SECTION 5 PROJECT EFFECTS

How will project construction affect ecosystem elements?

To build the Tukwila to Renton Project, construction activities will need to occur in and adjacent to wetlands, streams, and their associated buffers. In addition, construction activities will also occur in areas containing wildlife habitat. The construction effects we consider in this section are based on the assumption that all of the components of the project will be constructed per the description of the Tukwila to Renton Project found in Section 2 of this report.

The effects from project construction fall into two categories: temporary and permanent effects. Temporary effects are categorized as those effects that will dissipate over time, such as clearing of a work area that will ultimately be replanted and (over time) restored to or enhanced above its pre-disturbance state. Permanent effects are those effects that will remain in perpetuity after the project is constructed, such as permanent areas of new roadway or new bridges.

Project biologists worked with project engineers to identify where the project improvements would potentially affect the ecosystems resources. Prior to finalizing the project footprint, the I-405 Team modified the design, where feasible, to reduce or avoid effects to wetlands, streams, their associated buffers, and upland habitat. When one of these ecosystem elements was located within the construction footprint, engineers changed the footprint to avoid the element or, if the element could not be avoided, WSDOT determined to what degree project construction will affect ecosystem elements.

Wetlands

Portions or all of 12 of the 22 wetlands in the study area will be permanently filled or temporarily disturbed as a result of the project. Overall, 12 wetlands (approximately 7.5 acres) will be permanently disturbed by filling or grading to construct road improvements. Five of the wetlands that will be permanently disturbed are Category IV wetlands, six are Category III wetlands, and one, Wetland 24.7R, is a Category II wetland. Six of the 12 wetlands that will permanently disturbed will be completely filled. These six

wetlands, two Category III wetlands and four Category IV wetlands, include 0.55 acres of the permanent wetland effects. The majority of permanent wetland effects, 5.42 acres, will occur to Wetland 24.7R, a Category II wetland. Six wetlands (approximately 1.1 acres) will be temporarily disturbed. Disturbances to these six wetlands will include both temporary and permanent effects.

Wetland buffer effects will include permanent effects to the buffers of nine wetlands (approximately 8.1 acres) and temporary effects to the buffers of nine wetlands (approximately 0.5 acre). If a wetland is wholly filled, it is not considered to incur buffer effects. Effects to wetland buffers will include the same wetlands that will have temporary and permanent direct wetland effects, with the exception of Wetlands 0.6L, 2.7R, and 25.5L, which will incur temporary and permanent buffer effects, but no wetland effects.

Permanent Wetland Effects

To build the project, construction activities will need to occur in and adjacent to wetlands and their buffers. The magnitude of wetland disturbances generally depends on a wetland location and its proximity to proposed construction activities. In addition, the project will convert wetland buffer areas into new roadway facilities.

The total acreage of the wetlands in the study area is 93.86 acres. Of that total, 7.5 acres of 12 wetlands will be permanently affected by the project. The largest portion of affected wetlands includes 5.42 acres of Wetland 24.7R, an approximately 61-acre Category II wetland. The remaining permanent wetland effects include 1.81 acres of six Category III wetlands and five Category IV wetlands totaling 0.27 acres. Six of these 12 wetlands will be partially filled and six wetlands, Wetlands 2.2R-A, 2.2R-B, 2.31R, 2.6R, 2.81L, and 25.7L, will be completely filled.

Wetland buffers are areas of land surrounding a wetland boundary that protect wetlands from the effects of adjacent land use. Buffers help wetlands function by filtering storm runoff from surrounding developments, trapping sediment, absorbing nutrients, attenuating high flows, and providing wildlife habitat. Buffers also physically separate wetlands from developed areas in order to lessen noise, light, chemical pollution, and other associated human-related disturbances.

Due to the interconnectivity between a wetland and the surrounding uplands, effects to the buffer can damage the ability of the wetland to perform ecological functions.

Existing structures such as buildings, road prisms, and paved or impervious surfaces are not considered wetland buffer habitat, but provide information on the overall functions and values of the wetland systems. Most of the wetlands in the study area are adjacent to some paved surfaces and road fill prisms. Overall, wetland buffer habitat in the study area is generally of low quality and typically includes shrub, grass, and herbaceous habitat typically associated with highway right-of-way.

Wetland buffer effects will include permanent effects to the buffers of nine wetlands, totaling approximately 8.1 acres of wetland buffers located within the study area. Permanent effects to wetland buffers include the same wetlands that will have permanent wetland effects, with the exception of Wetlands 0.6L, 2.7R, and 25.5L, which will incur no direct wetland effects. A summary of the permanent wetland and associated wetland buffer effects is provided in Exhibit 5-1.

