construction Specifications. Standard Specifications are annotated simply as the section number, whereas Special Provisions (SPs) are annotated as “SPxxxx”. All measures comply with the Programmatic Biological Assessment and the programmatic BO from NMFS. Refer to the ODOT Specifications website (<http://www.oregon.gov/ODOT/HWY/SPECS/Pages/index.aspx>) for standard and boiler plate special provisions referenced below and Appendix 9 for an overview of how specifications are incorporated into projects and contract documents. ODOT is in the process of updating Standard Specifications and Boiler Plate SPs. Until those are published (anticipated in 2014 or 2015), depending on project components and site conditions, some of the existing boiler plate SPs may need to be edited during project development to comply with the FAHP, as presented below. These are in order of ODOT specification headings.

3.11.1 Material Sources and Disposal Sites – Section 00160 and SP00235

Standard specifications require the contractor to obtain aggregate materials unless sources have been specified in the SPs or Plans as Prospective or Mandatory Sources. Prospective sources/sites are optional, while mandatory are required. The development and utilization of Agency-furnished material source or disposal sites may be covered under the FAHP if the work falls within scope and follows other applicable impact avoidance and minimization measures.

- For projects with high environmental sensitivity, plan and designate Agency-furnished material sources or disposal sites and add SP00235 when these are to be included in the project.

3.11.2 Mobilization and Staging – Section 00210 and 00290.10

Standard Specifications Section 00210 and 00290.10 require the contractor to locate “staging and disposal sites in previously improved or disturbed sites, including existing roadways, pullouts, turnouts, parking lots, and storage yards that have been compacted, graveled and paved, unless otherwise approved in writing by the Engineer.” For locations of disposal, Contractors may dispose of clean fill at Agency-furnished sites, and any other construction waste at public facilities (Agency property, municipal recycling or landfills) or private property. When the Contractor utilizes private sites, they are responsible for obtaining all the required permits and environmental clearances. However, the Agency may reduce the risk of potential regulatory violations by proactively evaluating environmental constraints and designating sites that are to be used for the Contract.

- For projects with high environmental sensitivity, plan and designate staging areas and disposal sites as per ODOT Technical Services Bulletin GE08-04(B) (ODOT 2008b), and add SP00290.10.

3.11.3 Temporary Water Management and Fish Salvage – SP00245

To comply with the FAHP, work area isolation (also referred to as temporary water management, is required of any project element that involves substantial excavation, backfilling, embankment construction, or similar work below OHW where adult or juvenile fish are reasonably certain to be present, or 300 feet or less upstream from spawning habitats.

- When applicable, add SP00245 for site conditions, and develop a concept Temporary Water Management Plan to effectively isolate fish from in-water work areas (meaning that the work area is inaccessible to fish and does not allow a visible release of pollutants or sediment into

the water). SP00245 also requires the contractor to coordinate with the Agency for fish capture and removal, which is also requirement of the FAHP.

- See Section 2.5.2 for fish salvage reporting requirements.
- *Note: although the FAHP does not require review/approval of the Temporary Water Management Plan, project teams may request the expertise and services of the Service and/or ODFW representatives to help develop plans and/or review Contractor-updated plans.*

3.11.4 Pollution and Erosion Controls – Sections 00280 – 00290.30

Most of the design standards in the NMFS BO regarding general construction BMPs are sufficiently covered under Standard Specifications (00280, 00290.30(a))

- Include applicable parts of SP00290.30(a), including part (8) which complies with the turbidity standard in the FAHP.

3.11.5 Protection of Fish and Fish Habitat – Section 00290.34

When construction activities are in or near protected habitat resources, add boiler plate SP00290.34 about the contractor meeting with Agency Biologist on site before commencing project work. Modify this SP as needed for site-specific conditions, including the option for more than one meeting in advance of specific activities or adding requirements that certain subcontractors attend the meeting.

