ECOSYSTEM REPORT

SR 167 – 8th Street E Vic. to S 277th Street Vic.
Southbound HOT Lane

King / Pierce County, Washington

September 2008

Prepared for:

Washington State Department of Transportation
Urban Corridors Office
Seattle, Washington

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Washington State
Department of Transportation

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ACRONYMS AND ABBREVIATIONS

BMP	best management practice
CAVFS	compost amended vegetated filter strips
CFR	Code of Federal Regulations
cfs	cubic feet per second
Corps	US Army Corps of Engineers
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DCE	Documented Categorical Exclusion
DPS	distinct population segment
Ecology	Washington Department of Ecology
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Federal Insurance Rate Maps
GIS	Geographical Information System
GMA	Growth Management Act
HOT	high-occupancy toll
HOV	high-occupancy vehicle
HUC	Hydrologic Unit Code
HRM	Highway Runoff Manual
LWD	large woody debris
MOA	memorandum of agreement
MP	milepost
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration

NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
PGIS	pollution-generating impervious surface
RCW	Revised Code of Washington
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SPCC	Spill Prevention, Control, and Countermeasure
SR	State Route
TSS	total suspended solids
USDA	United States Department of Agriculture
USFWS	United Stated Fish and Wildlife Service
USGS	US Geologic Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

GLOSSARY

Term	Meaning
amphibians	A group of vertebrate animals that spend part of their time on land and part in the water. Amphibians must return to the water to breed and they have distinct larval and adult forms.
anadromous fish	A fish species that spends a part of its life cycle in the sea and returns to freshwater streams to reproduce (for example, salmon, steelhead, and trout).
bank	The slope of land adjoining a body of water, such as a river, lake, wetland, or drainage channel. With respect to flowing waters, banks are either right or left as viewed facing in the direction of the flow.
bankfull channel	The stream channel formed by the dominant discharge, also referred to as the active channel, which meanders across the floodplain.
bankfull width	The width of the stream channel between the tops of the stream banks where, under high flow conditions, the water level would be even with the top of the banks. In a river with a floodplain, this is the point just before water would spill over onto the floodplain.
base flow	The volume of flow in a stream or river during dry conditions, as opposed to conditions influenced by storm runoff. Base flows discharge groundwater and water from upstream channels, wetlands, lakes, and ponds.
basin	An area of land that drains to a specific water body.
best management practice (BMP)	Innovative and improved environmental protection tools, practices, and methods that have been determined to be the most effective, practical means of avoiding or reducing environmental effects.
buffer (aquatic resource)	A designated area along and adjacent to a stream or wetland that may be regulated to control the negative effects of adjacent development on the aquatic resource.
channelization (streams)	Structural alteration made to straighten, widen, deepen, or otherwise modify a natural stream channel.
cofferdam	A temporary watertight enclosure constructed around a worksite in a reservoir or on a stream, enabling the worksite to be pumped dry or the water level controlled so that construction can proceed in the dry.

Term	Meaning
confluence	The convergence of two streams of comparable size into a single channel, or the junction where two rivers, streams, etc., flow together.
construction footprint	The physical area affected by project construction activities.
corridor	The road or highway and the adjacent area that is affected by and extending along the highway. The distance the corridor extends out from the highway may vary depending on different factors, such as land use and topography, or the corridor may be defined as a set width, such as 0.25 or 0.5 miles.
critical areas	Environmentally sensitive areas defined by local critical area ordinances that typically include: aquifer recharge areas, fish and wildlife habitat conservation areas, flood hazard areas, geologic hazard areas, and wetlands. Critical area functions and values are protected by local jurisdictions that require development to avoid or compensate for adverse effects on critical areas.
critical habitat	Under the Endangered Species Act: (1) the specific areas within the geographic area occupied by a federally-listed species on which are found physical or biological features essential to conserving the species, and that may require special protection or management considerations; and (2) specific areas outside the geographic area occupied by a federally-listed species when it is determined that such areas are essential for the conservation of the species.
culvert	A pipe or box structure that drains open channels, swales, or ditches under a roadway or embankment.
deciduous	Trees that shed their leaves annually.
delineation	Establishing the boundaries of a wetland by applying adopted jurisdictional methods.
direct effect	An effect caused by an action or alternative and occurring at the same time and location. Effects may be ecological, aesthetic, historic, cultural, economic, social, or health-related.
direct-access ramp	A ramp that provides direct access to and from high-occupancy vehicle lanes for buses, carpools, and vanpools. This avoids the need to cross several lanes of general-purpose traffic, saving time and improving traffic flow and safety.

Term	Meaning
dominant species	A plant species that exerts a controlling influence on or defines the character of a vegetative community.
down-gradient	The direction of flow; i.e., downstream.
downstream	Referring to the direction of the flow of a stream or river.
drainage ditch	An open channel designed and constructed to convey water. This may include modifications of natural drainages or man-made historic channels incorporated in a system design.
ecosystem	A community of organisms interacting with each other, and the environment in which they live.
effect	Something brought about by a cause or agent; a result. This may include ecological, aesthetic, historic, cultural, economic, social, health, or other effects, whether direct, indirect, or cumulative. Effects include those resulting from actions that may have both beneficial and detrimental effects.
electrofishing	A fish sampling method that involves capturing fish using an electric shock technique.
emergent wetlands	Wetlands comprised of plants that are rooted in shallow water or saturated soil but have foliage that extends out of the water or above the ground surface.
encroachment	Any action, including the placement of fill and the construction of piers and bridge abutments, that will occur within the limits of the regulatory floodplain; intrusion by roads or development into habitat areas that reduces the area available to wildlife, or reduces the functions of the habitat area.
endangered species	Any species that is in danger of extinction throughout all or a substantial portion of its range.
Endangered Species Act (ESA)	Federal legislation adopted to prevent the extinction of plants and animals.
erosion	The wearing away of soil or rock by the action of running water, wind, ice, or geologic agents. For this analysis, erosion relates primarily to stormwater runoff.
escapement	The number of adult fish that enter a fresh water system to spawn.
Evolutionarily Significant Unit (ESU)	The term used by the National Marine Fisheries Service for a fish species population protected by a listing under the Endangered Species Act.

Term	Meaning
federally-listed species	Any species of fish, wildlife, or plant that has been determined by the US Fish and Wildlife Service or National Marine Fisheries Service to be endangered or threatened under Section 4 of the Endangered Species Act.
fill	Any material placed in an area to increase surface elevation.
filter fabric fence	Cloth fencing installed around a construction site to keep soil from migrating off the site.
filter strip	Grassy slopes that filter and diffuse stormwater running off highway shoulders.
flap gate	An opening through which water may flow freely at low water elevations, but which closes automatically and prevents water from flowing in the opposite direction at higher water elevations.
flood	An overflow or inundation that comes from a river, stream, tide, wave action, storm drain, or excess rainfall; any relatively high streamflow overtopping the natural or artificial banks in any reach of a stream.
forbs	Broad-leaved flowering plants.
forested wetland	A wetland characterized by woody vegetation that is 20 feet tall or taller.
general-purpose lane	A freeway or arterial lane available for use by all traffic.
geographic information system (GIS)	A digital computer mapping system that can overlay a wide variety of data such as land use, utilities, and vegetative cover, and provide a spatial analysis.
gradient	The rate at which a physical quantity, such as temperature or pressure, changes relative to change in a given variable, especially distance.
groundwater	That portion of the water below the ground surface that is free flowing within the soil particles. Groundwater typically moves slowly, generally at a downward angle because of gravity, and eventually enters into streams, lakes, and oceans.
groundwater recharge	The process where natural sources (infiltrating rain, snowmelt, or surface water) or pumped water enters and replenishes the ground water supply.

Term	Meaning
Growth Management Act (GMA)	Washington State legislation adopted in 1990, and subsequently amended, that requires all cities and counties in the state to conduct long-range comprehensive planning, and has more extensive requirements for the largest and fastest-growing counties and cities in the state. Such comprehensive plans must address several required topics, including but not limited to land use, transportation, capital facilities, utilities, housing, etc. The GMA requirements also include guaranteeing the consistency of transportation and capital facilities plans with land use plans.
grub	An action where roots or stumps are cleared by digging.
habitat	The environment or specific surroundings where a plant or animal grows or lives.
habitat fragmentation	The separation of a habitat into pieces that are no longer physically connected to each other as a result of human development.
hazardous materials	Any material that may pose a threat to human health or the environment because of its quantity, concentration, or physical or chemical characteristics.
herbaceous	A plant with no persistent woody stem above the ground.
high-occupancy vehicle (HOV)	High-occupancy vehicle is a special designation for a bus, carpool, or vanpool provided as an encouragement to increase ride-sharing. Specially designated HOV lanes and parking are among the incentives for persons to pool trips, use fewer vehicles, and make the transportation system more efficient.
High-occupancy toll (HOT)	High occupancy toll (HOT) lanes are HOV lanes (for carpools of two or more, vanpools and buses) that are also open to solo drivers who pay a toll. Toll rates adjust electronically to ensure that traffic in the HOT lane is free flowing (at least 45 miles per hour 90 percent of the time) even when the regular lanes are congested. The SR 167 HOT lanes provide toll-free express trips for buses, vanpools and carpools of two or more, and also give solo drivers the option to pay for a faster, more reliable trip when they need it the most.
hydric soil	Soils formed under conditions of saturation, flooding, or ponding long enough to develop anaerobic conditions (absence of oxygen) in the upper part.

Term	Meaning
hydrologically connected	Linked to or associated with the water source of another system either through surface water, a stream, groundwater, etc.
hydrology	Within the context of a wetland, permanent or periodic inundation or prolonged soil saturation sufficient to create anaerobic conditions in the soil.
hydroseed	A mixture of grass seed, fertilizer, lime, and wood fiber mulch designed to rapidly revegetate cleared areas.
impervious surface	Pavement, roofs, and other compacted or hardened areas that do not allow the passage of rainfall or runoff into the ground.
incised	A term used to describe down-cutting (downward erosion) by a stream. Incision deepens and often steepens the stream channel.
indirect effect	An effect that occurs later in time or is removed in distance from the proposed action, but is still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air, water, and other natural systems.
infiltration	The passage of water through the soil surface into the subsoil.
invasive species	Non-native species that disrupt and displace native species.
jurisdiction	A municipal government agency, such as a city or county, and as appropriate, federal and state agencies and federally recognized tribes. The term also can mean “to have authority over.”
land use	The type of activity (i.e., residential, commercial, or industrial) that occurs on property.
large woody debris (LWD)	Logs, limbs, or root wads that are waterward of the ordinary high water line. To qualify as large woody debris, it must be of sufficient size to be resistant to erosion, provide bank stability, or help maintain or create habitat features important to fish life.
levee	A manmade structure, usually an earthen embankment along the edge of a river channel, constructed to contain, control, or divert the flow of water so as to provide protection from temporary flooding.

Term	Meaning
macroinvertebrate	Small animals that are visible with the naked eye, yet have no backbone (insects, worms, larvae, etc.).
meandering	Following a winding and turning course.
minimization	Taking measures to reduce potential effects to the smallest practical amount, extent, size, or degree. Minimization could include alignment shifts, a commitment to seasonal construction windows, replacement of land or facilities, restoration or landscaping, or payment of fair market value for affected lands.
mitigation	An effort to: (1) avoid the effect altogether by not taking a certain action or parts of an action; (2) minimize the effect by limiting the magnitude of the action and its implementation, by using technology or by taking affirmative steps; (3) rectify the effect by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate the effect over time by preservation and maintenance operations; (5) compensate for the effect by replacing, enhancing, or providing substitute resources or environments; and/or (6) monitor the effect and take appropriate corrective measures.
mitigation bank	A mitigation project constructed in advance of planned development to mitigate for unavoidable effects on wetlands and their associated habitat. Banks are generally sized to provide sufficient mitigation for several development projects in one location. As a result, the bank typically provides higher functioning wetlands and more useable habitat than may be possible on an individual project scale.
obligate (OBL)	In context of wetland science, it is a plant species that the USDA Natural Resource Conservation Service has defined as 'occurs almost always (estimated probability 99%) under natural conditions in wetlands'.

Term	Meaning
ordinary high water mark (OHWM)	The elevation marking the highest water level, which is so common and maintained for a sufficient time in all ordinary years that it leaves evidence upon the landscape, such as a clear, natural line impressed on the bank, changes in soil character, destruction of or change in vegetation, or the presence of litter and debris. Generally, it is the point where the natural vegetation changes from predominately aquatic to upland species. Where the ordinary high water mark cannot be found, it is the line of mean annual flood – the highest the water gets in an average year, but not the highest it gets during extreme flooding.
palustrine	Tidal or non-tidal freshwater areas dominated by trees, shrubs, persistent emergents, mosses, or lichens. Palustrine also includes wetlands lacking this vegetation but having the following characteristics: area less than 20 acres, no active wave-formed or bedrock shoreline, and water depth in the deepest part is less than 6.6 feet at low water.
palustrine aquatic bed (PAB)	Surface waters dominated by plants that grow and form a continuous cover principally on or at the surface, including algal mats, detached floating mats, and rooted vascular plant assemblages. Total vegetation cover is greater than 80 percent.
palustrine emergent (PEM)	A wetland characterized by erect, rooted, non-woody plants such as cattails, rushes, and sedges.
palustrine forested (PFO)	A wetland characterized by woody vegetation that is 20 feet tall or taller.
palustrine scrub-shrub (PSS)	Areas dominated by woody vegetation less than 20 feet tall, such as trees, shrubs, or young trees that are stunted due to environmental conditions.
peak flow	The maximum instantaneous rate of flow during a storm, usually in reference to a specific design storm event.
pier	A vertical column or substructure unit that supports an elevated structure such as a bridge.
piscivorous animal	Animals that eat fish.
pollutant	Any substance introduced into the environment that contaminates or otherwise adversely affects the usefulness of a resource.

Term	Meaning
primary constituent elements	Physical and/or biological habitat features needed for the survival and successful reproduction of a species.
priority habitats	Habitat types with unique or significant value to a diverse group of species.
pump station	A mechanical facility that controls flows from one body of water to another.
raptor	A raptor is a carnivorous (meat-eating) bird. All raptors share at least three main characteristics: keen eyesight, eight sharp talons, and a hooked beak. Eagles, hawks, falcons, and owls are all considered raptors.
reconnaissance-level field survey	A qualitative investigation, where the biologist walks the site, photographs key areas, and makes observations of plants and wildlife, to assess overall site conditions.
refugia habitat	An area of a stream that provides shelter or safety for aquatic species.
resident fish	Fish that do not migrate out to the ocean but remain in fresh water.
restoration	To improve a disturbed or altered wetland by returning wetland parameters that may be missing.
retaining wall	A structure used to hold earth in place where the natural grade cannot be maintained.
retention/detention pond	A stormwater facility designed to reduce stormwater runoff quantity and quality effects by storing the increased runoff volume that results from development, allowing the suspended particles to settle out, and then slowly releasing it at a controlled runoff rate.
revetments	Facings of stone, concrete, or even such materials as tires, placed on a riverbank or levee to protect from erosion.
riffle	A shallow area of a stream or river in which water flows rapidly over a rocky or gravelly stream bed.
right-of-way	A strip of land purchased or granted prior to the construction of transportation improvements for roadway, sidewalks, sound walls, retaining walls, stormwater facilities, and other project features. This also includes permanent or temporary easements for construction and maintenance. Vacant land may also be set aside for future highway expansion under certain circumstances.

Term	Meaning
riparian	Pertaining to anything connected with or immediately adjacent to the banks of a stream, river, or other water body.
riparian area	The land and habitat adjacent to streams, lakes, estuaries, or other waterways, comprising the transition area between the aquatic ecosystem and the nearby upland terrestrial ecosystem. Riparian corridors, or zones, identified by soil characteristics or plant communities, include the wet areas in and near streams, ponds, lakes, springs, and other surface waters.
riprap	A man-made armoring, facing layer, or protective mound of rocks placed to prevent erosion or sloughing of a stream bank or structure due to flow of surface and stormwater runoff.
river mile (RM)	The distance of a point on a river measured in miles from the river's mouth along the low-water channel.
riverine	Freshwater areas that are contained within a channel and are not dominated by trees, shrubs, and persistent emergents; for example, rivers and streams.
runoff	Rainwater or snowmelt that leaves an area as surface drainage.
salmonid	Any member of the family Salmonidae, which includes all species of salmon, trout, and char (including bull trout).
saturated soil conditions	A condition in which all easily drained voids (pores between soil particles) in the root zone are filled with water to the soil surface.
scrub-shrub wetland	Wetland dominated by woody vegetation less than 20 feet tall. The vegetation may include shrubs, young trees, and trees or shrubs that may be stunted because of environmental conditions.
sediment	Material that originates from weathering and erosion of rocks, dirt, or unconsolidated deposits and organic material. Sediment is carried and deposited by wind, ice, or water. It is often transported by stormwater runoff and may be suspended within the water.
seep	A spot where water trickles out of the ground to form a pool or wet area.

Term	Meaning
sensitive species	Any native wildlife species that is vulnerable or declining and is likely to become endangered or threatened throughout a significant portion of its range without cooperative management or removal of threats.
sheet flow	Runoff that flows over the ground surface as a thin, even layer as opposed to a concentrated stream or channel.
Shoreline Management Act (SMA)	Washington's Shoreline Management Act (SMA) was adopted by the public in a 1972 referendum "to prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines." The SMA has three broad policies: encourage water dependent uses, protect shoreline natural resources, and to promote public access. It regulates land use within 200 inland from principal bodies of water and associated wetlands.
Shoreline Master Program	A requirement of the SMA, it identifies standards of protection for shoreline areas and contains shoreline policies, shoreline use environments (zones), and specific shoreline regulation.
side channel	A secondary stream that splits off and then rejoins the main channel.
slope	The change in elevation over a distance, or an inclined land form.
species of concern	Species whose conservation standing is of concern to the US Fish and Wildlife Service, but for which status information is still needed for consideration to list the species under the Endangered Species Act.
Spill Prevention Control and Countermeasures (SPCC) plan	A plan for minimizing effects to soil, surface water, and groundwater in the event of a spill of contaminated soil, petroleum products, contaminated water, or other hazardous substances. The SPCC plan addresses construction procedures, equipment, and materials.
staging area	Locations used during construction to provide room for employee parking, large equipment storage, and material stockpiles.
State-listed species	Species of wildlife that are considered to be at-risk and are protected by Washington State laws.
stormwater	The portion of precipitation that does not naturally percolate into the ground or evaporate, but flows overland, in channels, or in pipes into a defined surface water channel or a constructed stormwater facility.

Term	Meaning
stormwater detention	The process of storing stormwater in manmade facilities such as ponds or vaults and releasing the stormwater at a controlled rate. This helps control volume and rate at which stormwater enters streams and rivers. Controlling the flow of stormwater helps maintain or improve conditions in the streams and minimizes erosion of stream banks.
study area	The area specifically evaluated for environmental effects.
subbasin	A smaller portion, or subarea, of a watershed or catchment area.
substrate	Organic and mineral materials that form the bed of a body of water.
threatened species	Any species that is likely to become endangered within the foreseeable future throughout all or a substantial portion of its range.
topography	The physical features of a geographic area taken collectively; especially, the variations in elevation of the earth's surface.
transportation corridor	Travel routes that routinely experience the heaviest volume of vehicles to and from primary locations within a region.
trapezoidal channel	A water conveyance channel such as a stream or ditch with a flat bottom and steep side slopes. Trapezoidal channels are typically used to convey high volumes of water such as flood or stormwater flows.
tributary	A stream or other body of water that contributes its water to another stream or body of water.
turbidity	A condition caused by suspended sediments or floating material that clouds the water and makes it appear dark and muddy.
understory	The vegetation of a forest that grows in the shade of the canopy (branches and foliage of mature trees meeting overhead). The understory usually consists of smaller herbaceous and shrub species such as ferns, various berries, and ivies.
uplands	An area that is not sufficiently wet to exhibit the vegetation, soils, and/or hydrologic characteristics associated with wetlands.
vegetative community	A unique and defined area of vegetation within an ecosystem that is composed of specific species of plants.