Exhibit 5-1: Summary of Permanent Wetland Effects

Wetland	Wetland Size (acres)	Permanent Wetland Effects (acres)	Percentage of Wetland Incurring Permanent Effects (%)	Wetland Buffer Size (acres)	Permanent Buffer Effects (acres)	Percentage of Wetland Buffer Incurring Permanent Effects (%)**
0.6L	0.17	0.00	0%	0.63	0.26	41%
0.9R	1.00	0.12	12%	1.70	0.64	49%
2.2R-A	0.03	0.03	100%	0.00***	0.00	0%
2.2R-B	0.03	0.03	100%	0.00***	0.00	0%
2.31R	0.01	0.01	100%	0.00***	0.00	0%
2.6R	0.15	0.15	100%	0.49	0.00	0%
2.7R	0.25	0.00	0%	1.03	0.03	3%
2.81L	0.03	0.03	100%	0.00	0.00	0%
2.82R	0.38	0.17	45%	1.22	0.93	76%
2.9L	1.05	0.06	6%	0.74	0.12	16%
24.7R	61.00*	5.42	9%	25.90	4.23	16%
25.0L	4.51	0.61	14%	3.92	0.87	22%
25.5L	11.38*	0.00	0%	4.41	0.04	1%
25.7L	0.30	0.30	100%	0.34	0.34	0%
25.8L	11.50	0.57	5%	3.42	0.60	17%
Total	11.5*	7.5****	8%	42.97	8.1****	17%

*The size of these wetlands was estimated as the majority of their area lies outside of the study area. The total wetland acreage includes both the estimates and actual wetland survey data. This total represents only wetlands that are affected by the Tukwila to Renton Project.

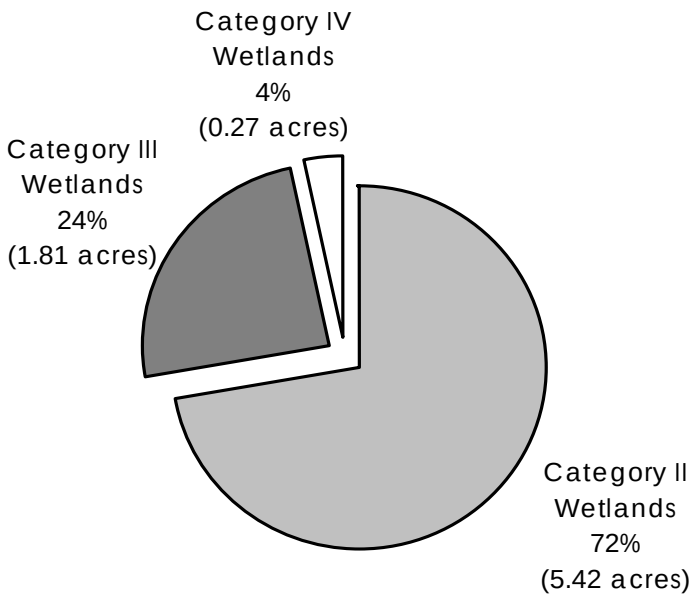
**Wetlands with less than 1 percent disturbance are rounded up to 1 percent.

***City of Renton wetlands less than 2,200 square feet (0.05 acre) are exempt from regulation under RMC Critical Areas Regulations (RMC 4-3-50 B(7)).

**** The total permanent effects in this table have been rounded up to the nearest tenth of an acre

A summary of the permanent effects to wetlands, categorized by the Ecology rating system is provided in Exhibit 5-2.

Exhibit 5-2: Percentages of Permanent Effects to Wetlands, Categorized by the Ecology Rating System



Filling a portion of a wetland or altering its vegetation can reduce the wetland's capacity to store stormwater, filter pollutants, protect stream banks from erosion, and provide wildlife habitat. Overall, wetland buffer habitat in the study area is generally of low quality and typically includes shrub, grass, and herbaceous habitat typically associated with highway right-of-way. Existing structures such as buildings, road prisms, and paved or impervious surfaces are not considered wetland buffer habitat.