- The Biologist should coordinate closely with the construction project manager to determine the best timing and scheduling this meeting. *Note: this would be a good meeting to invite your Service representative to attend (see Section 2.5).*

In-Water Work (Parts a, b):

- Standard specification 00290.34 meets applicable FAHP design standards if in-water work is not allowed.
- If in-water work within streams with native fish is allowed, all projects must include SP00290.34(a, b), edited for project location.
- If your project is in the Willamette River below Willamette Falls, ensure in-water work window is in compliance with the FAHP: The winter in-water work period between Dec 1 and Jan 31 for the Willamette River downstream of Willamette Falls is not approved.
 - *Note: unless work can be completed in the dry, this last item is an automatic exclusion from the FAHP and individual consultation is needed if in-water work is needed at that location/time (coordinate with the Service representative for more information).*

General Equipment Requirements (Part c-1):

- If applicable to the project, include SP00290.34(c-1) and add the following bulleted item for compliance with the FAHP:
 - Store, fuel and maintain all equipment in a staging area 150 feet or more from any waterbody, or in an isolated hard zone such as a paved parking lot. *Note: this distance may be modified based on site conditions, and justified/described in the Project Notification Report (approval is not needed if the modification would not increase the likelihood of take).*
- To comply with the FAHP, add the following to project SP if applicable to project/site conditions:
 - Whenever possible, eliminate the need for a temporary access road by using low impact equipment (spider crane) or existing routes that will minimize soil

- disturbance and compaction within 150 feet of any water body, or lower drilling equipment to the site using a crane.
- If temporary access roads are needed within 150 feet of any waterbody, use existing routes unless shown or approved. *Note: this distance may be modified based on site conditions, and justified/described in the Project Notification Report (approval not needed if the modification would not increase the likelihood of take).*
- Edit the fourth bulleted item of Boiler Place Part c-1 for the project SPs if applicable to project/site conditions for compliance with the FAHP:
 - Do not cross directly through a stream for construction access, unless shown or approved. If allowed, cross perpendicular to the waterway and do not block stream flow. When a crossing is no longer needed, block the area, obliterate the route, and restore the soils and vegetation.
 - *Note: The FAHP only allows temporary stream crossings if a fish biologist inspects the crossing to ensure it will not interfere with spawning behavior, eggs or pre-emergent juveniles in an occupied redd, or native submerged aquatic vegetation.*

Work Area Isolation (Part c-2):

If applicable to the project, include this SP to maintain compliance with the FAHP. Project may not block fish passage unless it did not exist prior to the project, and except temporarily during deployment of work area isolation. To comply with FAHP, when a temporary stream crossing is necessary, a fish biologist must be consulted to ensure the proposed crossing will not interfere with spawning behavior, eggs or pre-emergent juveniles in an occupied redd, or native submerged aquatic vegetation. Fish must be moved from isolated work areas, as per SP00245 (Section 3.11.3) and NMFS (2000).

Water Intake Screening (Part c-3):

If applicable to the project, include SP00290.34(c-3).

Special Aquatic Habitats (Part c-4):

The FAHP is more inclusive than the current boiler plate SPs. As applicable to the project, edit project SPs to only disallow the following:

- The following exploration or construction activities are not allowed in special aquatic habitats:
 - Use of pesticides or herbicides. *Note: do not include “herbicides” if allowed, as described in Section 3.11.8.*
 - Temporary roads or drilling pads built on steep slopes, where grade, soil type, or other features suggest a likelihood of excessive erosion or slope failure.
 - Exploratory drilling in estuaries that cannot be conducted from a work barge, or an existing bridge, dock, or wharf.
 - Installation of a fish screen on any permanent water diversion or intake that is not already screened.
 - Drilling or sampling in an EPA-designated Superfund Site, a state-designated clean-up area, or the likely impact zone of a significant contaminant source, as identified by the Agency (an exclusion in the FAHP).

Site Restoration (Part c-5):

If applicable to the project, include SP00290.34(c-5).

Surface Water Diversions (Part c-6):

If applicable to the project, include Boiler Plate SP00290.34(c-6).

Hydro-Acoustic (Part c-7):

If ESA-listed fish are known or likely to be present during pile installation, as applicable to the project, include the following project SPs (edit as needed based on site conditions and alternatives as negotiated/approved by the Service):