Term	Meaning
Water Resource Inventory Area (WRIA)	Is a geographic boundary created by the State to assist in the management of water resources. In 1971, the Washington State Legislature passed Chapter 90.54RCW, the Water Resources Act of 1971. This Act directed the Department of Ecology to develop a "comprehensive state water resource program" and said that "the department may develop the program in segments" in order to focus on specific areas or issues. In 1976, Ecology adopted Chapter173-500 WAC, which split the State into 62 Water Resource Inventory Areas.
watershed	The region of land that drains into a specific body of water, such as a river, lake, sea, or ocean. Rain that falls anywhere within a given body of water's watershed will eventually drain into that body of water.
wetland	Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.
wetland boundary	The point on the ground at which a shift from wetlands to non-wetlands or aquatic habitat occurs. These boundaries often follow topographic contours.
wetland hydrology	The condition where water is present during a portion (between 5 and 12.5 percent) of the annual growing season.
wetted perimeter	The width of a watercourse that is covered with water, either flowing or non-flowing.
wildlife corridor	Linear spaces that connect the various areas of an animal's habitat that may be important for feeding, watering, resting, and/or breeding.

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EXECUTIVE SUMMARY

What is the proposed project and why is it needed?

The Washington State Department of Transportation (WSDOT) plans to widen the State Route (SR) 167 roadway to construct a new southbound high-occupancy toll (HOT) lane from the vicinity of 8th Street E (Milepost [MP] 10.2) in Pierce County, Washington to the vicinity of S 277th Street in Kent (MP 18.24), King County, Washington. The construction of the HOT lane will require widening of the southbound bridge at the SR 18 interchange. Ramp meters will be installed at southbound on-ramps at the SR 167 interchanges with 15th Street SW, Ellingson Road, and 8th Street E. In addition, new signals will be installed at the SR 167 southbound ramp terminals with Ellingson Road and 8th Street E. SR 167 is an important thoroughfare for cars, trucks, and transit in the Green River Valley. This additional capacity will relieve congestion and improve safety for commuters traveling southbound on SR 167.

What is the purpose of this ecosystem report?

This report describes the existing conditions and potential range of effects to ecosystem elements that may be attributed to the construction and operation of the proposed project. The ecosystem elements include:

- Floodplains
- Surface water quality and quantity
- Aquatic resources (wetlands, streams, fisheries)
- Terrestrial wildlife and vegetation

The project team analyzed each ecosystem element to determine how the proposed project may directly, indirectly, and cumulatively affect each element.

This technical memorandum was prepared as part of a National Environmental Policy Act (NEPA) Documented Categorical Exclusion (DCE), which requires all actions sponsored, funded, permitted, or approved by a federal agency to consider the environmental effects of the Proposed Action. The Washington

State Environmental Policy Act (SEPA) requires a similar evaluation of environmental effects of proposed actions for state and local projects. This project is required to comply with both NEPA and SEPA, which includes a review of potential effects and possible mitigation measures. When potential effects to ecosystems exist as a result of the proposed project, a review of those potential effects and possible mitigation measures is required by both NEPA and SEPA.

How were potential effects on ecosystems identified and evaluated?

The project team identified and analyzed the potential effects of the proposed project using the WSDOT Environmental Procedures Manual (WSDOT, 2007).

Biologists gathered existing information for the study area through literature and internet research; interviews with local, state, and federal agency personnel; and previously prepared WSDOT reports. Additional information on the ecosystem elements in the study area was gathered by conducting wetland delineations, culvert and stream surveys, and field verification of wildlife habitat data. The collected information was then compared to the project footprint, including all roadway and drainage improvements, to assess potential effects resulting from the project.

What effects will the project have on ecosystems?

The proposed project is expected to have temporary and permanent effects on wetlands, aquatic resources, and wildlife habitat. The project will remove some vegetation, place fill material or structures in some wetlands, and streams, and will alter surface water and floodplain functions. The project adds approximately 10.87 net acres of additional pollution-generating impervious surfaces (PGIS) to the study area, which reduces the available wildlife habitat, though much of it is of marginal quality due to the proximity to the roadway. A summary of these effects is listed in Exhibit S-1.

Exhibit S-1
Summary of Ecosystem Element Effects

Ecosystem Element	Temporary Effects	Permanent Effects
Floodplains (acres)	1.88	N/A
Wetlands (acres)	2.13	N/A
Wetland buffers (acres)	0.95	0.70
Stream below ordinary high water mark (acres)	0.06	N/A
Stream buffers (acres)	2.43	2.85
Wildlife habitat (acres)	4.45	31.64

What are the key messages from this report?

The study area contains a number of ecosystem elements and ecological functions important to the region. The proposed project will directly affect ecosystem elements both temporarily and permanently. Some of these effects are potentially beneficial, like improving water quality treatment and the quality of aquatic habitats; and some are potentially negative, such as encroaching into wetland and steam buffers. This report provides a qualitative discussion of the potential effects on ecosystem elements and the proposed measures to minimize adverse effects to the ecosystems.

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CHAPTER 1 INTRODUCTION

What is the proposed project and why is it needed?

The Washington State Department of Transportation (WSDOT) plans to widen the State Route (SR) 167 roadway to construct a new southbound high-occupancy toll (HOT) lane from the vicinity of 8th Street E (Milepost [MP] 10.2) in Pierce County, Washington to the vicinity of S 277th Street in Kent (MP 18.24), King County, Washington (Exhibit 1). This new HOT lane will be a continuation of a southbound HOT lane that was constructed for the HOT Lane Pilot Project, which extends from the I-405 interchange in Renton to S 277th Street in Kent.

> High-occupancy toll (HOT) lanes are managed lanes intended to increase mobility by allowing more vehicle use of the HOV lane. HOT lanes maintain free, priority status for transit and carpools, the same as a HOV lane, but also allow single-occupant vehicles to pay a toll to use the lane. Toll rates are variable, depending upon the level of congestion.

The construction of the HOT lane will require widening the roadway to the outside of the existing pavement between 6th Avenue N in Algona and 5th Avenue S in Pacific. In addition, it will require widening the southbound bridge at the SR 18 interchange. Ramp meters will be installed at southbound on-ramps at the SR 167 interchanges with 15th Street SW, Ellingson Road, and 8th Street E. In addition, new signals will be installed at the SR 167 southbound ramp terminals with Ellingson Road and 8th Street E. All of the proposed widening work will occur within WSDOT right-of-way, with the exception of a site that will be used for stormwater management and mitigation for the effects to aquatic resources. The stormwater site (Site C) will be purchased at the northwest quadrant of the SR 167 / SR 18 interchange area.

SR 167 is an important thoroughfare for cars, trucks, and transit in the Green River Valley. The additional capacity that this project will provide to SR 167 will relieve congestion and improve safety for commuters traveling southbound.

Exhibit 1
Vicinity Map

What is the purpose of this ecosystem report?

This report describes the existing conditions and potential range of effects to ecosystem elements that may be attributed to the construction and operation of the proposed project. The ecosystem elements include:

- Floodplains
- Surface water quality and quantity
- Aquatic resources (wetlands, streams, fisheries)
- Terrestrial wildlife and vegetation

The project team analyzed the proposed project to determine how each ecosystem element may directly, indirectly, and cumulatively be affected.

This technical memorandum was prepared as part of a National Environmental Policy Act (NEPA) Documented Categorical Exclusion (DCE), which requires all actions sponsored, funded, permitted, or approved by a federal agency to consider the environmental effects of the Proposed Action. The Washington State Environmental Policy Act (SEPA) requires a similar evaluation of environmental effects of proposed actions for state and local projects. This project is required to comply with both NEPA and SEPA, which includes a review of potential effects and possible mitigation measures. When potential effects to ecosystems exist as a result of the proposed project, a review of those potential effects and possible mitigation measures is required by both NEPA and SEPA.

What policies or regulations are related to effects on ecosystem elements?

Each ecosystem element is protected by federal, state, and local laws because of their ecological functions and social value. The laws, regulations, and associated government agencies that govern the ecosystem elements in the study area are detailed in this section.

Floodplains

Laws and policies applicable to floodplains include:

- Presidential Executive Order 11988
- Memorandum of Agreement (MOA) on Work in State Waters (June 2002)
- Flood Control Zone Act of 1935, as amended (Title 86 Revised Code of Washington [RCW] and Washington Administrative Code [WAC] 173–158)
- Local jurisdictions' critical area ordinances

Surface Water Quality and Quantity

The state and federal regulations or statutes that protect aquatic habitats and the species in the study area include:

- US Clean Water Act (CWA) Section 401 for water quality
- CWA Section 404 for discharge of materials to waters of the U.S. including wetlands
- Section 10 of the US Rivers and Harbors Act
- Coastal Zone Management Act (CZMA)
- Washington State Hydraulic Code
- Water Quality Standards for Surface Waters of the State of Washington

The surface waters in the project area are managed by the jurisdictions in which they are located. Water courses within the project area are located within the WSDOT SR 167 right-of-way and the cities of Auburn, Algona, and Pacific. Each jurisdiction has either adopted the King County Surface Water Manual, the Stormwater Management Manual for Western Washington (Ecology), or its own drainage manual to regulate development. This project must comply with the WSDOT Highway Runoff Manual (HRM) and will be subject to Ecology review for the use of a demonstrative flow control approach. Local requirements for flow quantity control, water quality treatment, and temporary erosion and sediment control

What are critical areas ordinances?

The Washington State Growth Management Act (GMA) defines critical areas as environmentally sensitive areas that provide key functions to the ecosystem, such as:

- Wetlands
- Areas recharging aquifers
- Frequently flooded areas
- Geologically hazardous areas
- Fish and wildlife habitat conservation areas.

The act requires that local jurisdictions identify, designate, and protect the critical areas in their environment.

during construction, are similar to the requirements contained in the HRM.

Aquatic Resources

Local, state and federal regulations govern development and other activities in or near wetlands. In Washington, wetlands are regulated by local jurisdiction critical area ordinances as required by the state Growth Management Act (GMA). The proposed project is regulated in part by local critical area ordinances. The proposed project crosses through five local jurisdictions: King County, Pierce County, the City of Auburn, the City of Algona, and the City of Pacific.

The federal Clean Water Act (CWA) regulates activities that may affect wetlands and other waters of the US. The CWA is administered by the US Army Corps of Engineers (Corps) and Ecology, a designated state agency in Washington. The Corps also requires that project proponents initially determine the likely jurisdictional status of ditches. That status is based on whether or not the ditch flows into a regulated water body. The project proponent records indicators and patterns of flow. The Corps uses that information to make the final jurisdictional determination. WSDOT is now routinely applying this approach when requesting a jurisdictional determination from the Corps.

The primary federal and state regulations or statutes that apply to aquatic resources include the following:

- Endangered Species Act (ESA)
- CWA (Sections 303, 401, and 404)
- Shoreline Management Act (SMA)
- State Endangered Species Act
- Washington State Water Pollution Control Act - RCW 90.48
- Hydrologic Project Approval - RCW 77.55

Regulatory Terminology for Fish, Wildlife, and Plants

Endangered species - Endangered species are those plants and animals that are so rare they are in danger of becoming extinct.

Threatened species - Threatened species are plants and animals whose numbers are very low or decreasing rapidly. Threatened species are not endangered yet, but are likely to become endangered in the future.

Candidate species - Any species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is being considered for listing as endangered or threatened but is not yet the subject of a proposed rule.

Rare plant - A native plant species that is uncommon or scarce. Small population size puts the species at risk of extinction from a single event. These populations may be stable, but are low because of: the plant's unique biological characteristics and/or needs; the fact that it exists in small numbers naturally; or it is at the limit of its normal range.

Terrestrial Wildlife and Vegetation

The primary federal regulations or statutes that apply to fisheries, terrestrial wildlife, and vegetation are the following:

- Endangered Species Act (ESA)
- Fish and Wildlife Coordination Act
- Shoreline Management Act (SMA)
- Migratory Bird Treaty Act

Numerous state regulations also apply to these resources, including the following:

- State Endangered Species Act
- Washington State Fish and Game Code - RCW Titles 75 and 77
- Hydrologic Project Approval - RCW 77.55

Applicable local regulations include the sensitive and critical areas ordinances of King and Pierce Counties, and the cities of Algona, Auburn, and Pacific. The general goal of these regulations is to protect habitat, water quality, wetlands, and riparian areas, as well as the species. Each jurisdiction may have other sensitive areas or species that are also regulated, depending on the local resources.

What functions do study area ecosystem elements provide?

Floodplains

Floodplains serve as the link between streams, wetlands, and dry land. Floodplains filter pollution through natural processes, store floodwater, and provide habitat for fish and wildlife.

Surface Water Quality and Quantity

Surface waters provide habitat for fish, wildlife, and vegetation that support the entire ecosystem. Surface water bodies provide detention of storm water and help to convey water to large water bodies such as the Puget Sound. It is important to preserve the habitat in and around surface water bodies and to ensure that water quality is maintained to support those systems. In addition, stormwater must be managed effectively

to prohibit flooding of water bodies and floodplains, pollutants from entering natural systems, and misdirected conveyance of excessive stormwater.

Aquatic Resources

Rivers and streams, along with their associated tributaries and stream buffers, provide a variety of functions. These functions include:

- Transporting water, sediment, nutrients, and other materials
- Providing habitat for plants, animals, and humans
- Recharging groundwater
- Storing floodwater
- Filtering contaminants

The rivers and streams in the study area perform these functions to varying degrees.

In addition to providing wildlife habitat, riparian areas also provide shade to help reduce stream temperatures, organic litter that supplies food and other nutrients to the water body, and a buffer zone that helps to reduce sediment and other contaminant inputs. Riparian vegetation that falls into these water bodies can also provide cover for fish or provide basking areas for amphibians and reptiles.

In general, wetlands provide many functions including fish and wildlife habitat, water quality improvements, floodwater storage, and groundwater recharge. Large wetlands have more capacity for capturing stormwater flows, improving water quality, and providing a variety of habitats for wildlife, and are thus, more likely to provide greater functional benefits than smaller wetlands.

Terrestrial Wildlife and Vegetation

Wildlife and habitat are important components of an ecosystem's health and function. The presence of wildlife in urban landscapes depends on the availability of suitable habitat, and vegetation is an integral component of that habitat.

Vegetation provides food and shelter for wildlife including birds, small mammals, and amphibians. Loss of vegetation and the subsequent fragmentation of habitat caused by urban development can result in the decline of wildlife in both rural and urban areas.

In general, forested areas provide habitat for birds, mammals, reptiles, amphibians, and a variety of insect species. Primary and secondary cavity nesting bird species have opportunities to nest in areas where dead or dying trees and limbs exist.

Shrubs and grasses are one type of cover that provides habitat for a variety of smaller birds and animals, reptiles, amphibians, and a variety of insect species. Shrubs and grasses provide food sources for insects, songbirds, upland game birds, and many mammals. Shrubs can also provide shelter from predators or extreme weather, or to nest and raise young. Predator species, such as raptors and coyotes, use shrub and grassy areas to hunt.

Maintained vegetation does not typically provide habitat for a large diversity of species due to the regular disturbance regime associated with these areas. These areas are often frequented by small birds and mammals that are adapted to human presence. Small birds and mammals that use these areas can attract predators.

Non-native plant species are common to areas where both shrub/grasses and maintained vegetation occur. The presence of these non-native plant species typically increases and favors use by non-native wildlife species.

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CHAPTER 2 EXISTING CONDITIONS

What is the study area of the proposed project?

The study area surrounds the project footprint (Exhibit 2). It originates with the anticipated construction footprint and includes areas where temporary or permanent effects to ecosystem elements from the project may occur.

The affected ecosystem elements are located in two Water Resource Inventory Areas (WRIAs). Approximately the northern two-thirds of the project alignment is located in the Green River basin (WRIA 09). The remaining southern one-third of the project length is located in the Lower White River basin (WRIA 10). A small rise separates the two basins near 15th Street SW in Auburn. Mill Creek (WRIA 09.0051) is in the Green/Duwamish watershed (WRIA 09) to the north. Mill Creek is also located in Hydrologic Unit Code (HUC) 1711001303XX. Milwaukee Ditch (WRIA 10.0032) is in the Puyallup/White watershed (WRIA 10) to the south. Milwaukee Ditch is located in HUC 171100120204. The study area is broken down into individual study limits for each ecosystem element described below.

What is a WRIA?

A Water Resource Inventory Area (WRIA) is a geographic boundary created by the State to assist in the management of water resources. In 1971, the Washington State Legislature passed Chapter 90.54 RCW, the Water Resources Act of 1971. This Act directed the Department of Ecology to develop a "comprehensive state water resource program" and said that "the department may develop the program in segments" in order to focus on specific areas or issues. In 1976, Ecology adopted Chapter 173-500 WAC, which split the State into 62 Water Resource Inventory Areas.

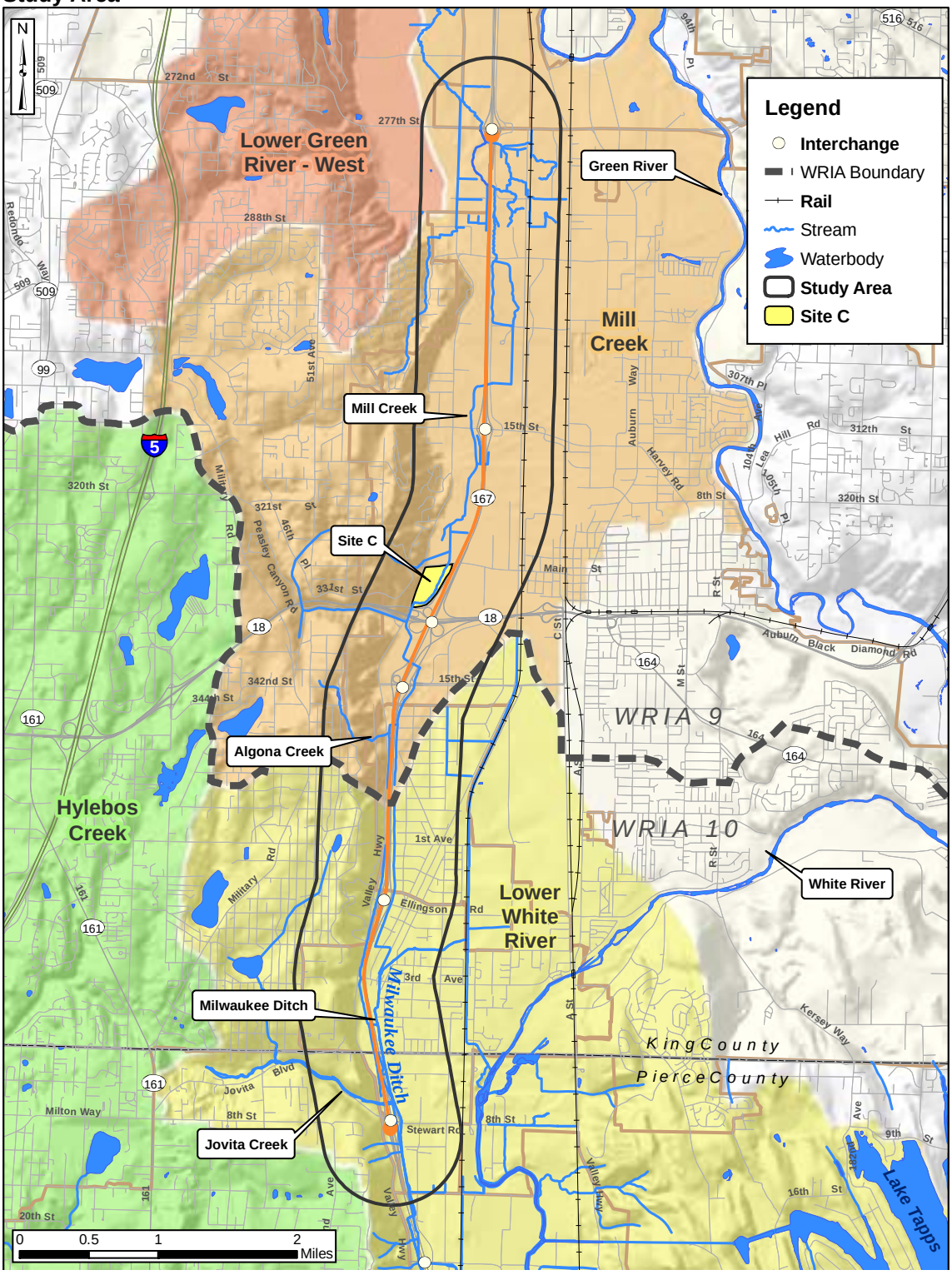
The study limits for wetlands and ditches includes the portions of the WSDOT right-of-way along the project alignment between S 277th Street and approximately 8th Avenue East.