Temporary Wetland Effects

To build the project's roadway and stormwater facilities, some construction activities will need to occur outside of the permanent project footprint, including clearing of both wetland and upland vegetation. As a result, WSDOT may need to place temporary fill in wetlands and buffers to allow adequate room for construction activities. This construction disturbance will result in a short-term loss of wetland functions. Potential erosion and sedimentation caused by construction activities will increase the amount of sediment settling within a wetland and reduce the quality of habitat available for invertebrate life and habitat for plants. Additionally, loose sediment will reduce the potential water

quality and quantity benefits provided by those wetlands. Loss of tree, shrub, and emergent vegetation will reduce the quality of habitat available for birds and small mammals. After the project is complete, wetlands where the vegetation is cleared or trimmed will still retain some water quality and quantity function, although at a diminished level until the wetlands are completely reestablished. These temporarily disturbed areas will be restored and replanted with appropriate native vegetation. WSDOT will develop a project-specific plan before construction begins to identify how vegetation restoration will occur.

The total acreage of wetlands in the study area is 93.86 acres. Of that total, approximately 1.1 acres will be temporarily affected. The total acreage of wetland buffer in the study area is 48.19 acres. Of this total, approximately 0.5 acre, or less than 2 percent, of wetland buffer will be temporarily affected. With the exception of wetlands 24.7R and 25.8L, most of the temporary wetland effects will occur within wetlands that are dominated by invasive species and surrounded by urban land uses including roads and buildings. The temporary effects to wetlands and their associated buffers are detailed in Exhibit 5-3.

Exhibit 5-3: Summary of Temporary Wetland Effects

Wetland	Wetland Size (acres)	Temporary Wetland Effects (acres)	Percentage of Wetland Incurring Temporary Effects (%)	Wetland Buffer Size (acres)	Temporary Buffer Effects (acres)	Percentage of Wetland Buffer Incurring Temporary Effects (%)**
0.6L	0.17	0.00	0%	0.63	0.08	13%
0.9R	1.00	0.03	3%	1.70	0.06	4%
2.7R	0.25	0.00	0%	1.03	0.02	2%
2.82R	0.38	0.02	5%	1.22	0.02	2%
2.9L	1.05	0.03	3%	0.74	0.03	4%
24.7R	61.00*	0.83	1%	25.90	0.08	1%
25.0L	4.51	0.05	1%	3.92	0.08	2%
25.5L	11.38*	0.00	0%	4.41	0.02	1%
25.8L	11.50	0.08	1%	3.42	0.02	1%
Total	93.86*	1.1***	1%	48.19	0.5***	1%

*The size of these wetlands was estimated as the majority of their area lies outside of the study area. The total wetland acreage includes both the estimates and actual wetland survey data.

**Wetlands with less than 1 percent disturbance are rounded up to 1 percent.

*** The total temporary effects in this table have been rounded up to the nearest tenth of an acre

Aquatic Resources

Permanent Aquatic Resources Effects

As a result of the project, new roadways and roadway structures (e.g., bridges and culverts) will be built within, over, or near river and stream habitats that support fish and other aquatic species within the study area. Project elements that will permanently affect fisheries and aquatic resources include:

- Construction of one new bridge and reconstruction of five additional bridges over the Green River to accommodate roadway widening, including installation of piling below the OHWM of the Green River.
- Construction of a new stormwater outfall to the Green River.
- Encroachment into the OHWM of Rolling Hills Creek to accommodate I-405, SR 167, and local roadway improvements.
- Encroachment into the OHWM of Thunder Hills Creek to accommodate I-405 roadway improvements including construction of a retaining wall.
- Removal of the Houser Way Bridge over the Cedar River to accommodate widening of I-405.
- Reconstruction of three bridges over the Cedar River, including a pedestrian bridge and relocation of the BNSF Railroad bridge.
- Construction of new stormwater outfalls to the Cedar River.
- Encroachment into the OHWM of Panther Creek between SR 167 and East Valley Road in order to expand SR 167 to the west.
- Encroachment into the OHWM of Panther Creek on the east side of SR 167 to accommodate a new SR 167 northbound auxiliary lane.
- Construction of new stormwater facilities for the treatment of water quality and quantity associated with new impervious surfacing created by the project. For more

information on stormwater facilities, see the *Water Resources Discipline Report*[66] for this project.

A summary of the permanent effects to aquatic resources can be found in Exhibit 5-4.