- The following requirements apply to piles located within the ordinary high water elevation or xx distance from the xx [to be completed for project SP] of the active stream channel. *Note: the distance depends on site conditions and effects to ESA-listed species, and should be discussed with the Service representative during Early Coordination. Also, larger pile may be approved, particularly if it means fewer numbers of piles or lower hydraulic impacts. In this case, Service approval will be required during the project notification process, and the Service may require additional hydraulic data to be submitted with the Project Notification Report. Potential allowances and additional requirements should be coordinated with the Service representative during Early Coordination.*
- Pile may be installed or replaced with concrete, steel round pile 24-inches in diameter or smaller, steel H-pile designated as HP24 or smaller, or untreated wood unless shown or approved.
- Whenever possible, use a vibratory hammer to install pile. An impact hammer may not be used when juvenile ESA-listed fish weighing less than 2 grams are likely to be present (as directed).
- When using an impact hammer to drive or proof steel piles, unless otherwise approved, one of the following sound attenuation methods must be used to effectively dampen sound:
 - Completely isolate the pile from flowing water by dewatering the area around the pile.
 - If water velocity is 1.6 fps or less, surround the pile being driven with a bubble curtain that must distribute small air bubbles around 100% of the pile perimeter for the full depth of the water column, as shown or approved.
 - If water velocity is greater than 1.6 fps, surround the pile being driven by a confined bubble curtain that must distribute air bubbles around 100% of the pile perimeter for the full depth of the water column, as shown or approved.
 - *Note: to comply with either above, provide plans and/or additional bubble curtain SPs that comply with NMFS and USFWS 2006 (Appendix 10).*
- For all pile installed or removed, maintain a pile installation and removal log, to be submitted upon completion of the related work. The log shall include types, sizes, locations and installation or removal methods, and dates.

Drilling, Boring or Jacking (Part c-8):

If applicable to the project, include SP00290.34(c-8) for compliance with the FAHP.

Treated Wood (Part c-9):

If applicable to the project, include SP00290.34(c-9), but with the following changes for compliance with FAHP:

- Delete the third bulleted item (“Piles treated with ammoniacal copper zinc arsenate, chromated copper arsenate, or creosote may be installed below OHW provided that no more than 50 piles are used. No other use for treated wood or preservative type is allowed below or over the OHW”) and replace with “Treated wood includes any temporary or permanent wood structures treated with chromated copper arsenate, ammoniacal copper zinc arsenate, alkaline

copper quat, ammoniacal copper citrate, copper azole, copper dimethyldithiocarbamate, borate preservatives, or oil-type wood preservatives, such as creosote, pentachlorophenol, or copper naphthenate”

Pile Removal (Part c-10):

If applicable to the project, include SP00290.34(c-10), and add the following:

- Remove bridge piles according to SP00510.
- If a pile in uncontaminated sediment is intractable or breaks, cut the pile or stump off at least three feet below the surface of the sediment.
- If a pile in contaminated sediment is intractable or breaks, cut the pile or stump off at the sediment line or, if it breaks within contaminated sediment, make no further effort to remove it and cover the hole with a cap of clean substrate appropriate for the site.
- To remove a creosote pile, use the following steps to minimize creosote release, sediment disturbance and total suspended solids.
 - Install a floating surface boom to capture floating surface debris.
 - Keep all equipment (*e.g.*, bucket, steel cable, vibratory hammer) out of the water, grip piles above the waterline, and complete all work during low water and low current conditions.
 - Dislodge the pile with a vibratory hammer, when possible – never intentionally break a pile by twisting or bending.
 - Slowly lift the pile from the sediment and through the water column.
 - Place the pile in a containment basin on a barge deck, pier, or shoreline without attempting to clean or remove any adhering sediment.
 - Fill the hole left by each pile with clean, native sediments immediately after removal.
 - Dispose of all removed piles, floating surface debris, any sediment spilled on work surfaces, and all containment supplies at a permitted upland disposal site.
 - If a pile is intractable or breaks, cut the pile or stump off at the sediment line or, if it breaks within contaminated sediment, make no further effort to remove it and cover the hole with a cap of clean substrate appropriate for the site.

Ditch and Culvert Cleaning (Part c-11):

Unless a requirement of another permit, do not use this SP because it is not part of the FAHP.