For streams, the study limits include channels adjacent to Site C, as well as 300 feet upstream and 1,320 feet (0.25 miles) downstream of the Site C boundaries and of Culverts 65 and 73. These culverts are located in the Lower White River Basin where an unnamed tributary to Milwaukee Ditch and Jovita Creek cross under SR 167.

The study limits for shorelines, floodplains, and wildlife habitat extends 0.5 miles from the centerline of the proposed project limits.

Exhibit 2

Study Area



How was data collected for the ecosystem elements?

The project team conducted a number of studies to develop the data needed for this report. As part of those studies, biologists, scientists, and engineers gathered existing information for the study area through literature and internet research; interviews with local, state, and federal agency personnel; and previously prepared WSDOT reports. Additional information on the ecosystem elements in the study area was collected by conducting wetland delineations and stream surveys and field verifying wildlife habitat data. The collected information was then compared to the project footprint, including all roadway and drainage improvements, to assess potential effects resulting from the project.

The studies resulted in a number of reports that were referenced to prepare this report including:

- *Draft Hydraulic Report for State Route 167 8th Street E Vic. to S 277th Street Vic. Southbound HOT Lane Project*. RW Beck, 2008.
- *Biological Assessment for the State Route 167 8th Street E Vic. to S 277th Street Vic. Southbound HOT Lane Project*. Jones & Stokes, 2008.
- *Technical Memorandum: SR 167 8th Street E Vic. to S 277th Street Vic. Southbound HOT Lane Project Stream Surveys*, Jones and Stokes, February 2008.
- *Jurisdictional Ditch Report, State Route 167, 8th Street E Vicinity to S 277th Street Vic. Southbound HOT Lane* Jones and Stokes, June 2007.
- *Wetland Delineation Report, State Route 167 8th Street E Vic. to S 277th Street Vic. Southbound HOT Lane,* Perteet Inc., September 2007.
- *Draft Wetland and Stream Mitigation Report, State Route 167, 8th Street E Vic. to S 277th Street Vic. Southbound HOT Lane,* Perteet Inc., March 2008.

A brief description of the methods used to collect data for each ecosystem element is described below.

Floodplains

Information regarding floodplains was gathered using information from local, state, and federal agencies and the Flood Insurance Rate Maps (FIRM) developed by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP).

Exhibit 3
Stream Analyzed during Field Reconnaissance near Emerald Downs in Auburn

Surface Water Quality and Quantity

The project team consulted with various public utilities and jurisdictions regarding the stormwater management issues in the study area, including their own maintenance staff; staff from the cities of Auburn, Pacific, and Sumner; a commissioner from Drainage District 24; and the US Army Corps of Engineers (Corps). The local Drainage District is responsible for maintaining the drainage conveyances (Exhibit 3) through Pacific and south through Sumner. WSDOT is responsible for maintaining Mill Creek and the remainder of the conveyances when they flow within WSDOT right-of-way.

The project team reviewed numerous sources of information regarding water bodies, water quality, and water quantity in the study area, including:

- Washington State Conservation Commission Salmon and Steelhead Habitat Limiting Factors reports for the Puyallup and the Green/Duwamish Watersheds
- King County's Year 2004 Water Quality Data Report for the Green/Duwamish Watershed
- King County's 1999 Draft Mill Creek Basin Flood Management Plan
- King County's 2006 Water Quality Monitoring Report for Mill Creek (Site A315)
- Ecology's White River Spring Chinook Habitat Guidance document

In addition, the project team contacted local, state, and federal agencies to obtain information on the condition of the surface water conveyance systems in the project area. The team also talked to WSDOT construction and maintenance personnel.

The project team relied on field data as well. Biologists conducted stream site assessments on October 27, 2006, November 9, 2006, and February 2, 2007. The study area for this field work was 0.25 miles downstream of the north and south termini of the project and included a few intermediate locations where the creeks leave the WSDOT right-of-way. In addition, team members modeled the data to estimate the hydrologic effect of floodplain storage, and to determine velocities in the study area channels.

Exhibit 4
Wetland in Study Area

Aquatic Resources

The project team conducted an inventory and qualitative assessment of streams as part of this project to determine the general quality of the streams and their habitat. The detailed stream surveys were initiated at the floodplain storage facility Site C, and culverts 65 and 73. The data collected from these surveys included:

- Existing Stream Geomorphology
- In-stream Habitat Type
- Riparian Vegetation
- Substrate Composition
- Abundance of Large Woody Debris (LWD)
- Quality of Pools

What are riparian areas?

Stream or river banks are riparian areas, and the plants that grow there are called riparian vegetation.

In addition, project team members surveyed culverts throughout the length of the project corridor to distinguish between streams and stormwater ditches, and to identify potential problems with fish passage.

Team biologists also reviewed information from the Washington State Department of Fish and Wildlife (WDFW), National Oceanic and Atmospheric Administration (NOAA) Fisheries and the US Fish and Wildlife Service (USFWS), and other literature about federally-listed species and species of concern that are known or expected to live in King and Pierce counties. They also spoke with local, state, and tribal biologists to obtain information on fish species that could be present in the project vicinity.

Team biologists delineated, classified, and rated the wetlands (Exhibit 4) within the study area. The team implemented the following methodologies:

Delineation - *Washington State Wetland Identification and Delineation Manual* (Ecology, 1997) and the *Corps of Engineers Wetland Delineation Manual* (Corps, 1987)

Classification - USFWS classification system (Cowardin et al., 1979)

Function - *Wetland Functions Characterization Tool for Linear Projects* (2000) developed by WSDOT

Rating - Local Critical Areas Ordinances and *Washington State Wetland Rating System for Western Washington* developed by the Ecology (Ecology, 2004)

The team did not evaluate areas within the existing road infrastructure, or median, for wetlands per the *WSDOT Guidance on Delineating Wetlands and Buffers Adjacent to Roads and Road Prisms* (2006).

The team also delineated natural and anthropogenic ditches that convey water to creeks, rivers, and wetlands, which are typically regulated as waters of the US. The team followed the Corps guidance for identification of regulated ditches.

Terrestrial Wildlife and Vegetation

To supplement the existing data, the team investigated field conditions and reviewed aerial photographs of portions of the SR 167 project corridor that could potentially be affected by the project.

The team also met with engineers who are designing stormwater facilities for the project to discuss how stormwater will be treated and detained in order to prevent effects to habitat in the study area.

Exhibit 5
Evidence of Wildlife in the Study Area

Small mammal tracks found in the project area during the wetland delineation.

Wetland Methodologies Defined

Delineation – Identification of the boundary or edge of a wetland.

Classification – Determination of the type of wetland including the landscape, vegetation cover and habitat type, and hydrological regime.

Function – Evaluation of a wetland's ability to improve water quality, store floodwater, provide fish and wildlife habitat, and be biologically productive.

Rating – Determination of a wetland's sensitivity to disturbance, its significance, or ability to replace it, and the functions it provides.

What are the current characteristics of ecosystem elements located in the study area?

In order to evaluate the potential effects of a project, it is necessary to understand the baseline conditions, or current conditions, of each resource.

Floodplains

Floodplains are found predominantly at the north end of the project area. Another large floodplain occurs in the White River basin southeast of the project limits. A small floodplain area is present associated with the mouth of Jovita Creek in the southern portion of the project. Exhibits 6a through 6c illustrate the location of floodways and floodplains in the project area.

Flooding frequently occurs in the Mill Creek subbasin due to high runoff rates from heavily developed basins, high water tables, vegetation-choked drainage ditches, inadequately sized culverts, backwater from the Green River during flood events, and levees at Mill Creek's confluence with the Green River. The lower reaches of Mill Creek are low and flat. When the Green River is at flood stage, water in Mill Creek cannot drain into the Green River, so it backs up and floods the surrounding areas. In addition, since the flow in the Green River is regulated by Howard Hanson Dam, the downstream water levels can remain high over an extended period of time after a flood event, thereby preventing flood waters in Mill Creek from receding. Beaver dams have also been an ongoing impediment to conveyance in Mill Creek throughout the project area. WSDOT has removed some of these dams located in the SR 167 right-of-way when they became problems, but on several occasions the beavers have returned and built new dams.

What are floodplains?

The area adjoining a river or stream that has been, or may be, covered by floodwater.

What are floodways?

The channel of a river or stream and the parts of the floodplain adjoining the channel that are reasonably required to efficiently carry and discharge the flood water or flood flow of a river or stream.

Exhibit 6
Flooding Problems

Backwatered area near Site C, upstream of a potential beaver dam.

Exhibit 6a
Floodplains

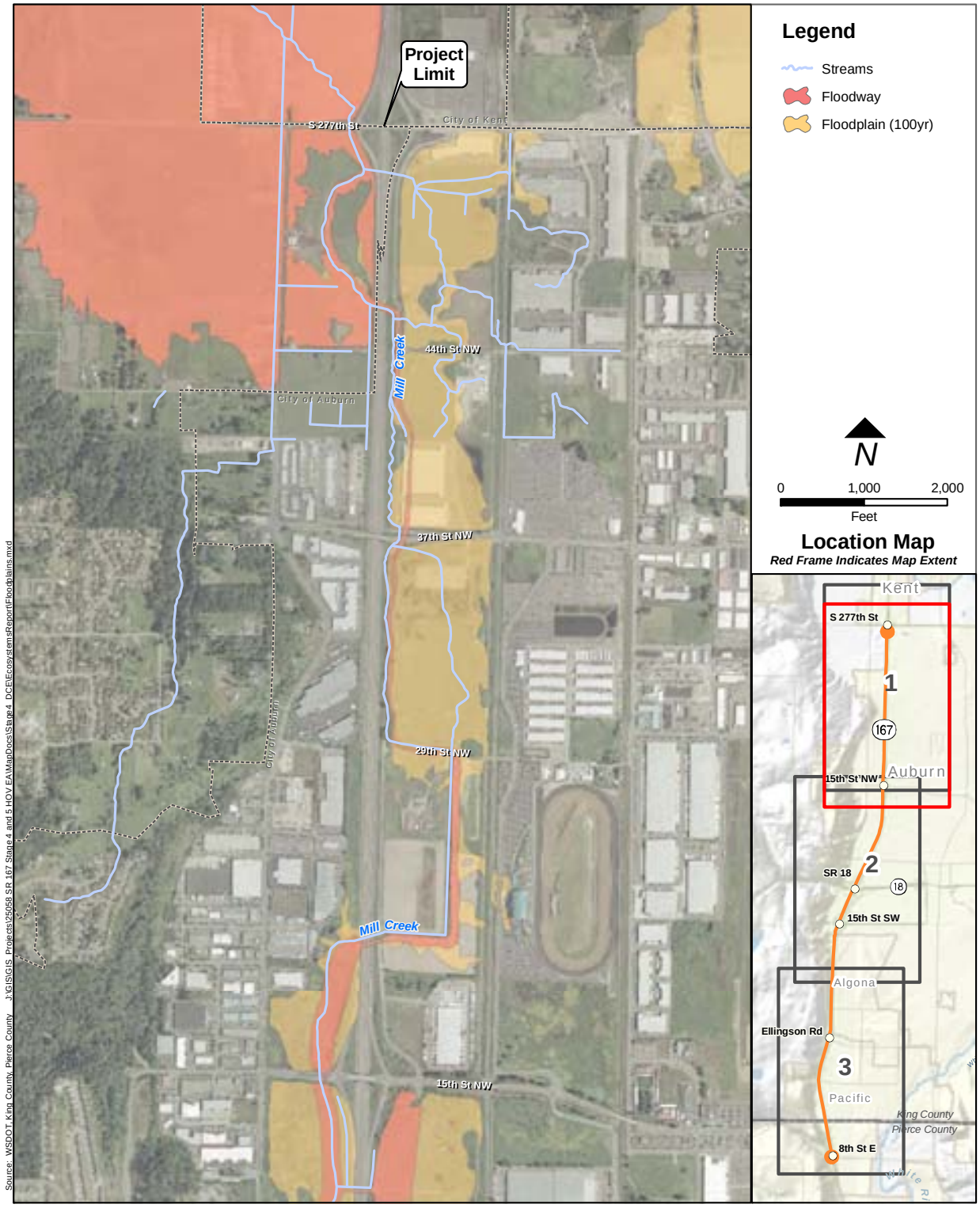


Exhibit 6b
Floodplains

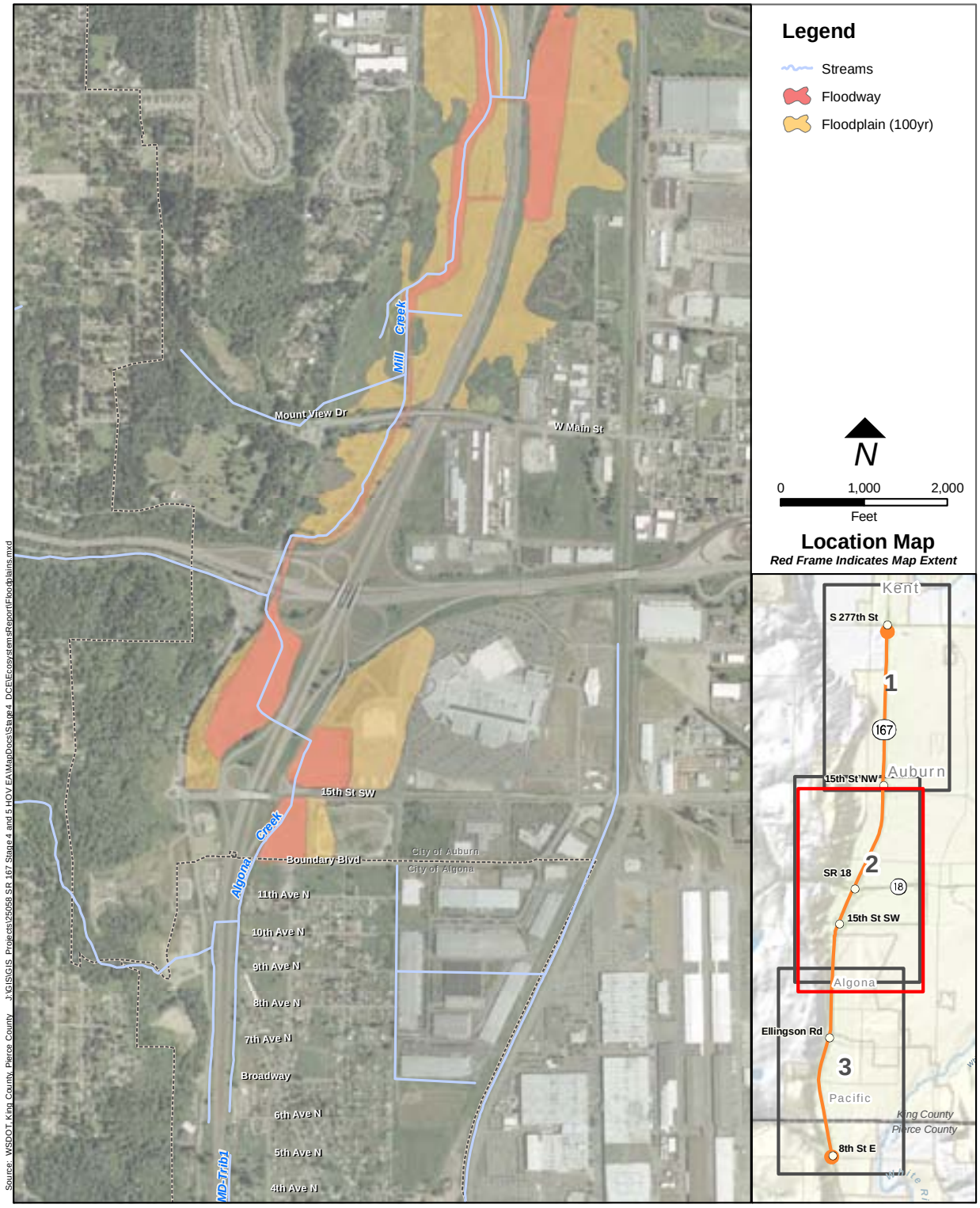
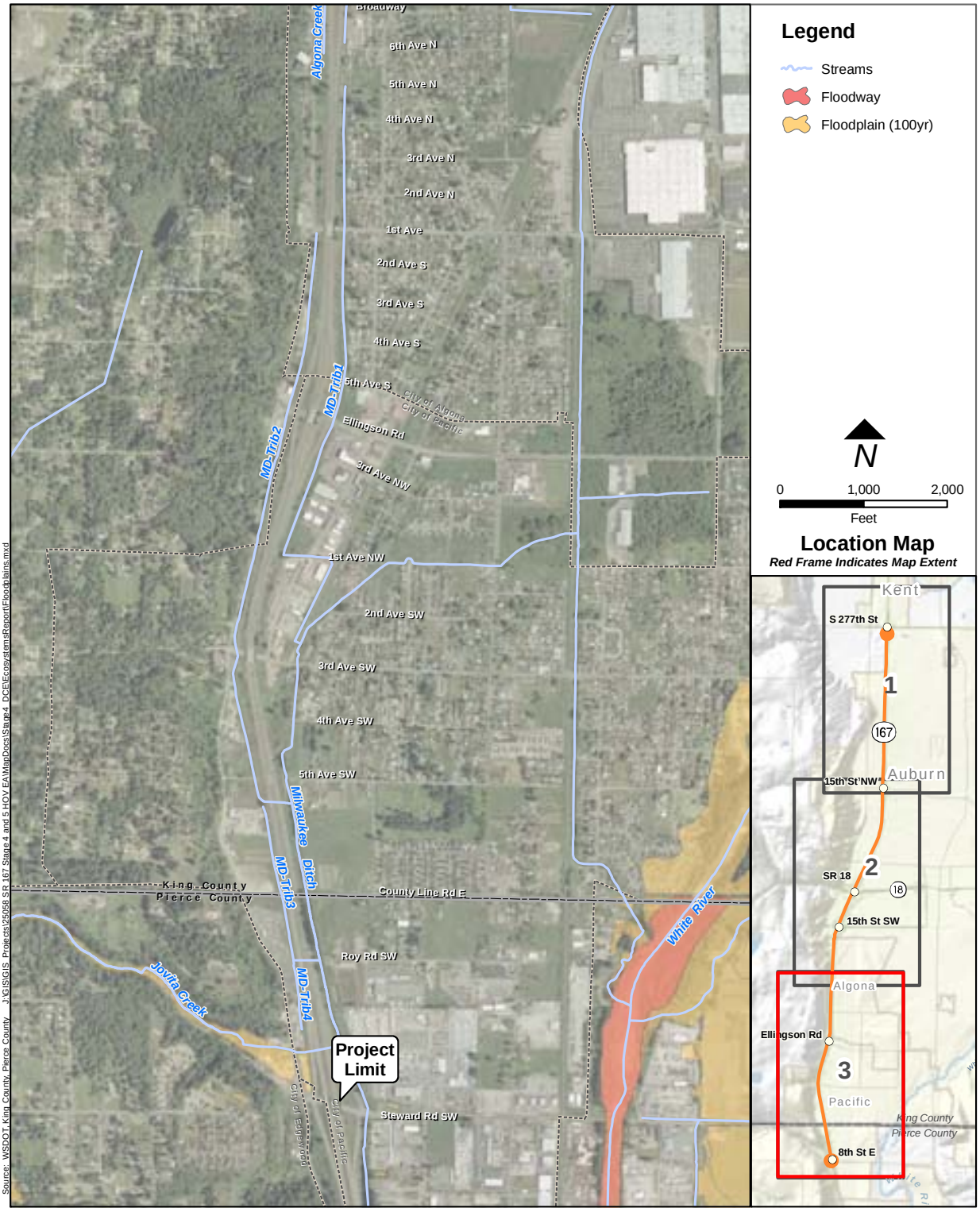


Exhibit 6c
Floodplains



Surface Water Quality and Quantity

The primary surface waters in the study area are streams and ditches. In the north end of the project area, SR 167 crosses Mill Creek; in the south end, SR 167 also crosses Milwaukee Ditch that flows south into the White River. Cities such as Auburn, Algona, Pacific, and Sumner, which are located adjacent to SR 167, use Mill Creek and the Milwaukee Ditch as discharge points for some of their storm drainage systems. However, no known instances of surface water in the project area are being used for drinking water, agriculture, industrial processes, or other uses.