Exhibit 5-4: Summary of Permanent Aquatic Resource Effects

	Regulated River/Stream Buffer (feet)	Permanent Effect Below OHWM (square feet)	Permanent Effect to River/Stream Buffer (square feet)	Permanent Shading Effects from New Over-water Cover (square feet)*
Gilliam Creek	100	1,742	46,174	0
Green River	100	16,553	121,532	16,988
Panther Creek	100	45,738	36,590	0
Rolling Hills Creek	75	4,792	33,106	5,227
Unnamed Tributary to Rolling Hills Creek	75	871	12,632	871
Thunder Hills Creek	75	2,614	37,462	0
Unnamed Tributary to Thunder Hills Creek	75	495	4,356	0
Cedar River	100	436	25,700	14,375
Total		73,500**	318,000**	37,500**

*Areas of shading detail only those new areas that will be shaded and do not account for existing shaded areas
** The total permanent effects in this table have been rounded up to the nearest 500 square feet

Over-water Structures

Over-water structures refers to structures that span over the top of waterbodies and include bridges and fly-over ramps that will be constructed as part of the project. Shading can have both beneficial and negative effects with regard to fish habitat. Fish and aquatic species are sensitive to incremental shifts in temperatures outside of their natural range. Often, stream systems in urban settings, including many in the project area, have elevated stream temperatures that are a potential threat to fish life. The scientific community has largely attributed these increases in water temperature to effects of impervious surfaces such as pavement, which heat stormwater runoff, and the reduction in shading provided by riparian trees. Shading from bridges over water can help reduce water temperatures and provide a beneficial effect to fish habitat.

Shading from overwater structures can also reduce available food sources for aquatic species. Shading from overwater

[66] *WSDOT, 2007b*

structures can also reduce the rate at which plants produce organic matter that starts food chains, thus reducing available food sources. Additionally, shading of existing stream buffers can result in reduced leaf litter production and an associated reduction in terrestrial invertebrates that fish eat.

Conversely, over-water structures also present a challenge for aquatic prey species such as juvenile salmon. The likelihood of predation is higher in these sections of a stream and certain fish species have demonstrated an aversion to segments with over-water structure. Predator species may concentrate in these areas, making passage for prey species difficult.

The project will create additional over-water cover on the Green River, Gilliam Creek, an unnamed tributary to Gilliam Creek, Rolling Hills Creek, an unnamed tributary to Rolling Hills Creek, Thunder Hills Creek, the Cedar River, and Panther Creek.

Permanent In-Water Structures

The built project will potentially result in permanent structures including pilings, roadways, retaining walls, culverts, and drainage features located within the existing OHWM of several rivers and streams in the study area. Placement of permanent structures within the OHWM will reduce the amount of in-stream habitat available for aquatic dependant organisms and can also reduce the waterbodies' ability to transport and store water, sediment, nutrients, and other materials; and provide for groundwater recharge and floodwater storage. Reducing the amount of available in-stream habitat can also affect fish as they will have fewer places in which to forage for food and hide from predators.

Permanent pilings may be placed within the OHWM of the Green River, Rolling Hills Creek, and the unnamed tributary to Rolling Hills Creek. These pilings are necessary to construct bridges, retaining walls, and fly-over ramps associated with the project. Permanent pilings can affect these waterbodies by causing streambed scour that increases sedimentation and changes to the streambed's sediment composition.

Expansion of the I-405 and SR 167 corridors within the study area will result in portions of the roadway prism being placed

within the OHWM of Gilliam Creek, Panther Creek, Rolling Hills Creek, and the unnamed tributary to Rolling Hills Creek.

An approximately 1 mile segment of Panther Creek flows parallel to SR 167 before flowing through a fish ladder and culvert underneath SR 167 and East Valley Road. The expanded SR 167 fill prism will be located within Panther Creek for the entirety of the area where Panther Creek flows parallel to SR 167, resulting in an almost complete loss of the main channel of Panther Creek in this area. In addition to the effects on the east side of SR 167, approximately 200 linear feet of Panther Creek on the west side of SR 167 will be filled to accommodate widening of the East Valley Road.

Portions of the OHWMs of Gilliam Creek, Rolling Hills Creek, the unnamed tributary to Rolling Hills Creek, and the unnamed tributary to Thunder Hills Creek will be placed in expanded existing or new culverts to accommodate stream flow and fish movements through the expanded road prism. Fill will be placed over the new or expanded culverts to accommodate the expanded roadway. Retaining walls will be placed within the OHWM of Rolling Hills Creek and the unnamed tributary to Thunder Hills Creek to minimize the effects of road widening.

Three new stormwater outfalls will be constructed for the project, one in the Green River and two in the Cedar River. The new outfall to the Green River is associated with a new flow control facility located southwest of the new Tukwila Parkway and SR 181 intersection. Portions of the outfall and/or an associated armored outfall pad will occur below the OHWM of the Green River. Existing outfalls on the north and south side of the Cedar River are anticipated to remain in place; however, portions of a new outfall and an associated armored outfall pad will be constructed below the OHWM.