Utility Lines (Part c-13):

If a project involves installing or relocating Agency-controlled utilities across a stream or wetland, whenever possible, design the utility as aerial lines, including lines hung from existing bridges. If it is not possible, add the following SP for compliance with the FAHP:

- Install Agency-controlled utility lines across waterways by directional drilling, boring and jacking that span the channel migration zone (as defined in Section 4.0) and any associated wetlands. Except in the case of intermittent streams, utilities may be trenched in the dry and all trenches must be backfilled below the ordinary high water line with native material and capped with clean gravel, as shown or approved.
- *Note: if this is anticipated, provide appropriate plans and specifications for saving/re-using large wood, streambed gravel or importing gravel suitable for fish use and congruent with site conditions (Section 3.11.10).*

3.11.6 Work Containment - SP00290.42

Several FAHP design standards require preventing construction material and debris from entering protected habitats. If the boiler plate SPs have not already been changed to move these to SP00290.34(c), include Boiler Plate SP00290.42 as needed to ensure compliance with the NMFS BO, with the following edits:

Work Containment Plan (Part a):

- Delete the 4th bulleted item: Prohibit the use of treated timber.
- Replace 4th bulleted item with the following: treated wood must adhere to SP00290.34(c-9)

Work Containment System (Part b):

- Add the following: All other project SPs apply to installation and removal of temporary piles.
- Currently there are no SPs for barge use, but barges are allowed in the FAHP for temporary construction access, following design standards listed below. As applicable to the project, add the following subsection 00290.42(c) for compliance with the FAHP: If a barge will be used as a work platform to support construction, the following conditions apply:
 - It must be large enough to remain stable under foreseeable loads and adverse conditions.
 - Before arrival, inspect and clean to ensure vessel and ballast are free of invasive species.
 - Secure, stabilize and maintain to ensure no loss of balance, stability, anchorage, or other condition that can result in release of contaminant or construction debris.
 - If a portable fuel tank is stationed on a barge to refuel equipment, the fuel tank must be double-walled and an absorbent containment boom shall be placed around the tank while it is on the barge.
 - When not in use, store fuel tanks on land in a specified containment area if within 150 feet of any waters of Oregon or the United States or storm inlet.
 - Refill fuel vessels on shore within secondary containment vessels of sufficient capacity to hold the entire volume of liquid available should an emergency spill occur.
 - All equipment on the barge must have its own containment, including containment pans or absorbent booms to locally contain minor spills.
 - Remove waste material (such as spent abrasives, paint chips) from the barge before any pause in work (*i.e.*, one day without active work), every three work days, or before reaching the calculated safe load weight of the barge.

3.10.7 Clearing, Grubbing and Earthwork – Sections 00320-330

Several measures in the FAHP require implementation of avoidance and minimization measures in streams, riparian zones and other protected habitat areas, and Standard Specifications Sections 00320.02, 00320.40, 00320.42, and 330.41 may be in conflict with FAHP. Depending on site conditions, add the following SPs:

- 00320.40(b) Preserving and Trimming Vegetation - Standard specifications 00320.02 require removal of down timber and other vegetation and construction debris in clearing or construction limits, except in areas designated to remain in place as shown on plans.
- As applicable, to maintain compliance with the FAHP, include boiler plate SP00320(b-4) to protect trees, but edit the Boiler Plat SP to include down timber.

- As applicable, add Boiler Plate SP00320(b-5) Stockpile Vegetation and Material – As specified on plans and as directed, stockpile native vegetation and down timber for use in site restoration. Do not salvage material dominated by weedy species, as directed. If shown on plans, remove conifer trees that are greater than 18-inch DBH with root wad intact, as directed. Mulch vegetation less than 18-inch DBH, into pieces no more than 2-inches in size. Store salvaged material in a clean/dry place until site restoration. Allow for material to remain on site rather than being mulched, as negotiated with the biologist and project team.
- As applicable, add SP00320.42 Ownership and Disposal of Matter – Vegetation, trees and material designated for preservation and salvage are the property of Agency. Dispose of all other matter according to Standard Specification Section 00290.20.
- Standard Specification Section 00330.41(a-2) allows for stockpiling native topsoil according to Standard Specification Section 01040.43, but there is no existing standard or boilerplate SP for stockpiling of boulders for use in site restoration or native streambank material. As applicable, add a new SP00330.41(a-13), for salvaging/stockpiling boulders or streambed material as shown on plans and as directed.

3.10.8 Weed Control - Section 01030

Unlike SLOPES IV and most other NMFS BOs for transportation projects, the FAHP allows for use of herbicide treatment within the riparian zone (as defined in Section 4.0), although the use involves considerable impact minimization measures. In fact, standard specification Standard Specification Section 01030.42 (c) allows only hand or light mechanical removal of weeds within 50-feet of “sensitive areas” (which must be shown on plans).