Mill Creek and the Milwaukee Ditch receive surface water runoff from SR 167. Runoff from the roadway reaches Mill Creek and the Milwaukee Ditch by overland flow or via the roadway drainage system that consists of roadside drainage swales, ditches, and culverts. Roadside drainage swales convey roadway runoff that collects in the median and routes it to various catch basins. The catch basins collect the flow from the swales and send it via pipes under the roadway to Mill Creek, the Milwaukee Ditch, and other ditches, which run parallel to the roadway.

The current water quality treatment facilities within the project area include media filter drains and compost-amended vegetated filter strips (CAVFS), which provide enhanced runoff treatment within the roadside embankment. Wetlands along the roadway provide some filtration of stormwater pollutants.

WSDOT removes sediment annually to maintain conveyance capacity at Mill Creek's confluence with Peasley Canyon, and less frequently in the ditches and creeks elsewhere along the project site. Beaver dams are removed when they cause a conveyance problem. When necessary, WSDOT obtains a Hydraulic Project Approval from the WDFW to perform these types of maintenance activities.

What is a ditch?

A ditch is a man-made channel used to collect and convey runoff. It is different than a swale because it may continue to contain flow after a storm event.

What is a culvert?

A culvert is a conduit through which flow passes. It may be used to allow water to pass underneath a road, railway, or embankment.

What is a drainage swale?

A drainage swale is a man-made channel used to collect and convey runoff during storm events.

Media Filter Drains have four basic components:

- A gravel no-vegetation zone, which disperses water and traps pollutants,
- A vegetated filter strip, which also removes pollutants,
- The ecology-mix bed consisting of crushed rock, dolomite, gypsum, and perlite that treats pollutants, and
- A gravel-filled underdrain trench, that allows the water to drain away from the area.

Historically the rivers and streams in the study area flooded, meandered, migrated, and abandoned their old channels throughout the valley floors. Stream channel morphology was influenced by spring floods, significant amounts of large wood, and, to a lesser extent, the activity of beavers. Channel migration in the valley created many relic river channels and a mosaic of forest, river, streams, riverine wetlands, beaver ponds, depressional floodplain wetlands, and small lakes (Perteet, 2007).

Exhibit 7
Wetland Characteristics

A Reed Canarygrass wetland downstream of the Main Street culvert.

Hydrology in the valley was progressively altered through channelization and drainage of tributaries and wetlands in the valley. The current river channel and valley is highly altered and not a 'natural' system. In 1906 the White River was diverted from its original course. It used to flow into the Green River, but now flows to the Puyallup. In 1962 Howard Hanson Dam was built further altering the valley hydrology. These significant hydrologic alterations have changed flow dynamics, flow volumes, and the conditions of the valley floor, which may no longer be able to support habitat types that existed prior to non-native settlement (pre-1850). The surficial geology of the study area contains relics of these former floodplain processes as well as anthropogenic alterations resulting from past and present land use practices.

Modern development of our roadways and commercial, industrial, and residential building within each subbasin constrain these systems by constricting the potential for lateral migration and reducing floodplain connectivity. Most of these streams are ditched channels choked with invasive species. The streams on the valley floor often do not contain classic stream characteristics, such as pools and riffles. The bottom substrate is predominantly fine silt and sands and not suitable for spawning. Vegetation along the stream banks is primarily reed canarygrass. Very few habitat-forming structures, such as tree trunks or fallen branches, exist except in some areas where habitat enhancement has been attempted. Fish passage is partially impeded by several culverts in the study area along Jovita Creek and Milwaukee Ditch. Other potential barriers

may exist at stream crossings between MP 14 and 17.8 in the Mill Creek basin (Culverts #34, #92, #27, & #3), and at MP 13.6 in the Milwaukee Ditch basin (Culvert #37/89).

Mill Creek

Mill Creek is a tributary of the Green River. Mill Creek was considered a Class A water body under the 1997 state water quality standards. In 2003, the rules were updated and Mill Creek was designated a Salmonid Spawning, Rearing, and Migration water body.

Mill Creek runs parallel to SR 167 through a series of ditches and culverts (Exhibits 6a and 6b). Approximately 9,673 acres of the Federal Way uplands and Auburn-Kent Valley floor drain to Mill Creek. The headwaters of Mill Creek are located along the eastern edge of the Federal Way uplands. From about 6th Avenue N, Mill Creek flows on the east side of SR 167 and enters two large wetlands in the vicinity of the Auburn Supermall. The wetlands are connected by a large culvert under 15th Street SW. From the wetlands, the creek crosses from east to west under SR 167 (Culvert 34). On the west side of the roadway, Mill Creek is joined by flow from Hill Creek in Peasley Canyon. From there, the creek continues north under SR 18 and 15th Street NW. The creek crosses under SR 167 (Culvert 30) to the east side where it continues north before again crossing under SR 167 (Culvert 3) approximately a half mile south of S 277th Street, near the project limits. Beyond the project limits, Mill Creek flows north and ultimately discharges to the Green River just south of the interchange of SR 516 and SR 167.

Flooding frequently occurs in the Mill Creek subbasin, as illustrated in Exhibits 6a, 6b, & 6c. Flooding occurs as a result of local runoff from basin tributaries, a seasonally high water table, vegetation-choked drainage ditches, and inadequately sized culverts.

In the project area the waters of Mill Creek often appear stagnant. The creek is located in a very flat area which leads to low water velocity and minimal flows.

Exhibit 8
Streams within the Study Area

Mill Creek, with a view of SR 167 in the background.

Milwaukee Ditch, downstream of Culvert 73.

Water levels in Mill Creek between SR 18 and 15th Street SW have risen within feet of the paved roadway surface on a few occasions and as recently as January 2006. In addition, several homes adjacent to the creek between 8th Avenue N and Boundary Boulevard in Algona appear to have finished floor elevations not much higher than the top of the creek channel. As a result, there is some concern that these properties may be subject to flooding during a major storm event.

According to the King County Water Quality Data Report water quality conditions in Mill Creek have historically been characterized as poor due to high temperatures, low dissolved oxygen, high nutrient concentrations, and high fecal coliform bacteria counts. In Ecology's Section 303(d) for the 2003-2004 water year, Mill Creek was rated in the "high concern" range. When looking at historical data for Mill Creek, some improvements in water quality have taken place with turbidity since 1979: total suspended solids, orthophosphorus, total phosphorus, ammonia, nitrate-nitrogen, and fecal coliform bacteria have all shown significant decreasing trends. Additionally, pH values have shown a decreasing trend (King County, 2004 and 2006).

Erosion along the stream banks of Mill Creek and periodic landslides within Peasley Canyon have caused high suspended solids and turbidity downstream in Mill Creek (Kerwin and Nelson, 2000). In addition, elevated water temperatures have been measured in Mill Creek from Peasley Canyon downstream to the creek's mouth (Kerwin and Nelson, 2000).

Milwaukee Ditch

The Milwaukee Ditch is a south-flowing creek that runs parallel to SR 167 through a series of ditches and culverts. From 5th Avenue N, the creek generally runs along the east side of the roadway to south of 16th Street E in Pacific where the flow is conveyed under SR 167 (Culvert 73) to the west side. The creek continues south on the west side of the roadway to about milepost 8, just north of Sumner. At this point, it crosses back to the east under SR 167 and continues to flow east under a rail line before entering a short channel

What is the purpose of the 303(d) list?

The 303(d) list is a list of impaired water bodies. Ecology places water bodies on the list when water quality standards have been violated for one or more regulated pollutants. A water body is removed from the list when an approved Water Cleanup Plan is in place.

extending to the White River. Flow from the White River backs up into Milwaukee Ditch when the White River is at flood stage.

Typically, runoff from SR 167 is collected in large ditches that run parallel to the roadway on the opposite side of the road from the Milwaukee Ditch. These ditches eventually join and contribute flow to the Milwaukee Ditch. In addition, several large drainages from the valley slopes enter the Milwaukee Ditch along SR 167, including the drainage from Trout Lake near 3rd Avenue SW in Pacific, and Jovita Boulevard E. (Culvert 65) just south of the King-Pierce County line.

Water quality data for Milwaukee Ditch is not available. Milwaukee Ditch is not listed on Ecology's 2004 303(d) list. The City of Sumner has installed flow and groundwater monitoring devices along the Milwaukee Ditch within the city limits, but no data from the devices has been collected to date. However, given the ditch-like characteristics of these systems and surrounding land uses similar to that of Mill Creek, it can be reasonably assumed that water quality in the Milwaukee Ditch is similar to that of Mill Creek. Overall, much of the natural surrounding vegetation has been removed. Most low gradient, slow moving channels of this type tend to have high temperatures and low dissolved oxygen.

Fisheries

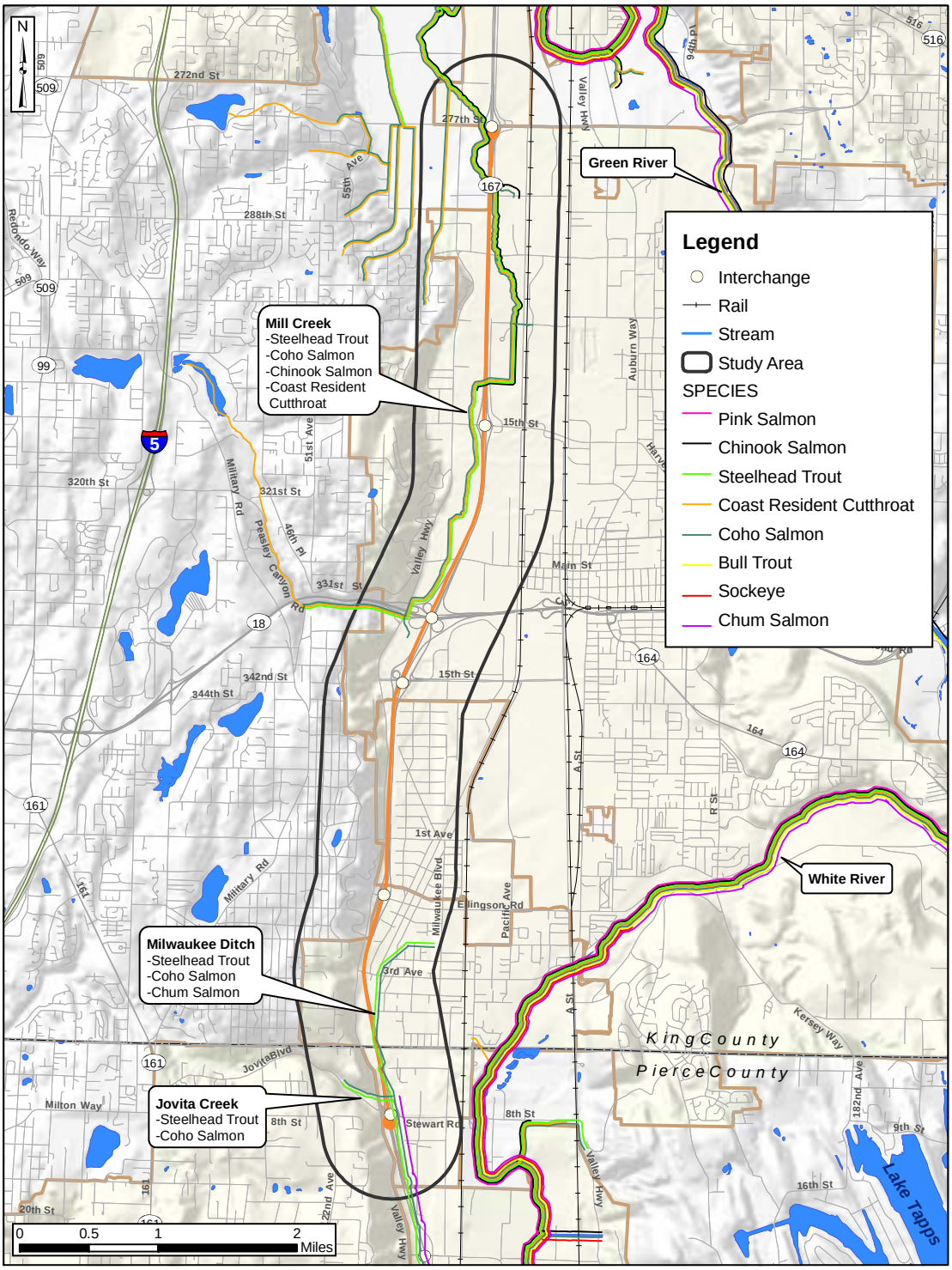
Several fish species inhabit the study area. The species that have been positively identified in the major water bodies within the study area and are considered protected species are listed in Exhibit 9.

Exhibit 9
Priority Fish Species in the Study Area

Common Name	Scientific Name	Status	Present in Mill Creek	Present in Milwaukee Ditch
Chinook salmon	*Oncorhynchus tshawytscha*	Federally threatened, State priority species	✔	
Coho salmon	*O. kisutch*	Federal species of concern, State priority species	✔	✔
Pink salmon	*O. gorbuscha*	State priority species		
Chum salmon	*O. keta*	State priority species	✔	✔
Steelhead trout	*O mykiss*	Federally threatened; State priority species	✔	✔
Cutthroat trout	*O. clarki clarki*	State priority species	✔	✔

Priority fish species include all state endangered, threatened, sensitive, and candidate species, and species of recreational, commercial, or tribal importance that are considered vulnerable. All fish species with state candidate status that occur in the study area also hold a federal designation and have been discussed above. No other state sensitive, threatened, or endangered fish species occur within the study area. Exhibit 10 illustrates the location of priority fish within the study area.

Exhibit 10
Location of Protected Fish Species within the Study Area



Other fish that may be present in Mill Creek and the Milwaukee Ditch due to their identification in these water bodies or their known existence in adjacent water bodies include:

- Channel catfish (*Ictalurus spp.*)
- Yellow perch (*Perca fluviatilus*)
- Pumpkinseed sunfish (*Lepomis gibbosus*)
- Goldfish (*Carassius auratus*)
- Black crappie (*Pomoxis nigromaculatus*)
- Largemouth bass (*Micropterus salmoides*)
- Smallmouth bass (*M. dolomieui*)
- Threespine stickleback (*Gasterosteus aculeatus*)

Wetlands

Wetlands in the study area are typically comprised of:

Emergent communities - reed-canarygrass

Shrub communities - willow, spiraea, or red-osier dogwood

Forested communities - red alder and black cottonwood

Reed-canarygrass is also prevalent throughout the study area in upland locations.

Project team biologists delineated 50 wetlands within the study area. Thirty-one wetlands were identified in WRIA 09 and 19 wetlands were identified in WRIA 10.

Exhibits 11a through 11o illustrate the location of all the wetlands delineated by the field team, as well as their associated buffers, stream buffers, and areas of potential impact. Note that not all wetlands and streams show associated buffers because the adjacent road infrastructure is not regulated as buffer.