Stream Buffer Encroachment

The construction footprint will encroach into the stream buffers of several of the streams and rivers in the study area including the Green River, Gilliam Creek, Rolling Hills Creek, an unnamed tributary to Rolling Hills Creek, Thunder Hills Creek, an unnamed tributary to Thunder Hills Creek, the Cedar River, and Panther Creek. Permanent and temporary effects on stream buffers in the study area are summarized in Exhibits 5-4 and 5-5, respectively.

Although baseline riparian conditions vary along the streams in the study area, all of the streams have stream buffers that are moderately to severely degraded. Therefore, many of the functions that riparian vegetation provides (such as LWD recruitment, contribution of organic material, fish cover, bank stabilization, and stream temperature regulation) are already altered and removing additional riparian vegetation could result in more effects to the stream system than would be realized under more natural conditions.

Fish Barrier Removal

WSDOT has identified seven existing fish passage barriers where in-water work will occur. These fish passage barriers occur on Panther Creek, Rolling Hills Creek, an unnamed tributary to Rolling Hills Creek, and Thunder Hills Creek.

Removal of fish passage barriers can result in changes to a waterbody's substrate both up- and downstream of the barrier. Construction related effects from the removal of fish barriers, such as sedimentation, dewatering, and fish removal are discussed in the Temporary Aquatic Resource Effects section.

Stormwater Runoff

The Tukwila to Renton Project would add approximately 58 acres of new net impervious surface within the study area. Increased amounts of impervious surfaces within the study area can result in effects to fish and other aquatic species.

Increases in stream peak flows resulting from increased impervious area can negatively affect fish. Peak flows and sustained high flows in streams during storm events can cause harm to, or kill, fish. Harm typically occurs when fish or other aquatic species are unable to get out of high flow areas and are swept downstream or battered against rocks or streambanks. Harm can also occur when high flows affect feeding or avoidance behavior as well as the energy reserves that help fish and other aquatic species fight disease. In urbanized streams where little to no refugia habitat exists and where storm events can cause rapid rises in stream levels, peak or sustained high flows can be especially detrimental to fish. Rerouting of stormwater into new or existing stormwater systems can change baseline drainage patterns into or away from creeks, and can also result in lost opportunities for groundwater infiltration.

In addition to effects on fish, increases in stream peak flows can also negatively affect aquatic habitat. High flows can cause streambanks and streambeds to scour and erode, resulting in increased sedimentation, changes in streambed composition, and decreased habitat complexity. Streambank scour can also result in losses of stream buffers as streambanks erode and cause plants to fall into the water.

Temporary Aquatic Resources Effects

Project construction will have several temporary effects on fisheries and aquatic resources. These temporary effects are primarily related to construction-related in-water disturbances and stream diversions, in-stream sedimentation, and stream buffer and riparian vegetation. Streams that will be temporarily affected by project construction are the Green River, Gilliam Creek, Rolling Hills Creek, an unnamed tributary to Rolling Hills Creek, Thunder Hills Creek, Panther Creek, and an unnamed tributary to Thunder Hills Creek.

Construction activities over, in, or near a stream can disturb fish, other aquatic species, and aquatic habitat. Except where absolutely necessary (as in the case of culvert replacements or extensions, and bridge removal and construction), construction equipment will not enter streams below the OHWM. In addition, streams will be dewatered prior to replacing or lengthening culverts. Dewatering and stream diversions could strand or entrain (draw in) fish and create temporary barriers to fish migration. Rivers and streams that may need to be dewatered to construct the project include Gilliam Creek, the Green River, Rolling Hills Creek, an unnamed tributary to Rolling Hills Creek, Thunder Hills Creek, an unnamed tributary to Thunder Hills Creek, Panther Creek, and the Cedar River. Dewatering of each of these waterbodies will only occur in localized areas where construction will occur. A summary of the temporary construction effects to aquatic resources can be found in Exhibit 5-5.

Exhibit 5-5: Summary of Temporary Aquatic Resource Effects

	Regulated Stream Buffer (feet)	Temporary Effect Below OHWM (square feet)	Temporary Effect to Stream Buffer (square feet)	Temporary Effects from Shading * (square feet)
Gilliam Creek	100	436	3,920	0
Green River	100	57,499	14,810	436
Panther Creek	100	3,050	6,969	0
Rolling Hills Creek	75	436	3,920	436
Unnamed tributary to Rolling Hills Creek	75	436	1,307	871
Thunder Hills Creek	75	436	4,792	0
Unnamed Tributary to Thunder Hills Creek	75	436	6,970	0
Cedar River	100	871	3,049	2,178
Total		64,000**	46,000**	4,000**

*Areas of shading detail only those new areas that will be shaded and do not account for existing shaded areas. The shaded areas represent areas directly below/in the footprint of an overwater structure. Whereas other areas are shaded during a solar day, these are likely the areas where the effects and duration are the greatest.