If hand or mechanical control is not considered cost effective, herbicide treatment in the riparian zone can be allowed by adding Boiler Plate SP01030.42(c) (Herbicide Treatment) and editing as follows:

The following weed control methods are allowed within 50-feet of aquatic habitat or the riparian zone associated with ESA-listed species covered by the FAHP:

- ***Non-herbicide methods.*** Limit vegetation removal and soil disturbance within the riparian zone by limiting the number of workers there to the minimum necessary to complete manual and mechanical plant control (*e.g.*, hand pulling, clipping, stabbing, digging, brush-cutting, mulching or heating with radiant heat, pressurized hot water, or heated foam).
- ***Herbicide Label.*** Herbicide applicators must comply with all label instructions.
- ***Power equipment.*** Gas-powered equipment with tanks larger than 5 gallons will be refueled in a vehicle staging area placed 150-feet or more from any natural waterbody, or in an isolated hazard zone such as a paved parking lot.
- ***Maximum herbicide treatment area.*** The total area treated with herbicides within the riparian zone will not exceed totals of 10-acres above bankfull elevation and 2 acres below bankfull elevation, per 1.6-mile reach of a stream, per project per year.
- ***Herbicide applicator qualifications.*** Herbicides will be applied only by an appropriately licensed applicator using an herbicide specifically targeted for a particular plant species that will cause the least impact. The applicator will be responsible for preparing and carrying out the herbicide transportation and safety plan, as follows.
- ***Herbicide transportation and safety plan.*** The applicator will prepare and carry out an herbicide safety/spill response plan to reduce the likelihood of spills or misapplication, to take remedial actions in the event of spills, and to fully report the event.
- ***Herbicides.*** The only herbicides allowed are (some trade names are shown in parentheses):

- aquatic imazapyr (*e.g.*, Habitat)
- aquatic glyphosate (*e.g.*, AquaMaster, AquaPro, Rodeo)
- aquatic triclopyr-TEA (*e.g.*, Renovate 3)
- chlorsulfuron (*e.g.*, Telar, Glean, Corsair)
- clopyralid (*e.g.*, Transline)
- imazapic (*e.g.*, Plateau)
- imazapyr (*e.g.*, Arsenal, Chopper)
- metsulfuron-methyl (*e.g.*, Escort)
- picloram (*e.g.*, Tordon)
- sethoxydim (*e.g.*, Poast, Vantage)
- sulfometuron-methyl (*e.g.*, Oust, Oust XP)
- **Herbicide adjuvants.** The only adjuvants allow are shown in Table 8, with mixing rates described in label instructions. Polyethoxylated tallow amine (POEA) surfactant and herbicides that contain POEA (*e.g.*, Roundup) will not be used.

Table 1. Allowed herbicide adjuvants, trade names, and application areas.

Adjuvant Type	Trade Name	Application Areas
Surfactants	Agri-Dex	Riparian
	LI 700	Riparian
Drift Retardants	41-A	Riparian
	Vale	Upland

- **Herbicide carriers.** Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil. Use of diesel oil as an herbicide carrier is prohibited.
- **Herbicide mixing.** Herbicides will be mixed more than 150-feet from any natural waterbody to minimize the risk of an accidental discharge.
- **Dyes.** A non-hazardous indicator dye (*e.g.*, Hi-Light or Dynamark) is required to be used with herbicides within 100-feet of live water. The presence of dye makes it easier to see where the herbicide has been applied and where or whether it has dripped, spilled, or leaked. Dye also makes it easier to detect missed spots, avoid spraying a plant or area more than once, and minimize over-spraying (SERA 1997).
- **Spill Cleanup Kit.** A spill cleanup kit will be available whenever herbicides are used, transported, or stored. At a minimum, cleanup kits will include Material Safety Data Sheets, the herbicide label, emergency phone numbers, and absorbent material such as cat litter to contain spills.
- **Herbicide application rates.** Herbicides will be applied at the lowest effective label rates.
- **Herbicide application methods.** Liquid or granular forms of herbicides will be applied as follows:
 - Broadcast spraying – hand held nozzles attached to back pack tanks or vehicles, or by using vehicle mounted booms.
 - Spot spraying – hand held nozzles attached to back pack tanks or vehicles, hand-pumped spray, or squirt bottles to spray herbicide directly onto small patches or individual plants using.
 - Hand/selective – wicking and wiping, basal bark, fill (“hack and squirt”), stem injection, cut-stump.
 - Triclopyr – will not be applied by broadcast spraying.