Exhibit 11a
Wetlands

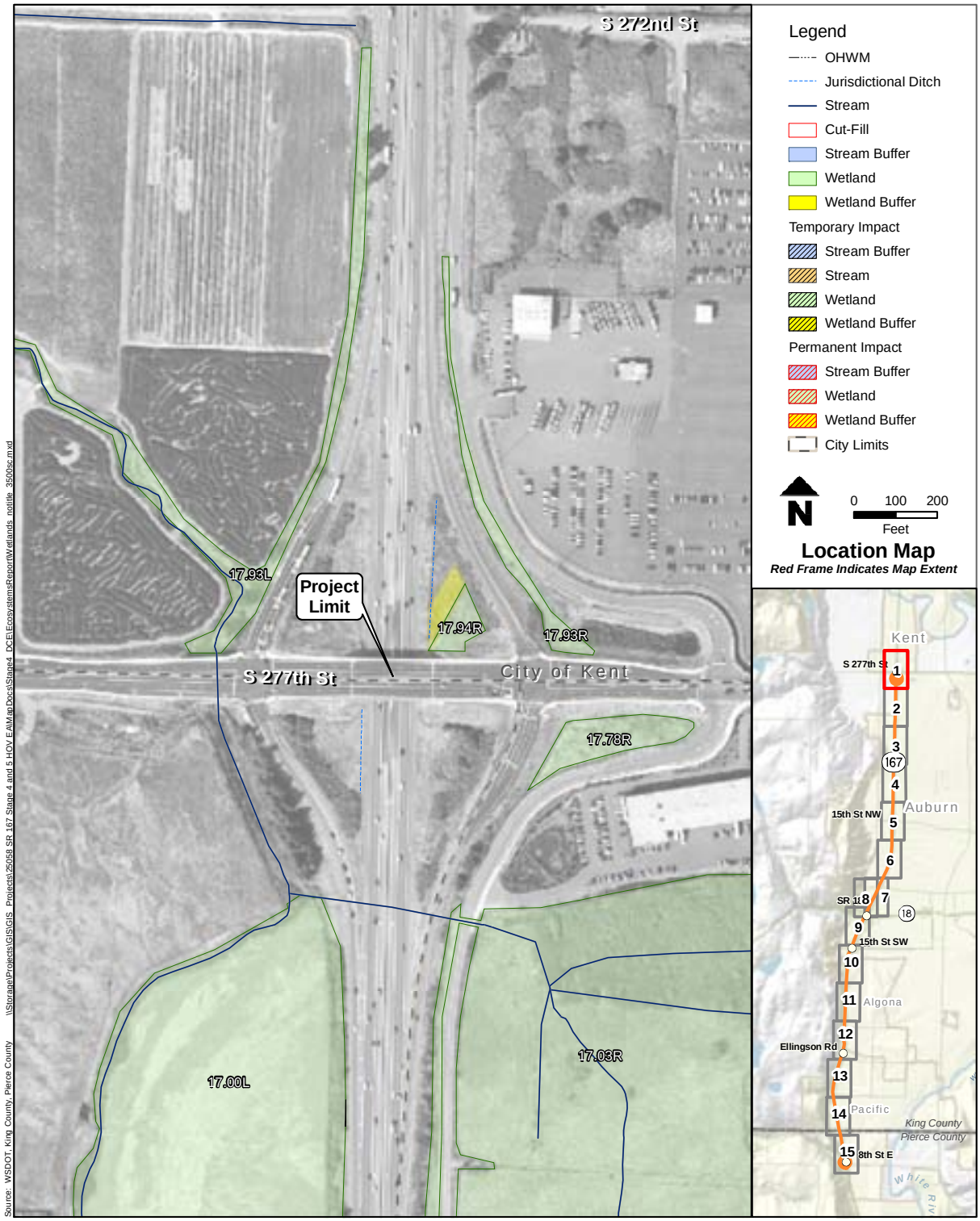


Exhibit 11b
Wetlands

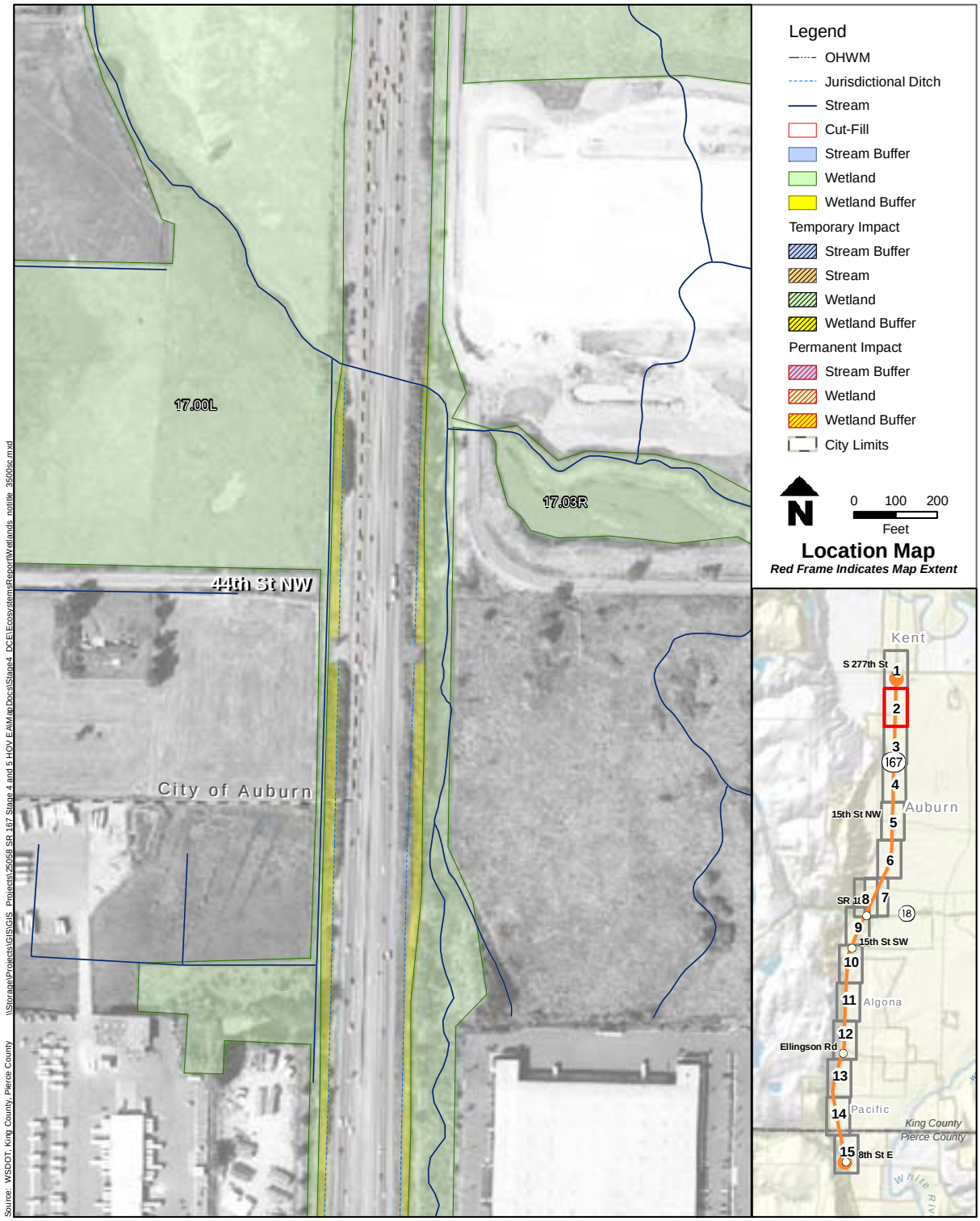


Exhibit 11c
Wetlands

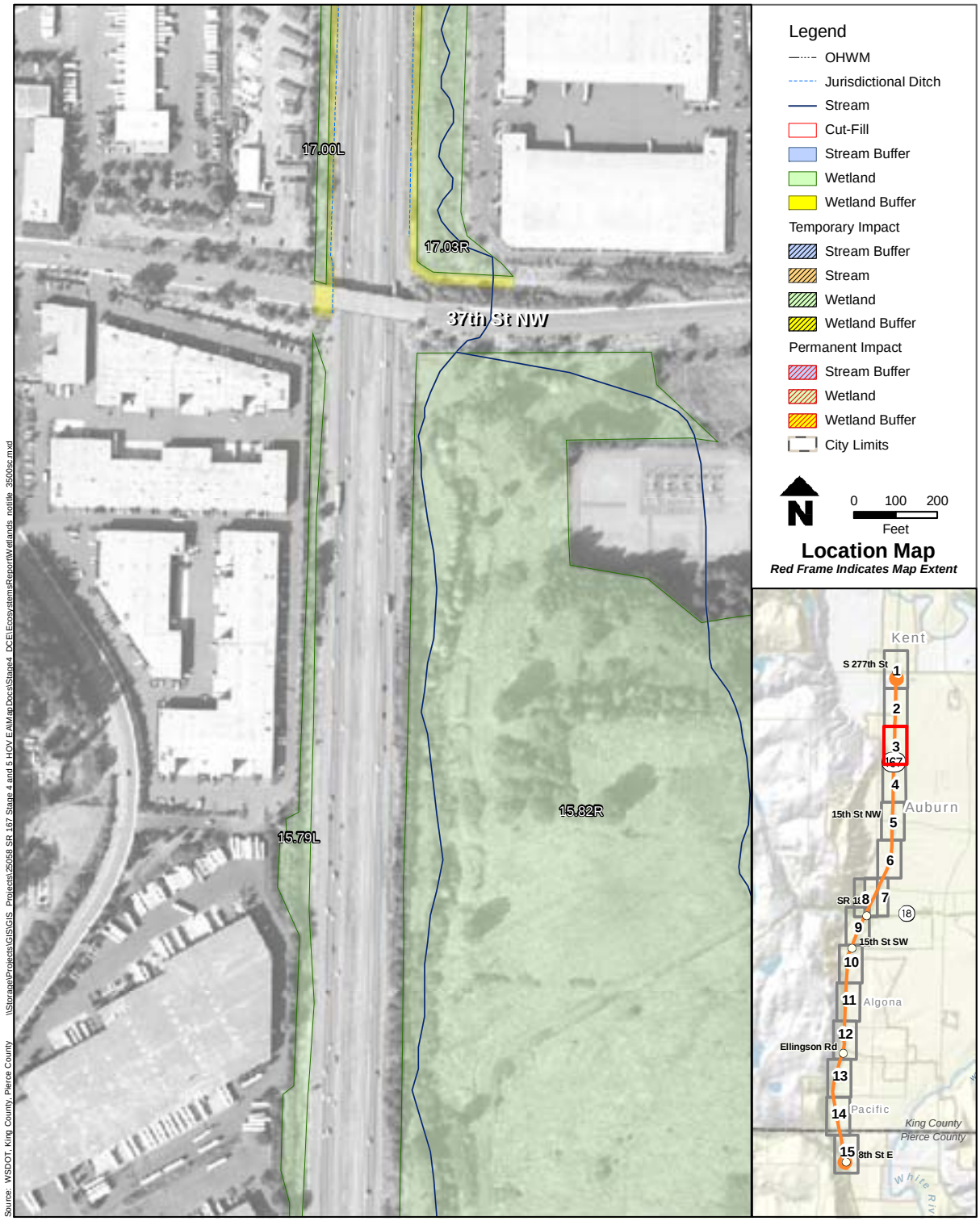


Exhibit 11d
Wetlands

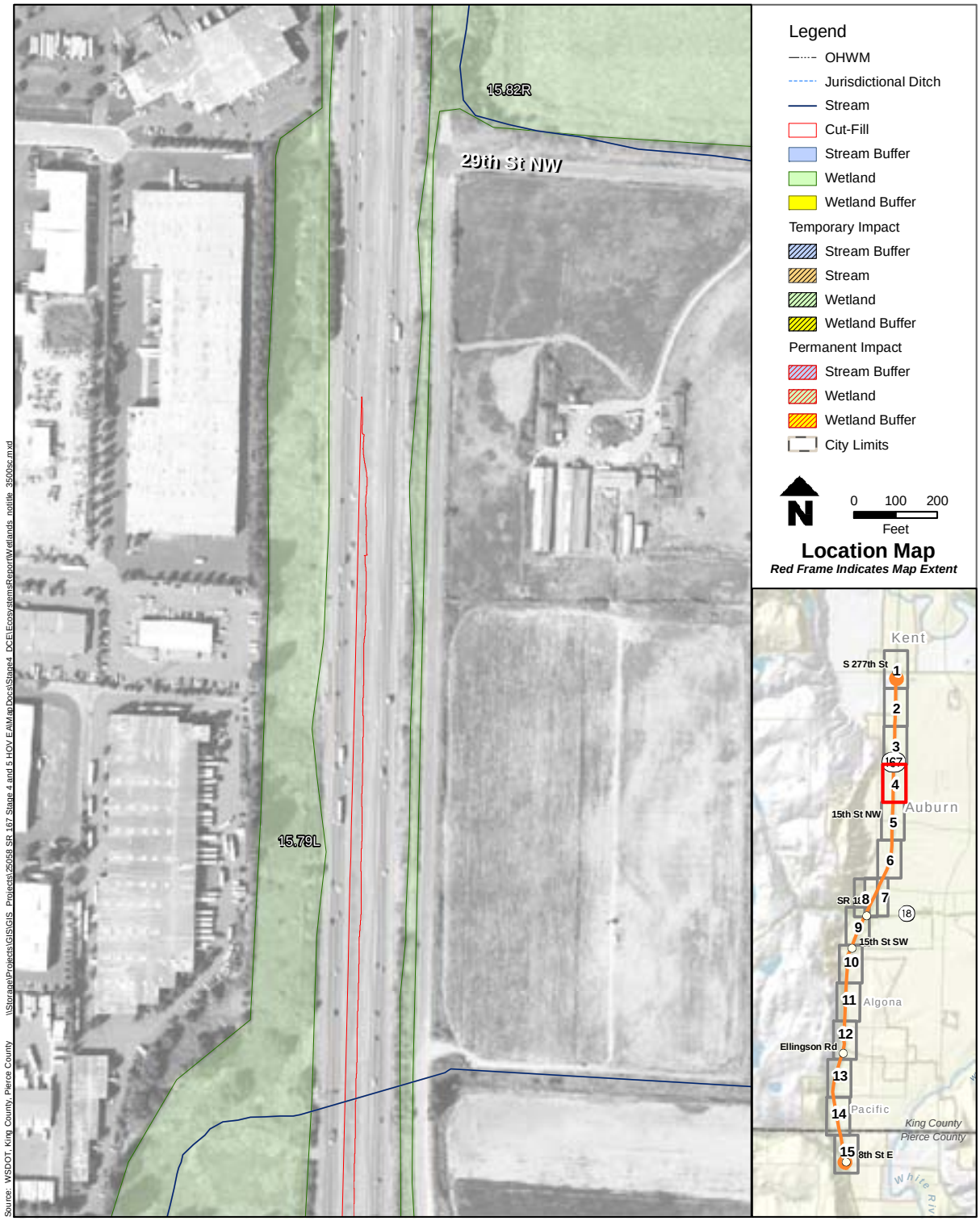


Exhibit 11e
Wetlands

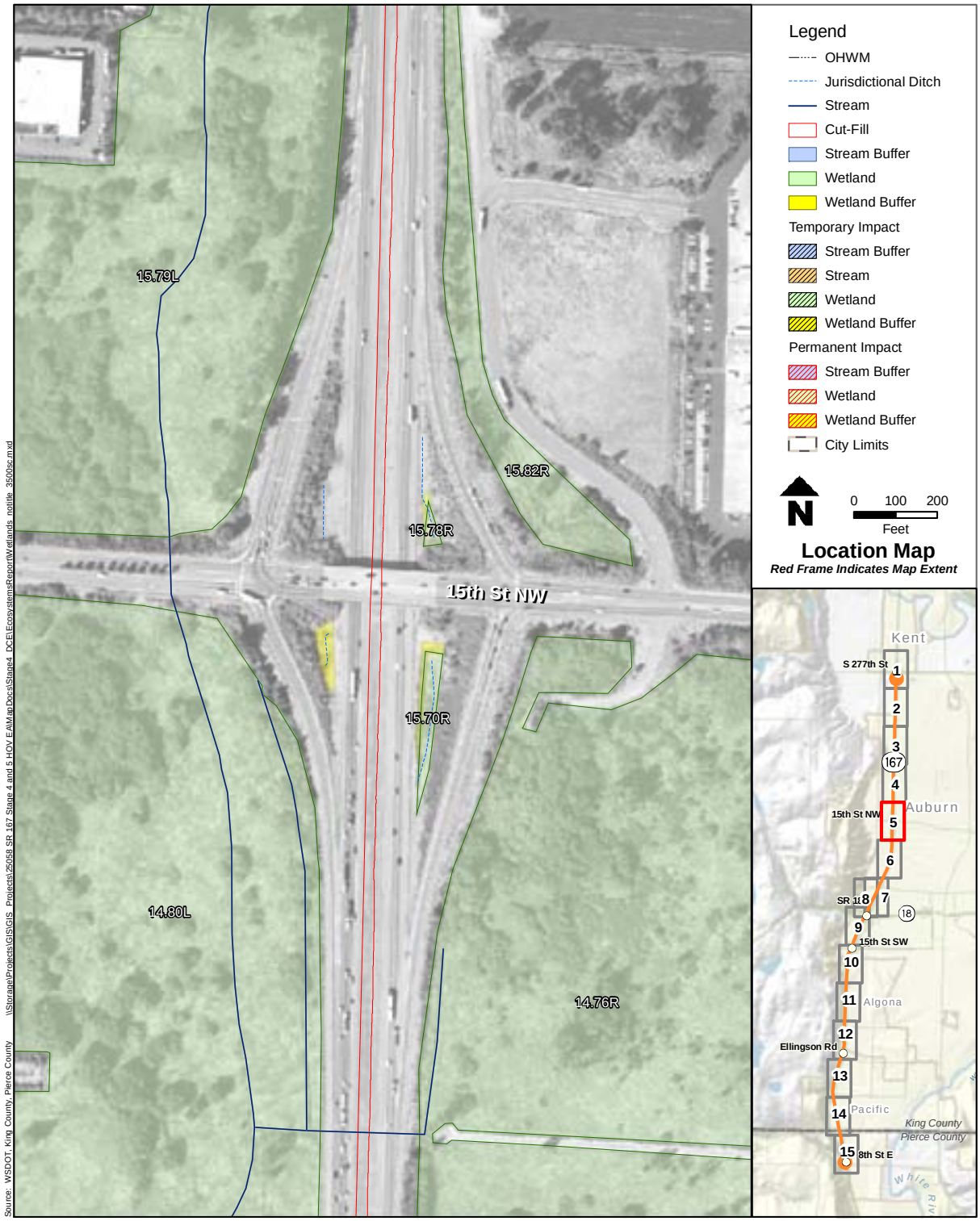


Exhibit 11f
Wetlands

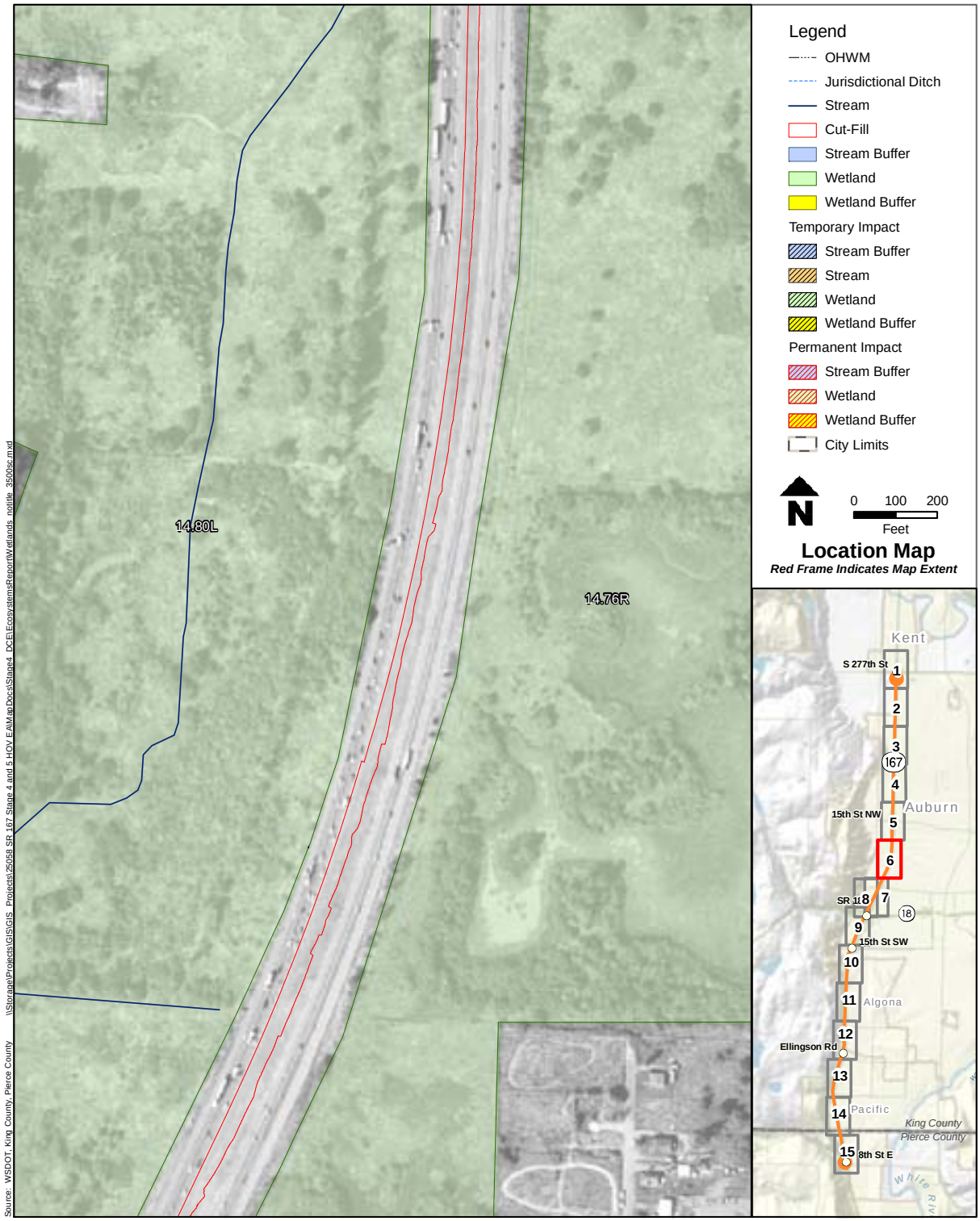


Exhibit 11g
Wetlands

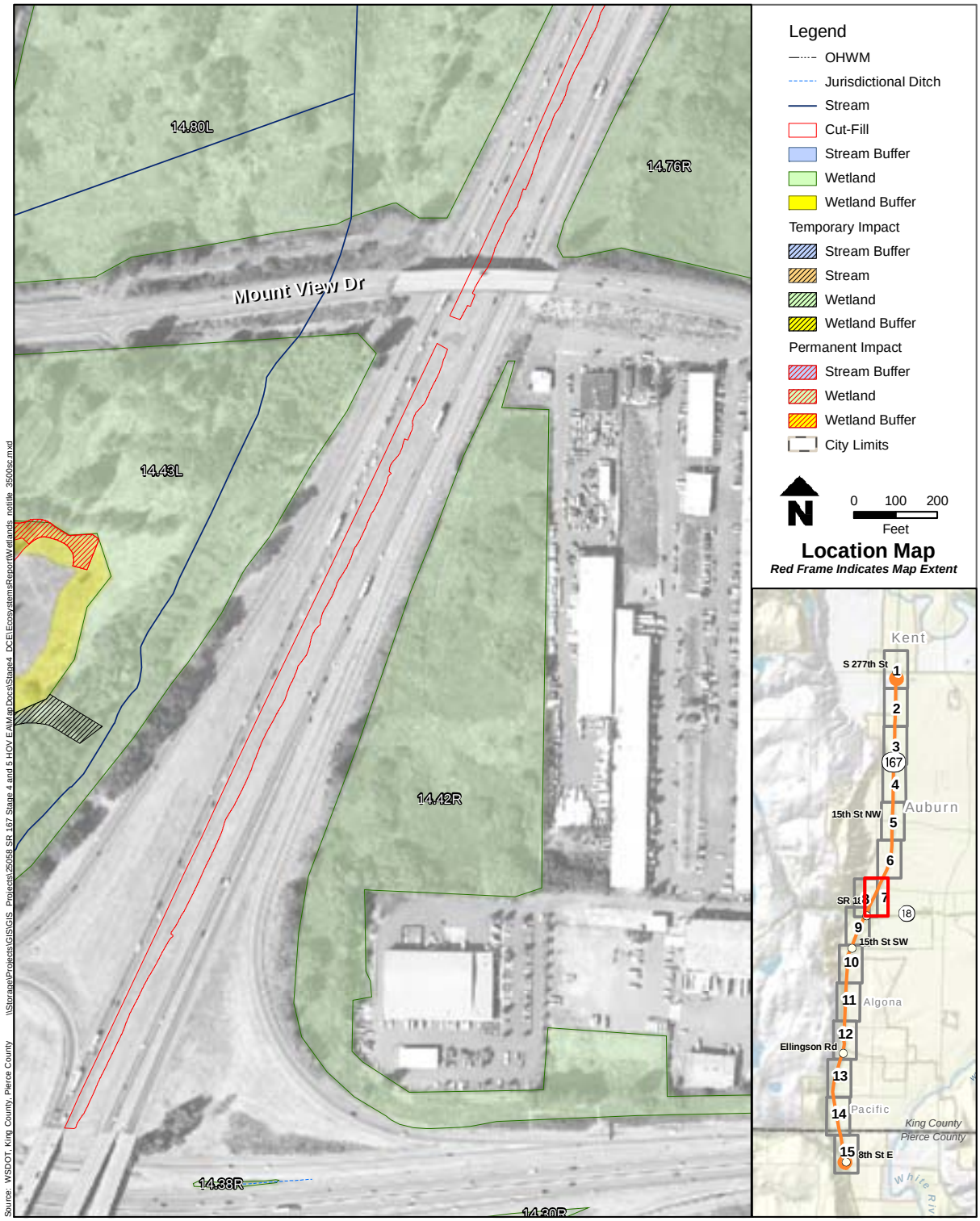


Exhibit 11h
Wetlands

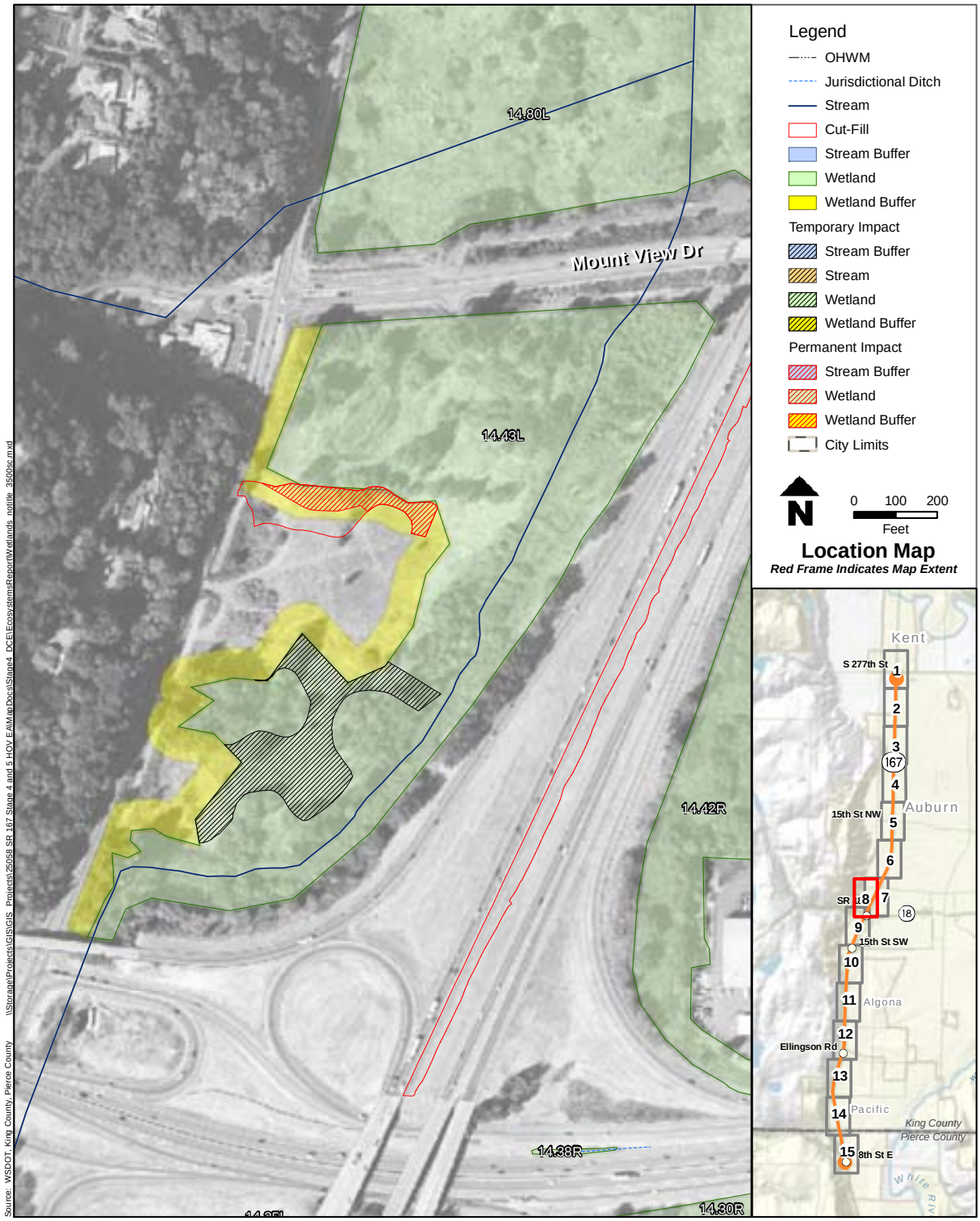


Exhibit 11i
Wetlands

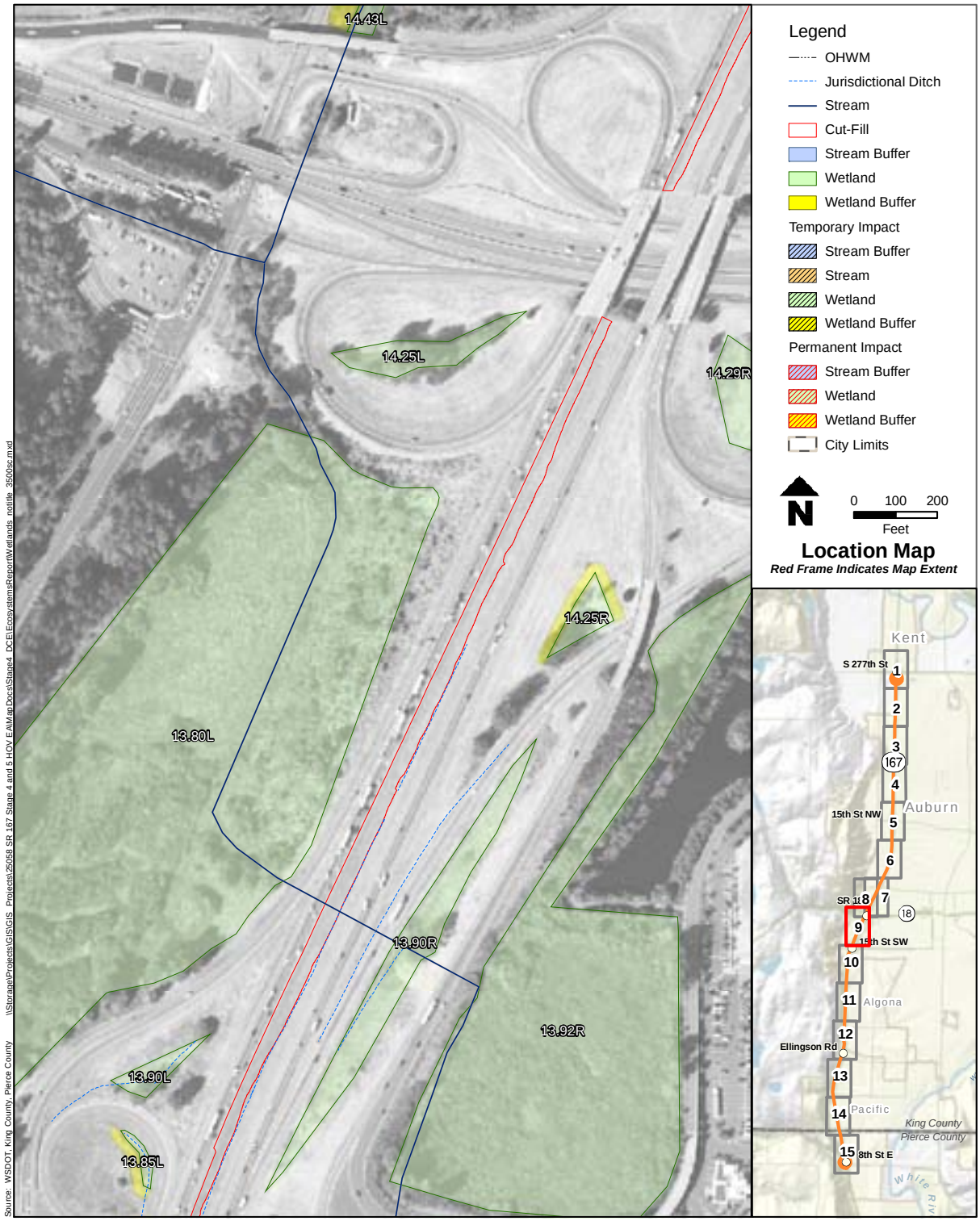


Exhibit 11j
Wetlands

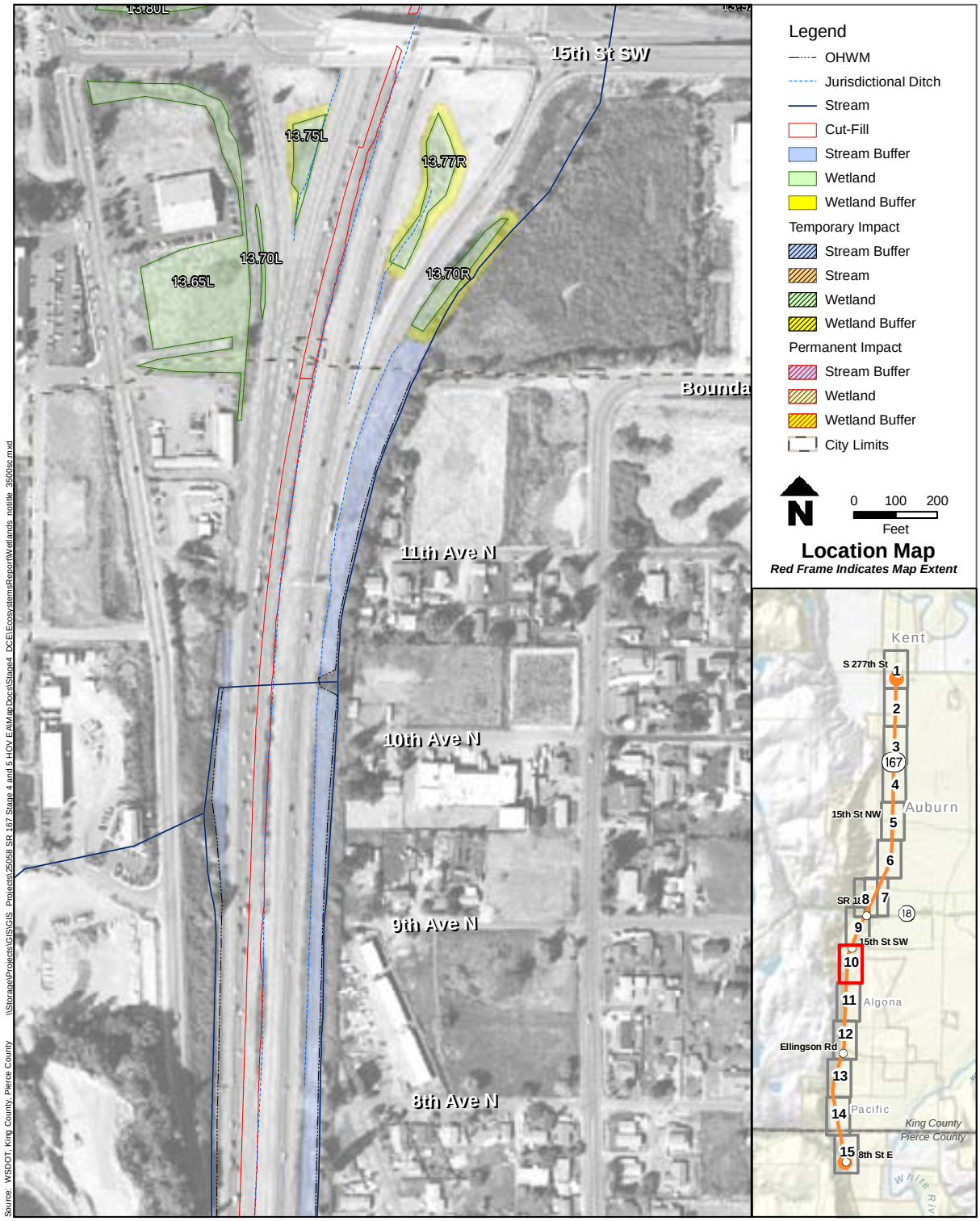


Exhibit 11k
Wetlands

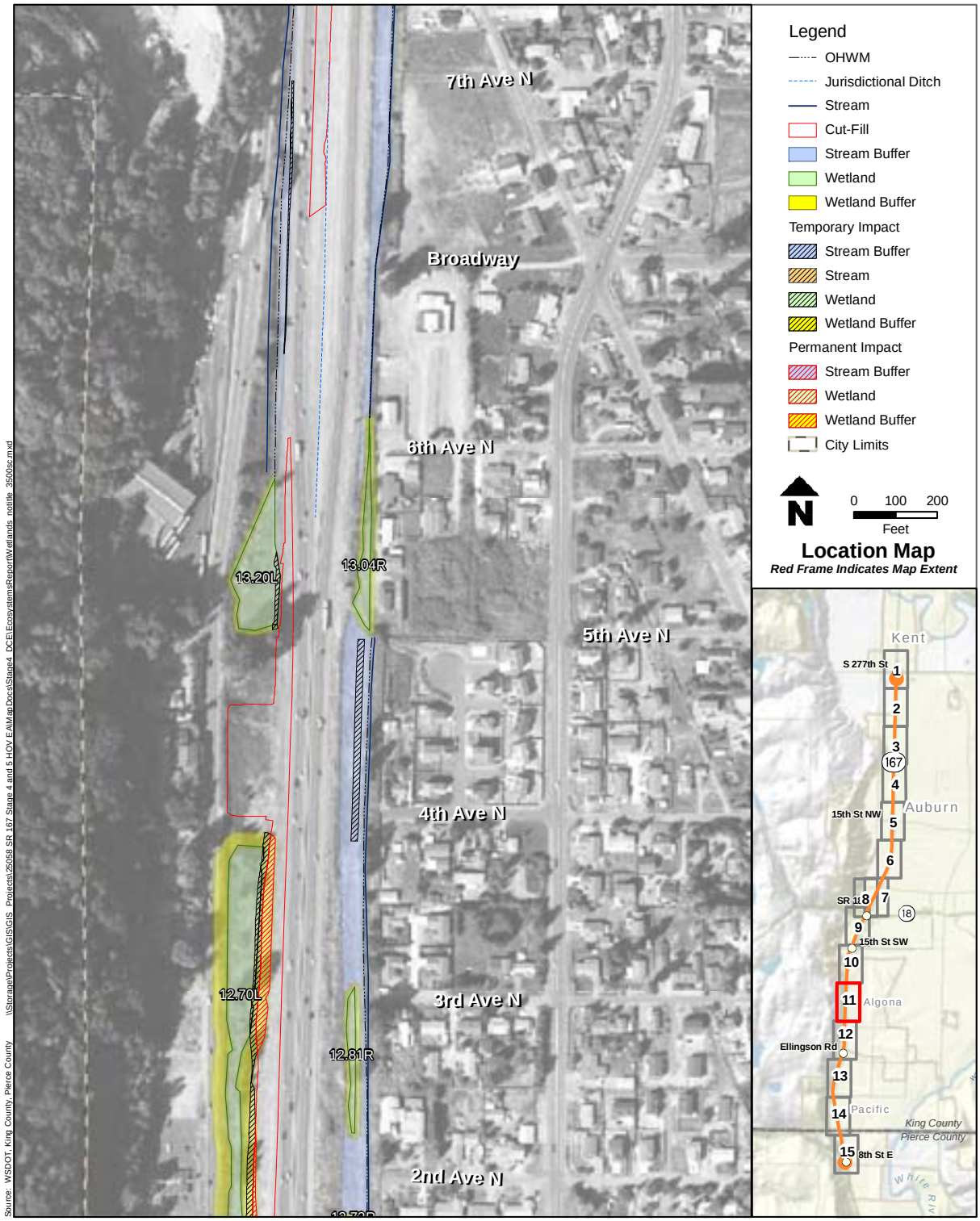


Exhibit 11l
Wetlands

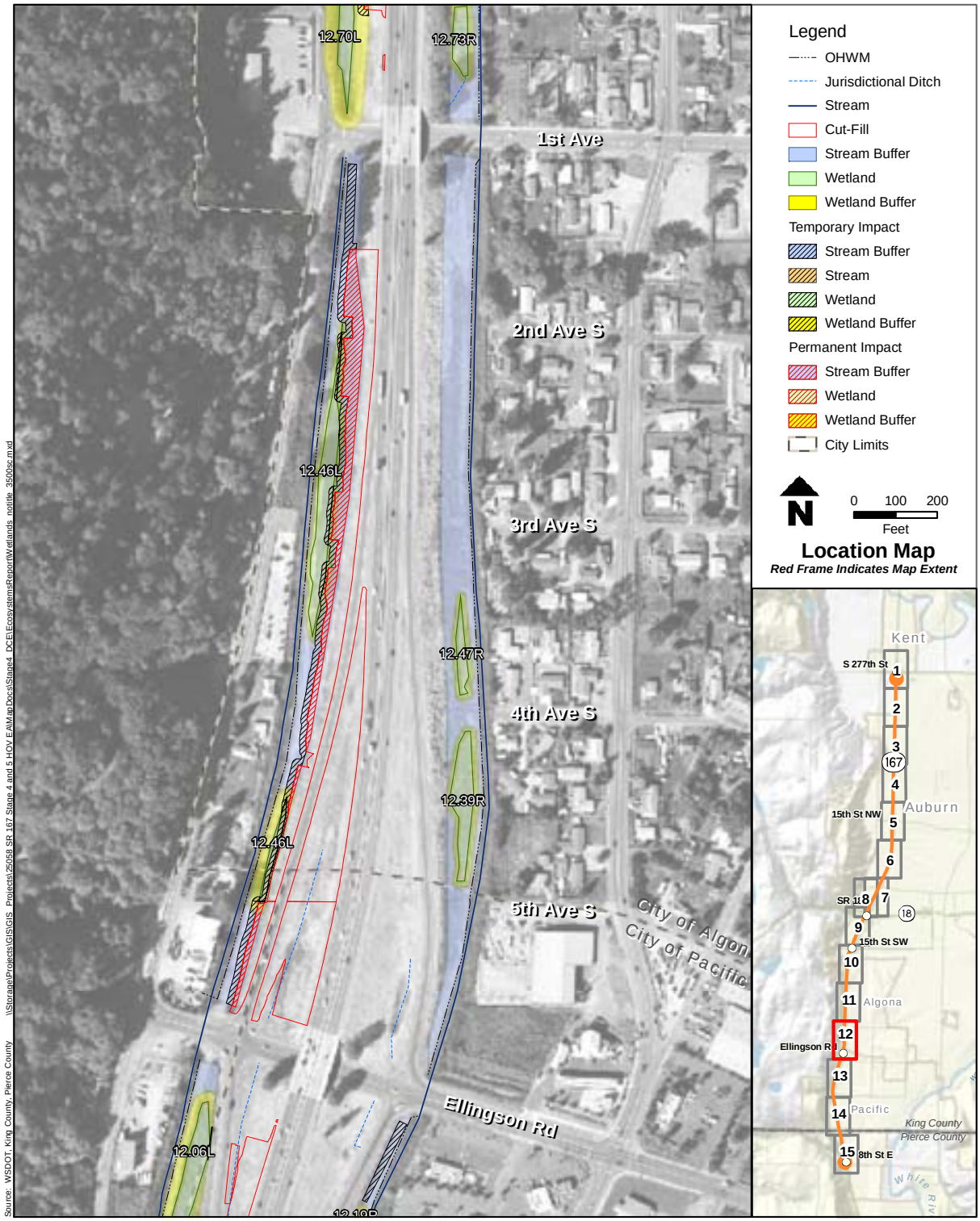


Exhibit 11m
Wetlands

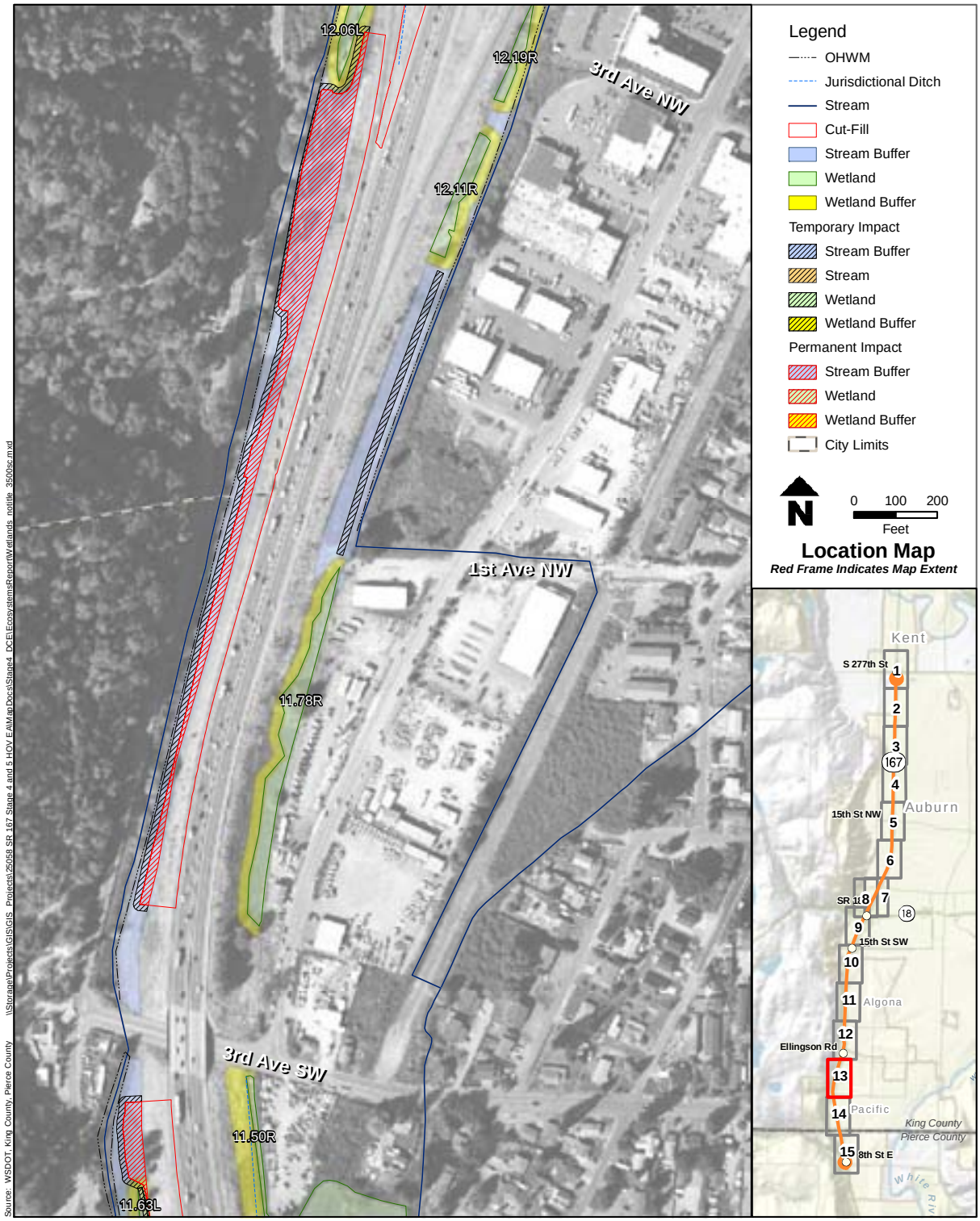


Exhibit 11n
Wetlands

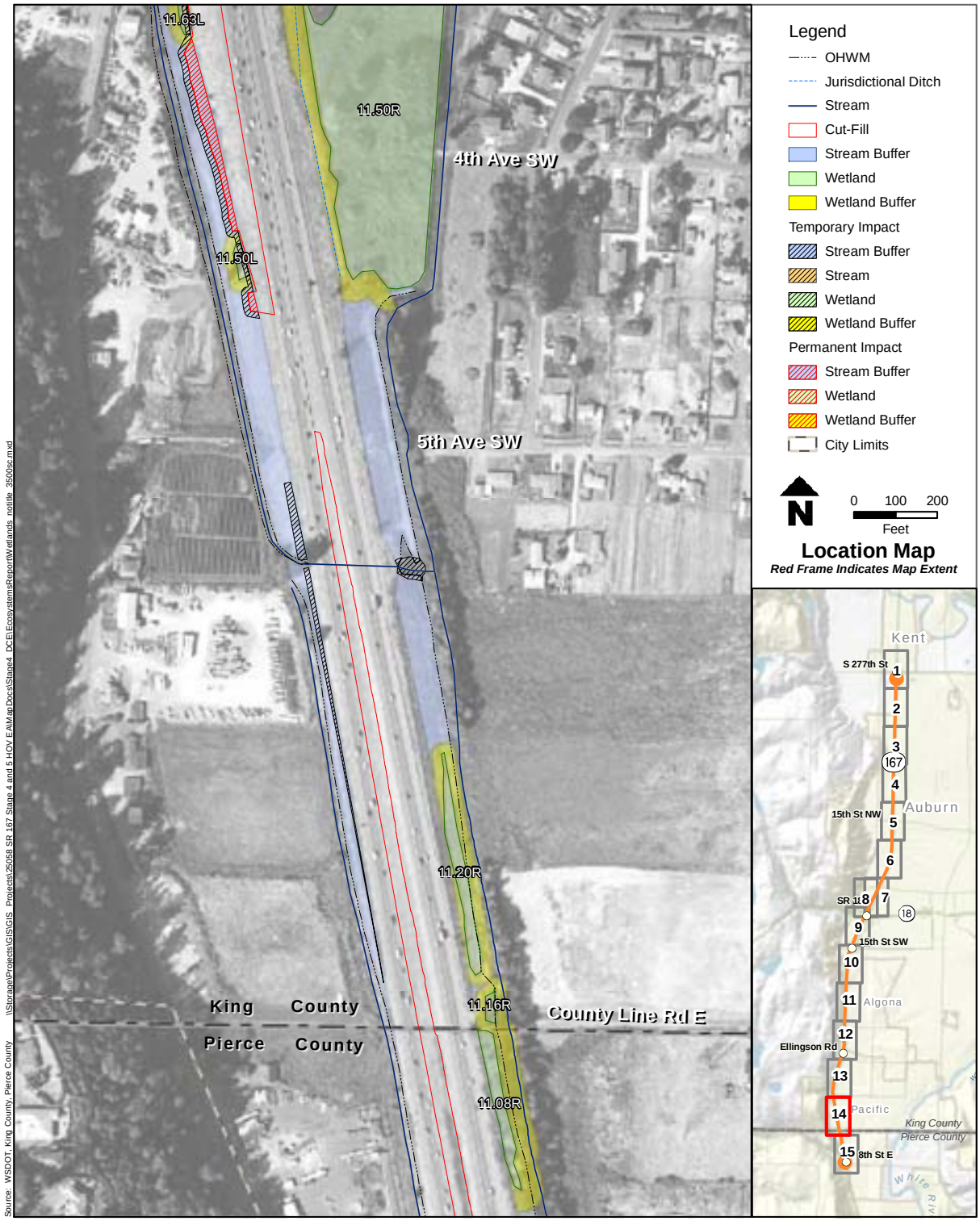
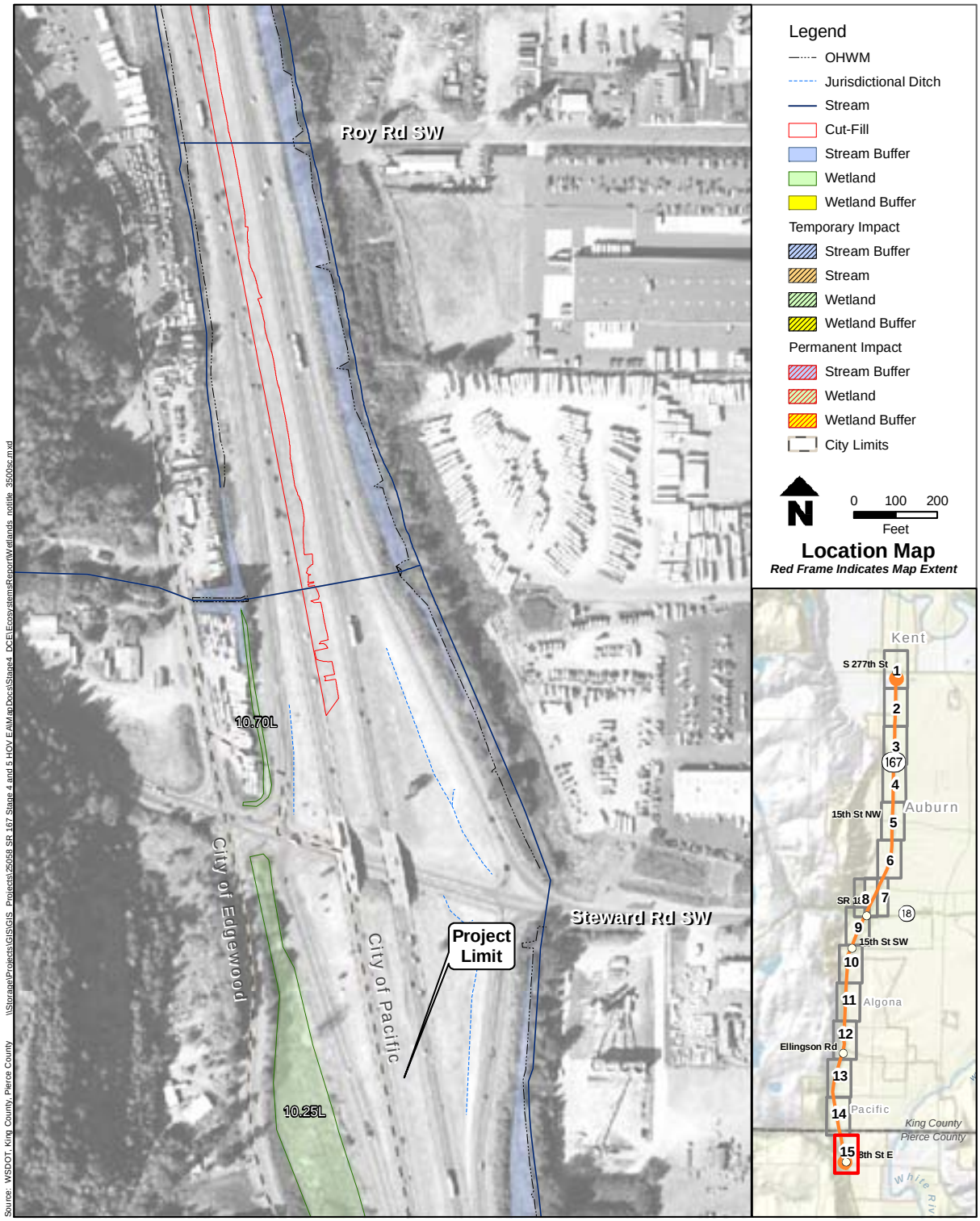


Exhibit 11o
Wetlands



Terrestrial Wildlife and Vegetation

Limited wildlife-supporting habitat exists in the study area. Nearby wetlands provide most of this habitat. The US Fish and Wildlife Service identified a number of listed species potentially found in King and Pierce counties (USFWS, 2007 and 2008). The species and their designation is listed in Exhibit 12.

Exhibit 12
King and Pierce County Protected and Sensitive Species

Designation by USFWS	King County	Pierce County
Listed		
Bull trout (*Salvelinus confluentus*)	x	x
Canada lynx (*Lynx canadensis*)	x	x
Gray wolf (*Canis lupus*)	x	x
Grizzly bear (*Ursus arctos = U. a. horribilis*)	x	x
Marbled murrelet (*Brachyramphus marmoratus*)	x	x
Northern spotted owl (*Strix occidentalis caurina*)	x	x
Arenaria paludicola (*marsh sandwort*) [historic]		x
Castilleja levisecta (*golden paintbrush*) [historic]	x	x
Howellia aquatilis (*water howellia*)		x
Designated		
Critical habitat for bull trout	x	x
Critical habitat for the marbled murrelet	x	x
Critical habitat for the northern spotted owl	x	x
Proposed		
None		
Candidate		
Mardon skipper (*Polites mardon*)		x
Oregon spotted frog (*Rana pretiosa*)	x	x
Yellow-billed cuckoo (*Coccyzus americanus*)	x	x
Taylor's checkerspot (*Euphydryas editha taylori*)		x
Yellow-billed cuckoo (*Coccyzus americanus*)		x

Exhibit 12 (Cont.)
King and Pierce County Protected and Sensitive Species

Designation by USFWS	King County	Pierce County
Species of Concern		
Bald eagle (*Haliaeetus leucocephalus*)	x	x
Beller's ground beetle (*Agonum belleri*)	x	
California wolverine (*Gulo gulo luteus*)	x	x
Cascades frog (*Rana cascadae*)	x	x
Fender's soliperlan stonefly (*Soliperla fenderi*)		x
Hatch's click beetle (*Eanus hatchi*)	x	