** The total temporary effects in this table have been rounded up to the nearest 500 square feet

Some construction will likely occur during hours of darkness or reduced light. Therefore, artificial lighting will be required for some work areas. Lighting can negatively effect fish by causing fish to be attracted to the light, thereby disrupting feeding and migration patterns, and also by attracting predators to lighted areas where the fish may be congregating.

Construction noise, including driving of pilings either in-water or in-ground near a waterbody, can produce sound vibrations that propagate to nearby water and affect fish behavior. Installation of steel piles with an impact hammer can produce intense sound pressure waves that can injure and kill fish.[67] The injuries caused by such pressure waves include hemorrhage and rupture of internal organs, and damage to the auditory system. Vibratory installation of steel piles and installation of concrete piles with an impact hammer is expected to produce lower noise levels than installation of steel piles using an impact hammer, without the percussive sound pressure peaks that may cause injury to fish. Noise

[67] *NMFS, 2005*

generated during vibratory pile installation or installation of concrete piles with an impact hammer is not expected to cause peak percussive sound pressure levels capable of killing fish. In addition to sound effects from pile driving, installation of piling can result in temporary increases in sedimentation as a result of disturbing bottom sediments. Pile driving could occur in or near the Green River, Rolling Hills Creek, and the unnamed tributary to Rolling Hills Creek.

General construction noise in the vicinity of the study area waterbodies could disturb or displace fish for relatively long periods (weeks to months) at any given stream or river crossing. For all in-stream work, the work window specified in various permits and approvals will limit the potential noise effects to fish because these windows are designed to allow work when fish are less likely to be present.

To provide the room necessary to construct the project, the project construction footprint extends beyond the footprint of the new roadbed or any other new permanent structures resulting from the project. Most construction-related activities will occur within these limits.

Potential erosion due to construction of culvert extensions, retaining walls, bridges or replacements, and stormwater facility discharges of runoff could introduce fine sediments into the streams and rivers of the study area. Excessive fine sediment input into streams could smother salmon eggs in the gravel (unable to receive enough oxygen to survive), decrease micro- and macroinvertebrate survival (limit available food for fish), and create conditions where visual predators (such as coho salmon) have reduced capacity to capture prey. In addition, certain types of sediments can cause damage to the gills of fish, increasing the risk of anoxia (the absence or reduced supply of oxygen in arterial blood or tissues) and stress that can lead to fish mortality (death).

What are macroinvertebrates and microinvertebrates?

Macroinvertebrates are small animals without backbones, which are visible to the naked eye (insects, worms, larvae, etc.). Microinvertebrates are similar to macroinvertebrates, but are not visible to the naked eye. Waterbodies have communities of aquatic macro- and microinvertebrates. The species composition, species diversity, and abundance of the macro- and microinvertebrates in a given waterbody can provide valuable information on the relative health and water quality of a waterway.

The potential for erosion and sedimentation will be highest in areas where construction activities will occur within or directly adjacent to streams. Within the study area, these areas include streams that cross or flow adjacent to I-405, I-5, SR 167, and local streets where in-water (below the OHWM) or adjacent-to-water construction will occur.

Additional potential short-term effects from the project could include hazardous materials (for example, oil and gasoline),

chemical contaminants, nutrients, or other materials entering the waterbodies in the study area.

Wildlife Habitat

Permanent Effects

The constructed project will result in approximately 58 acres of new net impervious surfacing in the study area and an associated reduction of other land use cover types and associated habitats. The permanent loss of approximately 34 acres of potential habitat will affect wildlife species in the study area. Permanent removal of vegetation will eliminate habitat currently available to wildlife species. Wildlife species are likely to migrate to other portions of the study area or outside the study area to find usable and available habitat. The permanent effects to wildlife habitat are shown in Exhibit 5-6.

Exhibit 5-6: Potential Permanent Land Cover Loss In the Study Area

Land Cover	Baseline Land Cover (acres)	Permanent Land Cover Loss (acres)	Percentage of Overall Land Cover Loss
Forested	549.6	1.7	1%
Shrubs and Grasses	250.6	3.1	1%
Maintained Vegetation	1,550.2	29.2	2%
Total	2,350.4	34.0	2%

The forested land use cover type will be permanently reduced by approximately 1.7 acres, which is a 1 percent loss. Affected forested land cover will be converted to shrub/grass, maintained vegetation, and impervious surface cover types. Where possible, portions of the forested cover type will be preserved near the margins of the proposed roadway through avoidance and minimization measures. The shrub/grasses cover type will be permanently reduced by approximately 3.1 acres, a 1 percent loss due to roadway widening. The shrub/grasses cover type will be primarily converted to maintained vegetation and impervious surface land use cover types. The maintained vegetation cover type will be permanently reduced by approximately 29.2 acres, a 2 percent loss due to roadway widening and new roadway construction.