- Keep the spray nozzle within 4-feet of the ground; 6-feet for spot or patch spraying more than 15-feet of the high water mark if needed to treat tall vegetation.
- Apply spray in swaths parallel towards the project area, away from the creek and desirable vegetation (*i.e.*, the person applying the spray will generally have their back to the creek or other sensitive resource).
- Avoid unnecessary run off during cut surface, basal bark, and hack-squirt/injection applications.
- **Washing spray tanks.** Spray tanks shall be washed 300-feet or more away from any surface water.
- **Minimization of herbicide drift and leaching.** Herbicide drift and leaching will be minimized as follows:
 - Do not spray when wind speeds exceed 10 miles per hour, or are less than 2 miles per hour.
 - Be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind.
 - Keep boom or spray as low as possible to reduce wind effects.
 - Increase spray droplet size whenever possible by decreasing spray pressure, using high flow rate nozzles, using water diluents instead of oil, and adding thickening agents.
 - Do not apply herbicides during temperature inversions, or when ground temperatures exceed 80 degrees Fahrenheit.
 - Wind and other weather data will be monitored and reported for all broadcast applications.
- **Rain.** Herbicides shall not be applied when the soil is saturated or when a precipitation event likely to produce direct runoff to salmon bearing waters from the treated area is forecasted by the NOAA National Weather Service or other similar forecasting service within 48 hours following application. Soil-activated herbicides can be applied as long as label is followed. Do not conduct hack-squirt/injection applications during periods of heavy rainfall.
- **Herbicide buffer distances.** The following no-application buffers, which are measured in feet and are based on herbicide formula, stream type, and application method, will be observed during herbicide applications (Table 9). Herbicide applications based on a combination of approved herbicides will use the most conservative buffer for any herbicide included. Buffer widths are in feet, measured as map distance perpendicular to the bankfull elevation for streams, the upland boundary for wetlands, or the upper bank for roadside ditches. Before herbicide application begins, the upland boundary of each applicable herbicide buffer will be flagged or marked to ensure that all buffers are in place and functional during treatment.

Table 2. Herbicide buffer distances by herbicide formula, stream type, and application method.

Herbicide	No Application Buffer Width (feet)					
	Perennial Streams and Wetlands, and Intermittent Streams and Roadside Ditches with flowing or standing water present			Dry Intermittent Streams, Dry Intermittent Wetlands, Dry Roadside Ditches		
	Broadcast Spraying	Spot Spraying	Hand Selective	Broadcast Spraying	Spot Spraying	Hand Selective
Labeled for Aquatic Use						
aquatic glyphosate	100	waterline	waterline	50	none	none
aquatic imazapyr	100	15	waterline	50	none	none
aquatic triclopyr-TEA	Not Allowed	15	waterline	Not Allowed	none	none
Low Risk to Aquatic Organisms						
Imazapic	100	15	bankfull	50	None	none
Clopyralid	100	15	bankfull	50	None	none
metsulfuron-methyl	100	15	bankfull	50	None	none
Moderate Risk to Aquatic Organisms						
Imazapyr	100	50	bankfull	50	15	bankfull
sulfometuron-methyl	100	50	5	50	15	bankfull
Chlorsulfuron	100	50	bankfull	50	15	bankfull
High Risk to Aquatic Organisms						
Picloram	100	50	50	100	50	50
Sethoxydim	100	50	50	100	50	50

3.11.9 Planting – Section 01040

Woody plantings will be a design feature, included in Roadside Development Plans. Standard Specifications (Section 01040) describe approved methods and acceptance criteria for plantings. Project Plans and Specifications will describe planting locations, preparation, species and plant sizes, soil amendments, and requirements for herbicide or pesticides. The Contractor is responsible for maintaining plantings during the specified plant establishment period (typically one year after installation). For full payment, the Contractor must replace dead plantings. SPs will be required to limit plant materials and construction options to those that are most likely to benefit natural habitat restoration. Examples are listed below, although others may be applicable to site-conditions.

Soil Fertility Test (SP01040.13):

In most cases, this should have been conducted prior to construction to determine if topsoil should be salvaged, and if amendments would need to be specified. Therefore, this typically is not a required item.

Topsoil (SP01040.14):

Use option (a) if topsoil is to be stockpiled and reused.

Soil Amendments (SP01040.16):

Require soil amendments as specified by Roadside Development Plans. Conditioners or amendments may be helpful in cut slopes or other areas with poor quality soil.