Larch Mountain salamander (*Plethodon larselli*)	x	x
Long-eared myotis (*Myotis evotis*)	x	x
Long-legged myotis (*Myotis volans*)	x	x
Northern goshawk (Accipiter gentilis)	x	x
Northern sea otter (*Enhydra lutris kenyoni*)	x	x
Northwestern pond turtle (*Emys (= Clemmys*) *marmorata marmorata*)	x	x
Olive-sided flycatcher (*Contopus cooperi*)	x	x
Oregon vesper sparrow (*Pooectetes gramineus affinis*)		x
Pacific lamprey (*Lampetra tridentata*)	x	x
Pacific Townsend=s big-eared bat (*Corynorhinus townsendii townsendii*)	x	x
Peregrine falcon (*Falco peregrinus*)	x	x
River lamprey (*Lampetra ayresi*)	x	x
Slender-billed white-breasted nuthatch (*Sitta carolinensis aculeata*)		x
Tailed frog (*Ascaphus truei*)	x	x
Valley silverspot (*Speyeria zerene bremeri*)	x	x
Western gray squirrel (*Scirius griseus griseus*)		x
Western toad (*Bufo boreas*)	x	
Van Dyke's salamander (*Plethodon vandykei*)		x
Aster curtus (white-top aster)	x	x
Botrychium pedunculosum (stalked moonwort)	x	x
Castilleja cryptantha (obscure paintbrush)		x
Cimicifuga elata (tall bugbane)	x	x
Cypripedium fasiculatum (clustered lady's slipper)		x
Lathyrus torreyi (Torrey's peavine)		x

A number of animal species, protected or otherwise, exist within the study area. While conducting field investigations as part of this project, biologists documented the species identified. Exhibit 13 summarizes the species both observed in the field and expected to occur within the study area.

Exhibit 13
Wildlife Species Occurrence within the Study Area

Species	Observed[1]	Expected[2]	Notes
Birds			
American goldfinch (*Carduelis tristis*)	X		
American robin (*Turdus migratorius*)	X		
Barn swallows (*Hirundo rustica*)	X		
Belted king fisher (*Megaceryle alcyon*)	X		
Bewicks wren (*Thryomanes bewickii*)	X		
Black-capped chickadee (*Poecile atricapillus*)	X		
Brewer's blackbird (*Euphagus cyanocephalus*)		X	
Brown creeper (*Certhia americana*)	X		
Bushtit (*Psaltriparus minimus*)	X		
Cedar waxwing (*Bombycilla cedrorum*)		X	
Cliff swallows (*Petrochelidon pyrrhonota*)	X		
Coopers hawk (*Accipiter cooperii*)	X		
Dark eyed junco (*Junco hyemalis*)		X	
Downey woodpecker (*Picoides pubescens*)	X		
European starling (*Sturnus vulgaris*)	X		
Great blue heron (*Ardea herodias*)	X		
House finch (*Carpodacus mexicanus*)		X	
Mallard (*Anas platyrhynchos*)		X	
Mourning dove (*Zenaida macroura*)		X	
Northern flicker (*Colaptes auratus*)	X		
Northern rough-winged swallow (*Stelgidopteryx serripennis*)	X		
Northwest crow (*Corvus caurinus*)	X		
Osprey (*Pandion haliaetus*)	X		Male, female, and juvenile seen at one location
Pileated woodpecker (*Dryocopus pileatus*)	X		