Most of the maintained vegetation affected will be converted to impervious surface.

Temporary Effects

Temporary effects to wildlife species include noise associated with general and localized construction activities. Wildlife species in the study area will be affected by the localized increase in noise levels. Wildlife species disturbed by this localized increase in noise will likely disperse to locations where the noise levels are decreased and only return to the disturbed areas when construction ceases. Due to the levels of noise typically associated with the I-405 and SR 167 corridors, noise levels from localized construction activities will decrease to ambient levels at approximately 1,600 feet.[68] The temporary effects to wildlife habitat are shown in Exhibit 5-7.

Exhibit 5-7: Potential Temporary Land Cover Loss In the Study Area

Land Cover	Baseline Land Cover (acres)	Permanent Land Cover Loss (acres)	Percentage of Overall Land Cover Loss
Forested	549.6	6.0	1%
Shrubs and Grasses	250.6	6.6	3%
Maintained Vegetation	1,550.2	60.7	4%
Total	2,350.4	73.3	3%

In addition to direct effects to wildlife, construction activities, including clearing vegetation for staging areas and access roads, will affect the land cover types and associated wildlife habitat in the study area. It is anticipated that 6 acres of forested, 6.6 acres of shrub/grasses, and 60.7 acres of maintained vegetation will be temporarily disturbed during construction activities, including vegetation clearing, material stockpiling, and staging.

Construction disturbance will result in a short-term loss of wildlife habitat. Habitat areas will be temporarily reduced until the newly planted trees, shrubs, and forbs become established. Compaction of top soils and erosion resulting from construction activities could also result in temporary

[68] *WSDOT, 2005c*

effects during re-vegetation. Soil compaction decreases moisture infiltration and can stunt new root growth of planted species. BMPs will be implemented as required in the WSDOT HRM[69] to minimize compaction, erosion, and sedimentation during construction. Land use cover types where the vegetation is cleared or trimmed will retain some habitat quality and function, although at a diminished level until the cover types are reestablished.

Will project construction affect listed species?

Several rivers and streams in the study area contain various life stages of Chinook salmon, steelhead, and bull trout, which are currently listed as threatened under the ESA. Construction activities below the OHWM will occur in the Green River, Gilliam Creek, Springbrook Creek, Panther Creek, and potentially the Cedar River, which are either known or anticipated to contain ESA listed fish species. Pile driving will occur below the OHWM of the Green River, which could affect Chinook salmon, bull trout, and steelhead trout; however, all areas where pile driving will occur will be dewatered prior to commencing pile driving to minimize effects to listed species. Additional information on the effects to fish from these activities can be found above.

How will project operation affect ecosystem elements?

No additional negative effects on wetlands, aquatic resources, or wildlife habitat are expected during operation of the Tukwila to Renton Project. Some wetlands, streams, and rivers within the study area are currently affected by routine vegetation maintenance to meet safety and operation standards as set forth by WSDOT. Wetland and riparian areas located within the right-of-way and presently subject to routine maintenance activities would likely continue to be affected by these practices and conditions.

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[69] *WSDOT, 2006b*

Does the project have other effects that may be delayed or distant from the project area?

Effects that could be delayed or distant from the project include effects that induce growth and associated changes in land use, population density, or growth rate. Delayed or distant effects also include effects on air and water and other natural systems, including ecosystems.

The project is not anticipated to result in additional growth, so no delayed or distant effects from growth are expected. Other potential delayed and distant effects are discussed further below.

Wetlands

Delayed and distant effects from the project were assessed as they relate to the loss of specific wetland functions. Delayed or distant effects from the project may include a reduction in the habitat area available for wetland-dependent wildlife and changes to wetland hydrology resulting from the built project.

Wetlands and buffers affected by the project will not be available for use by wildlife as habitat. As a result, increased competition for food and refugia in the remaining wetlands may occur because of the potential influx of displaced wildlife from the affected wetlands. The likelihood and severity of delayed or distant effects caused by increased competition among wetland-dependent wildlife would be highest for wetlands with the largest quantity of potential wildlife habitat. Similarly, there would be a low likelihood and severity of delayed or distant effects to wetland-dependent wildlife in the wetlands with low wildlife habitat function before an action occurs.