Soil Bio-Amendments (SP01040.17):

Use option (e) if imported topsoil is used. Check with the Agency's qualified products list for acceptable types.

Fertilizer (SP01040.18):

Although it is in the Standard Specification Section 00290 specifications, landscaping subcontractors often only read the 01040 contract provisions. Therefore, add the following SP for all projects that would require reseeding or plantings near a stream with covered aquatic species:

- Do not apply surface fertilizer within 50-feet of any stream channel.

Mulch (SP01040.20):

Use option (e) if vegetation is specified to be cleared and mulched, as per SP00320 above, or other mulches as recommended by the site restoration designer.

Herbicides (SP01040.21):

If vegetation or topsoil is specified for re-use, do not allow any of the herbicides presented in Section 3.11.8 for natural habitat restoration.

Watering (SP01040.22 and 01040.54b):

The use of time release water pellets is not recommended, as they are only effective when adequately maintained, and this is a step that is all too often not implemented. When not properly maintained the pellets draw moisture away from the plant. Deep irrigation tubes may be specified, although because these too require maintenance that typically is not implemented, they are generally not recommended.

Miscellaneous (SP01040.23):

Specify browse protectors(c) if animal damage may be a concern. Tree shelters are another type of protector that may be beneficial in some situations, and would need to be specified via project SPs. Use option (b) or (j) if boulders or course woody debris are specified to be stockpiled for re-use in site restoration.

Construction (SP01040.43):

One of the many challenges of roadside revegetation is that construction activities and equipment leave the planting areas too heavily compacted for successful plant establishment. Heavily compacted and 'smoothed' soils severely limit water infiltration, a leading cause for planting failure, and may lead to erosion and loss of imported topsoil. Currently, there are no specifications or boiler plate SPs for proper preparation of restoration surfaces. Heavily compacted soil surfaces should be tilled or ripped (at least two feet deep is ideal) to help loosen compacted soils and provide a better substrate for seeding. Soil amendments may be added at that time. Add option (d) of the Boiler Plate SPs, edited as follows:

- Grade and finish areas that are to receive seeding and planting areas to proper grade, contour and cross section, including cultivating areas that have been compacted by construction activities by scarifying, tilling, or ripping to a depth of at least 24 inches before placing topsoil, and imprinting parallel to contours for erosion control and seeding. Do not utilize track-walking to create imprinted surfaces, unless otherwise directed.

3.10.10 Waterway Enhancements - Section 01091

Although design plans are typically required for installation of in-stream enhancements, such as fish rocks (boulders), streambed substrate and large wood, SPs are also required to provide

further design specifications and for payment of bid items. ODOT’s boiler plate SP01091 already has several common types of waterway enhancements, but these need to be carefully reviewed and edited to meet project-specific design goals. Furthermore, the Boiler Plate SP language and bid items need to be modified if the on-site materials are to be stockpiled and re-used (see Section 3.11.7).

Unconfined Bubble Curtain Specifications:

1. General - An unconfined bubble curtain is composed of an air compressor(s), supply lines to deliver the air, distribution manifolds or headers, perforated aeration pipe, and a frame. The frame facilitates transport and placement of the system, keeps the aeration pipes stable, and provides ballast to counteract the buoyancy of the aeration pipes in operation.

2. The aeration pipe system shall consist of multiple layers of perforated pipe rings, stacked vertically in accordance with the following:

Water Depth (m)	No. of Layers
0 to less than 5	2
5 to less than 10	4
10 to less than 15	7
15 to less than 20	10
20 to less than 25	13

3. The pipes in all layers shall be arranged in a geometric pattern which shall allow for the pile being driven to be completely enclosed by bubbles for the full depth of the water column and with a radial dimension such that the rings are no more than 20 in (0.5 m) from the outside surface of the pile.

4. The lowest layer of perforated aeration pipe shall be designed to ensure contact with the substrate without burial and shall accommodate sloped conditions.

5. Air holes shall be 1/16 in (1.6 mm) in diameter and shall be spaced approximately 3/4 in (20 mm) apart. Air holes with this size and spacing shall be placed in four adjacent rows along the pipe to provide uniform bubble flux.