Red-breasted merganser (*Mergus serrator*)		X	
Red-tailed hawk (*Buteo jamaicensis*)	X		
Red-winged blackbird (*Agelaius phoeniceus*)		X	

Exhibit 13 (Cont.)
Wildlife Species Occurrence within the Study Area (Cont.)

Species	Observed[1]	Expected[2]	Notes
Rock dove (*Columba livia*)	X		
Rufus hummingbird (*Selasphorus rufus*)		X	
Song sparrow (*Melospiza melodia*)	X		
Stellars jay (*Cyanocitta stelleri*)	X		
Tree swallow (*Tachycineta bicolor*)	X		
Violet green swallows (*Tachycineta thalassina*)	X		
Western scrub jay (*Aphelocoma californica*)	X		Adults feeding three juveniles
White crowned sparrow (*Zonotrichia leucophrys*)		X	
Winter wren (*Troglodytes troglodytes*)		X	
Yellow-rumped warbler (*Dendroica coronata*)	X		
Mammals			
Various bat species (*Myotis spp.*)		X	
Coyote (*Canis latrans*)		X	Scat and tracks observed
Deer (*Odocoileus spp.*)	X		
Field mice		X	
Feral cats (*Felis cattus*)		X	
Feral dogs (*canis lupus familiaris*)		X	
Gray squirrel (*Sciurus carolinensis*)	X		
Douglas squirrel (*Tamiasciurus douglasii*)	X		
Opossum (*Didelphis virginiana*)		X	
Mountain beaver (*Aplodontia rufa*)		X	Burrow observed
Rabbit	X		
Raccoon (*Procyon lotor*)	X		Sleeping in crotch of maple tree
River otter (*Lontra Canadensis*)	X		Adult observed in Mill Creek
Vole (*Microtus longicaudus*)		X	
Insects			
Dragonfly	X		
Gardner spider	X		
Mosquitoes	X		
Paper wasps (*Polistes fuscatus pallipes*)	X		
Swallow-tailed butterfly (*Papilio spp.*)	X		
Water striders (*Gerris remigis*)	X		
Western white butterfly (*Pontia occidentalis*)	X		
Woodland skipper butterfly (*Ochlodes sylvanoides*)	X		

Exhibit 13 (Cont.)
Wildlife Species Occurrence within the Study Area (Cont.)

Species	Observed[1]	Expected[2]	Notes
Yellow jackets (*Vespula spp.*)	X		
Honey bees (*Apis mellifera*)	X		
Reptiles/Amphibians			
Garter snake (*Thamnophis spp.*)	X		
Pacific chorus frog (*Pseudacris regilla*)		X	

1 - Species in the observed column were observed during site visits, wetland delineations, and stream surveys performed for the project

2 - Species in the expected column are common species typical to the project area, but not observed during fieldwork performed for the project

The study area includes three distinct types of landscape cover. They are categorized based on similarities in landscape features (such as the presence of vegetation, buildings, and/or roads), and expected wildlife presence and use. The three general cover types in the study area are:

1. Urban Growth – Agricultural Complex
2. Wetland – Riparian Areas
3. Upland Slope

Within these general types of landscape cover, various specific habitats are present, as listed in Exhibit 14.