Even though new impervious surfaces may not have direct effects to wetlands, new impervious surfaces could change existing drainage patterns. Adding new impervious surfaces may result in changes to stormwater conveyance, which may change the hydrology of wetlands in the study area. These changes will subsequently affect hydrology of nearby wetlands, including wetlands that occur in areas beyond the study area. The majority of wetlands in the study area are associated with ditches that also act as stormwater conveyance systems, and these conveyance systems will continue to be used after the project is complete. In addition, wetlands in the

study area do not rely solely on impervious surface runoff for hydrology.

The likelihood that a delayed or distant effect could occur as a result of the project, and the severity of that effect, are related to two primary factors: 1) the level of function provided by the affected wetland; and 2) the ability of WSDOT to mitigate for the potential effect.

Aquatic Resources

Delayed or distant effects to aquatic resources from the project include effects from potential removal of fish passage barriers and to stream buffers as a result of the replanting that will occur post construction.

Removal of fish passage barriers can result in inaccessible fish habitat becoming accessible to a variety of fish species. Opening up presently inaccessible habitat can provide fish species with new areas in which to spawn, rear, migrate, and forage, resulting in increased habitat connectivity and potential increases in fish populations. Additionally, reintroducing anadromous fish to reaches currently inhabited only by resident fish may affect the distribution and abundance of resident fish as well as prey species.

Wildlife Habitat

Delayed or distant effects from the project on wildlife habitat may include a reduction in and fragmentation of the habitat types available for wildlife. Fragmentation of existing habitat may also contribute to reducing overall habitat connectivity and impeding movement of species between divided habitats.

Were potential cumulative effects on ecosystem elements considered?

Cumulative effects for aquatic resources and wetlands are evaluated in a separate *Cumulative Effects Analysis Technical Memorandum*.[70] That report also discusses cumulative effects for this project in the areas of Air Quality, Surface Water, and Water Quality. Cumulative effects for other disciplines were determined to be unnecessary for this project.

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[70] *WSDOT, 2007c*

What effects would occur under the No Build Alternative?

Wetlands

The No Build Alternative would have no new permanent, temporary, or indirect effects on wetlands in the Tukwila to Renton Project study area. No wetland or wetland buffer would be filled or cleared under this alternative, and there would be no change to current management of stormwater flows or existing wildlife habitat functions.

Many of the wetlands that occur in the right-of-way are currently affected by the lack of forested upland buffer; mowed vegetation associated with WSDOT maintenance activities; and the lack of modern stormwater control, conveyance, and management facilities. Wetlands in the study area that currently receive untreated runoff would likely continue to be affected by these conditions. Water quality in these wetlands would continue to be affected by sediment transport and erosion. It is possible that emission-reducing improvements in automobiles or increases in traffic volumes could change the concentrations of pollutants and contaminants entering these wetlands; however, there is no means to accurately predict that such changes would occur. Minor roadway safety improvements would continue to take place.

Aquatic Resources

The No Build Alternative assumes that the project will not be constructed and WSDOT will continue with ongoing maintenance activities in the study area. In this scenario, no physical changes would occur to the rivers and streams from construction activities, though some disturbance to stream buffers may occur through routine maintenance activities such as mowing or brushing. The amount of untreated stormwater entering these waterbodies from I-405, I-5, SR 181, SR 167, SR 169, and Talbot Road would remain unchanged. It is possible that emission-reducing improvements in automobiles or increases in traffic volumes could change the concentrations of pollutants and contaminants entering these streams; however, there is no means to accurately predict that such changes would occur.

The No Build Alternative would not increase impervious surface areas. Therefore, it is assumed that it would result in little change to baseline water quality in, and increased flow into, the streams and rivers in the study area. Existing fish passage barriers throughout the study area would remain. This alternative will not change the existing effects on fish and other aquatic organisms and the habitats in which they live. Minor roadway safety improvements would continue to take place, which could result in effects from construction of in-water structures or removal of riparian vegetation to accommodate construction activities.

Wildlife Habitat

The No Build Alternative would have no permanent, temporary, or indirect effects on wildlife and land use cover types in the Tukwila to Renton Project study area. No cover types would be fragmented, cleared, or converted under this alternative, and there would be no change to current existing wildlife habitat functions.

Most of the wildlife habitat that occurs in the study area is fragmented and non-forested. Vegetated cover types are dominated by invasive plants and early successional species that provide marginal wildlife benefits. Habitat quality in the right-of-way and existing cover types would continue to be degraded and affected by invasive species under the No Build Alternative. Under the No Build Alternative, normal roadway maintenance will continue including vegetation mowing and clearing to maintain roadway safety.

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