6. The system shall provide a bubble flux of 105 cubic ft (3.0 cubic m) per minute per linear meter of pipe in each layer (32.91 cubic ft [0.93 cubic m] per minute per linear foot [0.3 meter] of pipe in each layer). The volume of air per layer is the product of the bubble flux and the circumference of the ring:

$$V_t = 3.0 \text{ m}^3 / \text{min}/\text{m} * \text{Circum of the aeration ring in meters}$$

or

$$V_t = 32.91 \text{ ft}^3 / \text{min}/\text{ft} * \text{Circum of the aeration ring in feet}$$

7. Meters shall be provided as follows:

- a. Pressure meters shall be installed at all inlets to aeration pipelines and at points of lowest pressure in each branch of the aeration pipeline.

- b. Flow meters shall be installed in the main line at each compressor and at each branch of the aeration pipelines at each inlet. In applications where the feed line from the compressor is continuous from the compressor to the aeration pipe inlet the flow meter at the compressor can be eliminated.
- c. Flow meters shall be installed according to the manufactures recommendation based on either laminar flow or non-laminar flow.

Performance: In Washington, unconfined bubble curtains have achieved a maximum of 17 dB attenuation and more typically range between 9 to 12 dB. Should hydroacoustic monitoring reveal that an unconfined bubble curtain is not achieving (to be determined based on site and project specific considerations), the NMFS and/or USFWS staff person on the project should be contacted immediately regarding modifications to the proposed action. Should attenuation rates continue at less than (to be determined based on site and project specific considerations), re-initiation of consultation may be necessary.

Confined Bubble Curtain Specifications:

1. General - A confined bubble curtain is composed of an air compressor(s), supply lines to deliver the air, distribution manifolds or headers, perforated aeration pipe(s), and a means of confining the bubbles.
 - a. The confinement (fabric, plastic or metal sleeve, or equivalent) shall extend from the substrate to a sufficient elevation above the maximum water level expected during pile installation such that when the air delivery system is adjusted properly, the bubble curtain does not act as a water pump (*i.e.*, little or no water should be pumped out of the top of the confinement system).
 - b. The confinement shall contain resilient pile guides that prevent the pile and the confinement from coming into contact with each other and do not transmit vibrations to the confinement sleeve and into the water column (rubber spacers, air filled cushions).
2. In water less than 50 ft (15 m) deep, the system shall have a single aeration ring at the substrate level. In waters greater than 50 ft (15 m) deep, the system shall have at least two rings, one at the substrate level and the other at mid-depth.
3. The lowest layer of perforated aeration pipe shall be designed to ensure contact with the substrate without sinking into the substrate and shall accommodate for sloped conditions.
4. Air holes shall be 1/16 in (1.6 mm) in diameter and shall be spaced approximately 3/4 in (20 mm) apart. Air holes with this size and spacing shall be placed in four adjacent rows along the pipe to provide uniform bubble flux.
5. The system shall provide a bubble flux of 105 cubic ft (3.0 cubic m) per minute per linear meter of pipe in each layer (32.91 cubic ft [0.93 cubic m] per minute per linear foot [0.3 meter] of pipe in each layer). The total volume of air per layer is the product of the bubble flux and the circumference of the ring:

$$V_t = 3.0 \text{ m}^3/\text{min}/\text{m} * \text{Circ of the aeration ring in meters}$$

or

$$V_t = 32.91 \text{ ft}^3/\text{min}/\text{ft} * \text{Circ of the aeration ring in feet.}$$

6. Meters shall be provided as follows:
 - a. Pressure meters shall be installed at all inlets to aeration pipelines and at points of lowest pressure in each branch of the aeration pipeline.
 - b. Flow meters shall be installed in the main line at each compressor and at each branch of the aeration pipelines at each inlet. In applications where the feed line from the compressor is continuous from the compressor to the aeration pipe inlet the flow meter at the compressor can be eliminated.
 - c. Flow meters shall be installed according to the manufactures recommendation based on either laminar flow or non-laminar flow.

Performance: In Washington, few projects have used confined bubble curtains so there is a lack of data. Based on performance in other locations, the effectiveness of a confined system could range from 9 dB to 30 dB. Should hydroacoustic monitoring reveal that a confined bubble curtain is not achieving (to be determined based on site and project specific considerations), the NMFS and/or USFWS staff person on the project should be contacted immediately regarding modifications to the proposed action. Should attenuation rates continue at less than (to be determined based on site and project specific considerations), re-initiation of consultation may be necessary.