Exhibit 14
Study Area Landscape Cover Types, Habitats, and Associated Wildlife

Cover Type	Description	Habitat and Associated Wildlife	Other Notes
Urban Growth - Agricultural Complex	Light to medium commercial, residential, and industrial use areas with asphalt, lawns, and ornamental plantings interspersed with agricultural lands and fragmented natural habitat, including small stands of deciduous and coniferous forest.	Provides habitat for species associated with human use, such as small rodents and birds (house mouse, house sparrow, European starling, rock dove); species associated with human-altered landscapes consisting of predominantly edge and fragmented habitat (coyote, Virginia opossum, raccoon, American crow, red-tailed hawk, great horned owl); species associated with agricultural fields (gulls, killdeer, Brewer's blackbird, Canada goose, coyote).	This is the most abundant cover type in the project area. Although humans are present in these areas, wildlife use is abundant for certain species due to their association with humans and specific habitat areas (e.g., fallow agricultural fields or undeveloped parcels).
Wetland - Riparian Areas	Seasonally flooded wetlands and riparian habitat associated with the banks and buffers of rivers, creeks, streams, and ditches.	Provides deciduous tree cover (e.g., red alder, black cottonwood) and wetland habitat. Wildlife species include marsh wren, song sparrow, northern flicker, belted kingfisher, mallard, red-winged blackbird, red-tailed hawk, various small rodents, beaver, raccoon, coyote, frogs, and salamanders.	This cover type dominates the natural landscape portions of the project area that are not in human use.
Upland Slope	Gradual to steep slope zone where the Kent Valley meets the surrounding uplands. Mixed coniferous and hardwood forest.	Provides forested areas of red alder, big-leaf maple, Douglas fir, black cottonwood, and western red cedar. Understory and disturbed areas include mostly non-native English ivy, Himalayan blackberry, and grasses. Wildlife include the Norway rat, song sparrow, black-capped chickadee, Bewick's wren, downy woodpecker, northern flicker, red-tailed hawk, great horned owl, frogs, and salamanders.	This is the least abundant cover type in the project area, although it is more common farther away (more than 0.25 miles) from the SR 167 corridor. It is found occasionally where the road approaches upland areas, such as in the southern portion of the project area.

Exhibits 15a through 15c illustrate the land cover types throughout the study area.

Exhibit 15a

Vegetative Land Cover – Habitat Type

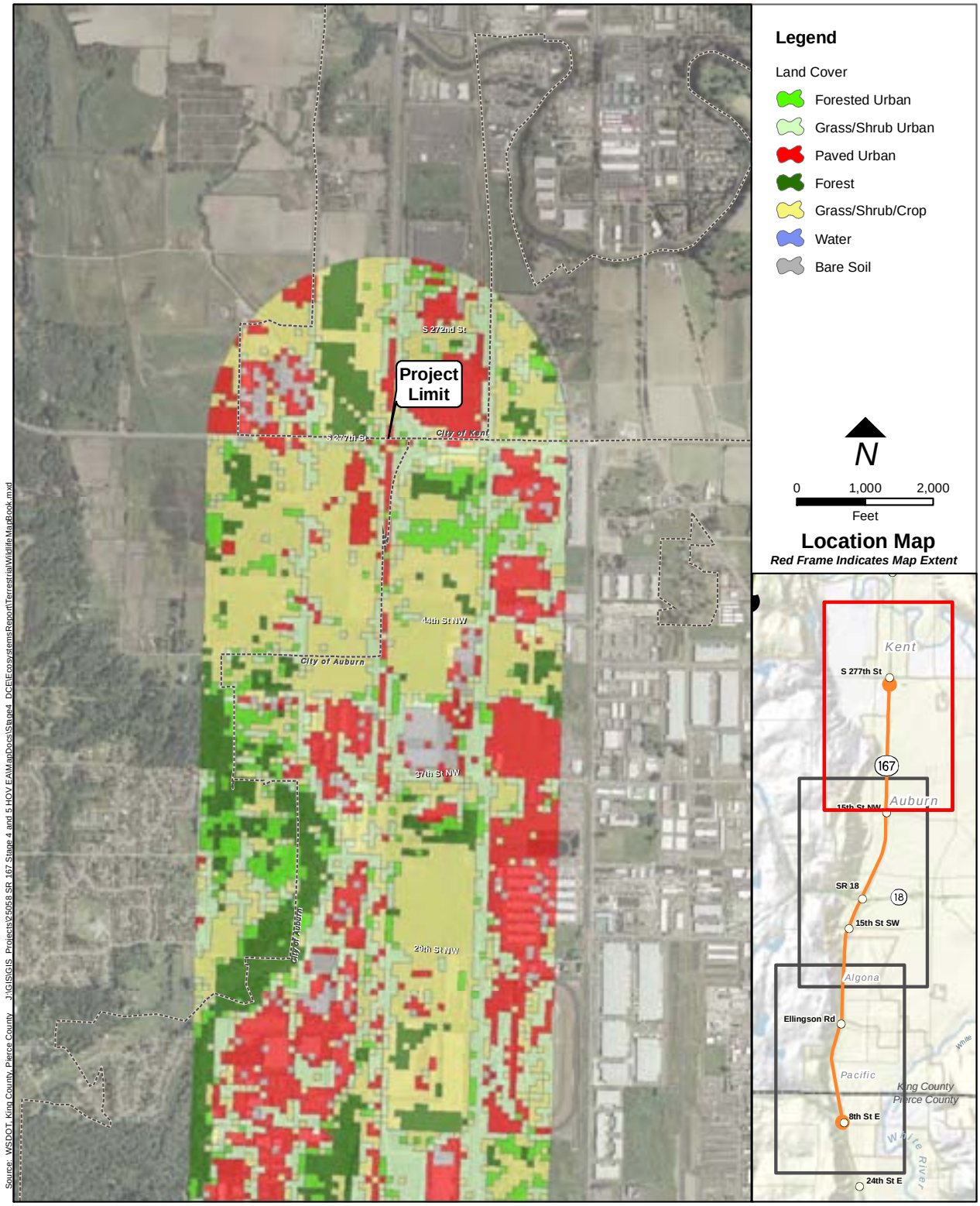


Exhibit 15b

Vegetative Land Cover – Habitat Type

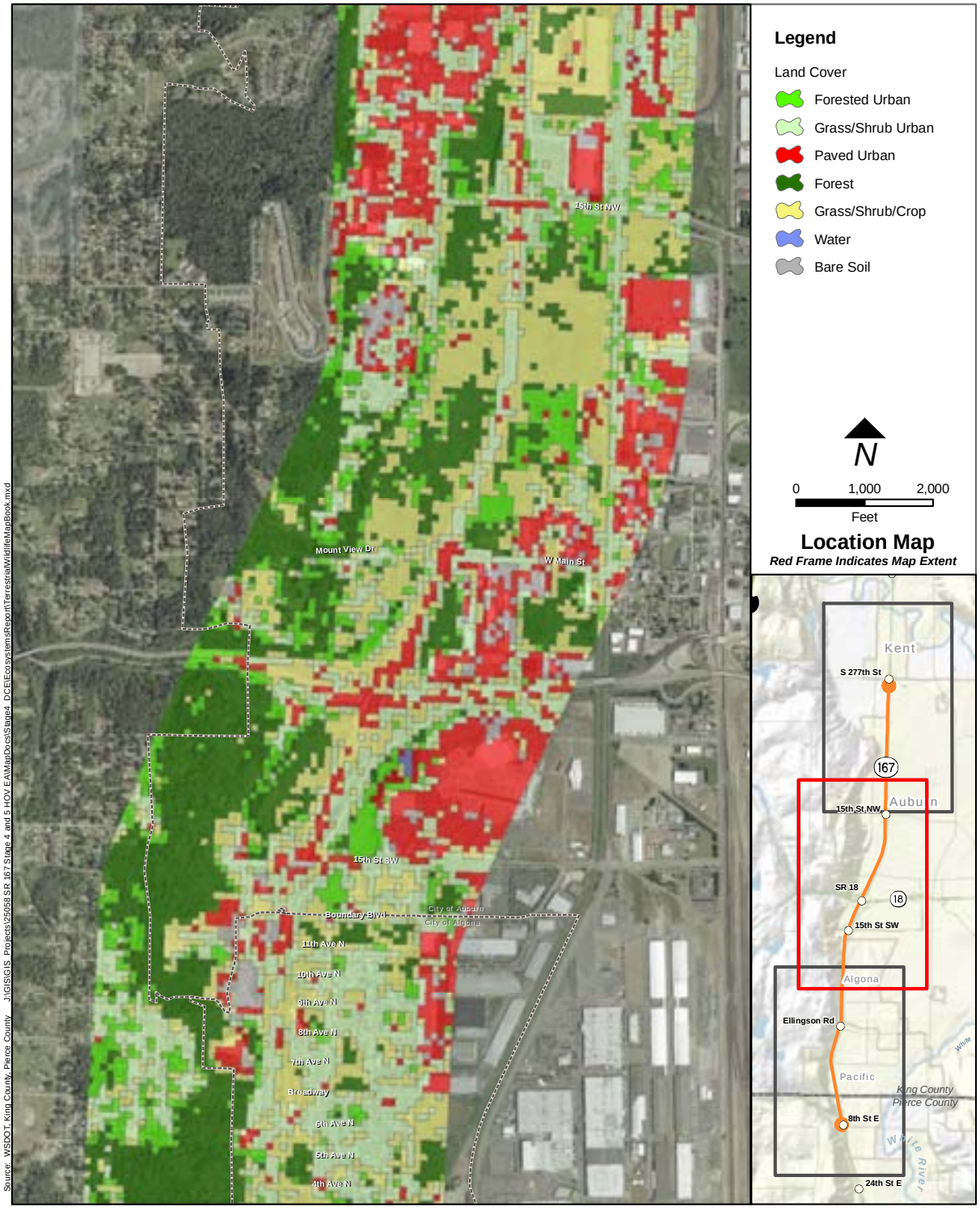
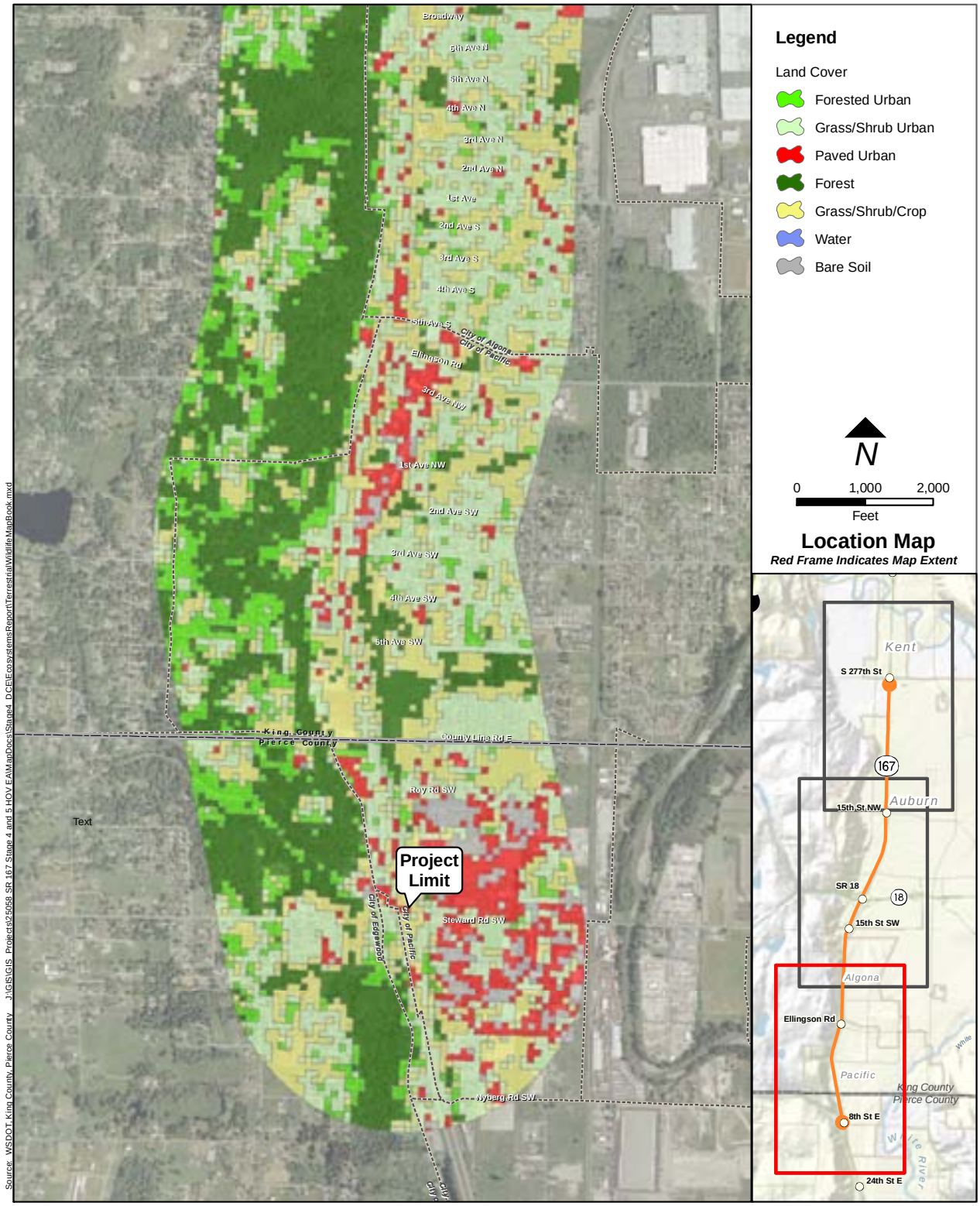


Exhibit 15c

Vegetative Land Cover – Habitat Type



The entire project lies within the Puget-Willamette Lowlands of western Washington where conifers are most common. Vegetation is dominated by needle-leaved, evergreen tree species and large deciduous trees such as:

- Douglas-fir (*Pseudotsuga menziesii*)
- Western red cedar (*Thuja plicata*)

Other dominant tree species include

- Big-leaf maple (*Acer macrophyllum*)
- Black cottonwood (*Populus trichocarpa*)

Scattered patches of forest habitats occur throughout the vicinity of the project.

Shrub communities are dominated by:

- Shrub willows (*S. scouleriana, S. sitchensis*)
- Douglas spiraea (*Spiraea douglasii*)
- Red-osier dogwood (*Cornus stolonifera*)

Herbaceous communities tend to be either wetland or highly disturbed and compacted soils. They generally consist of:

- Reed-canarygrass (*Phalaris arundinacea*)
- Bentgrass (*Agrostis spp.*)
- Cattail (*Typha latifolia*)

Highly disturbed areas associated with industrial lands and past land-clearing activities have been heavily colonized by:

- Himalayan blackberry (*Rubus discolor*)
- Scot's broom (*Cytisus scoparius*)
- Stinging nettle (*Urtica dioica*)

Wetlands in the study area are typically comprised of reed-canarygrass in the emergent communities; willow, spiraea, or red-osier dogwood in the shrub communities, and red alder and black cottonwood if they occur in forested communities. Reed-canarygrass is also prevalent throughout the study area in upland locations.

The study area has been identified as a habitat for the threatened species Golden paintbrush (*Castilleja levisecta*).

This species once occurred from Oregon to Vancouver Island in British Columbia. Eleven populations now exist in open grasslands ranging from Thurston County, Washington, north through the Puget Trough, to southwest British Columbia, Canada (62 FR 31740-31748). However, anthropogenic changes that have occurred at the site (i.e., filling of historic wetlands with off-site material), have resulted in areas that are likely unsuitable habitat for golden paintbrush. No golden paintbrush was observed in the field.

Is the project within a recognized tribal treaty fishing area?

The Muckleshoot Indian Tribe, the Puyallup Tribe of Indians, and the Confederated Tribes and Bands of the Yakama Nation have Usual and Accustomed Fishing Grounds and Stations within the SR 167 project area.

This use of fisheries in the Puget Sound area by the Confederated Tribes and Bands of the Yakama Nation was found to be by consent of the tribes in that region. This consent requirement remains today.

CHAPTER 3 POTENTIAL EFFECTS OF THE PROJECT

The following sections describe possible direct, indirect, and cumulative effects of the project. These effects are related to both the construction and/or operation of the facilities associated with the project, which includes bridge widening, fill embankments, retaining walls, and stormwater facilities. These effects can also be temporary or permanent in nature.

Direct effects are defined as effects that have a direct, cause-and-effect relationship to the proposed action.

Indirect effects are defined as effects that are "caused by an action and are later in time or farther removed in distance but are still reasonably foreseeable" (Federal Regulation on the Protection of the Environment - 40 Code of Federal Regulations [CFR] 1508.8). These effects, which usually result from the initial action, include changes in land use, water quality, social issues, and population density.

Cumulative effects are defined as effects that "result from incremental consequences of an action when added to other past, present, and reasonably foreseeable future actions." The cumulative effects of a project may be undetectable when viewed in the individual context of direct or indirect effects. However, cumulative effects can add to other disturbances and eventually lead to a measurable environmental change. Cumulative effects include effects from a proposed project that, when combined with neighboring projects, may lead to a cumulative effect on the environment.

How were effects on ecosystem elements evaluated?

The project team reviewed existing conditions from the data souces described above, then evaluated how the project will likely affect those resources. The team also determined what the applicable regulations require for mitigation of any potential effects.

Floodplains

The project team evaluated whether additional stormwater runoff from the proposed project will have an adverse effect on floodplain storage since the project is in a floodplain area with a history of flooding.

The project team began designing stormwater best management practices (BMPs) to address floodplain storage at the onset of the project. The Draft Hydraulic Report (RW Beck, 2008) provides the design details and calculations; however, in summary, the report relies on allowing groundwater recharge and providing additional floodplain storage to improve natural ecosystem conditions and prevent flooding. For the floodplain storage approach to be supported by Ecology, WSDOT has demonstrated that the approach will not increase the stream channel erosion rates beyond those that are characteristic of natural or reestablished conditions. Supporting data is required to show that this approach protects water quality and satisfies state and federal water quality laws (RW Beck, 2008).

Surface Water Quality and Quantity

Surface water modeling was conducted to size detention ponds, determine flows for the existing culverts, and evaluate the media filter drains and CAVFS. The modeling results provided the following data to assist the project team in evaluating the effects of the proposed project on surface water quality and quantity:

- Volume of runoff from rainfall and stormwater to be treated
- A simulation of the performance of stormwater retention/detention facilities or reservoirs
- Magnitude, frequency and duration of stream flow
- Pollutant loading and concentrations

Aquatic Resources

In particular, the team looked at whether any work will be done in, around, or near water bodies. Construction work could cause adverse effects to water quality, water flow or quantity, and aquatic resources or habitat. The team used the results of the stream assessment field investigation and the surface water modeling to estimate the effects of the project on the physical integrity of streams and stream habitat, including the effects to:

- Channel stability
- Channel scouring/sediment deposition
- Stream habitat
- Water quality
- Average velocity
- Erosion and deposition
- Riparian habitat conditions
- Biological indicators (macroinvertebrates)

The team evaluated the effects of the proposed project on wetlands by identifying direct and indirect project actions on both wetlands and their buffers. The team ascertained the likelihood of any alteration of ecological functions and the long-term consequences to water quality, hydrology, and habitat.

Terrestrial Wildlife and Vegetation

Biologists evaluated the potential project effects on terrestrial wildlife and vegetation by reviewing existing information and the results of field reconnaissance to determine whether suitable habitat for listed or proposed species is present in the study area. The team also reviewed the preliminary roadway and stormwater designs as well as anticipated construction and highway traffic effects on terrestrial habitats. The team calculated the physical effects of the project by overlaying the proposed permanent and temporary construction limits of the roadway widening onto a map suitable wildlife or plant habitat.

How will project construction affect ecosystem elements?

The project team reviewed existing data, project plan sets, and construction methods to identify areas of potential effects and to determine appropriate mitigation measures. The expected direct, indirect, and cumulative effects of the proposed project were determined by the process recommended in the Washington State Department of Transportation (WSDOT) Environmental Procedures Handbook, Chapter 412, and the Council of Environmental Quality regulations (40 CFR 1508.7).

The effects of the proposed project will include those of both a temporary and permanent nature. Temporary effects are categorized as those that will dissipate over a typically short period of time, such as increased turbidity in surface waters due to ground disturbance. Permanent effects are those that will remain in perpetuity after the project is constructed, such as permanent areas of new roadway. Temporary and permanent effects can be either direct or indirect. Direct effects of the project and can be negative or positive. Indirect effects are sometimes called secondary effects and usually occur later in time, after project construction. These effects can also be negative or positive.

Project team members identified where the project improvements will likely affect the ecosystem resources. Prior to finalizing the project footprint, the 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, team members determined to what degree project construction will affect ecosystem elements and compensatory mitigation plans.

Direct Effects

The direct effects of the proposed project include effects associated with ground disturbance and earthwork, building structures, water quality and quantity, vegetation and habitat

modification, fish exclusion and removal, and channel dewatering. These activities are described below in the discussions of direct temporary effects that are related primarily to project construction, and direct permanent effects that are related primarily to project operation.

What temporary direct effects will occur as part of construction of the proposed project?

Floodplains

The construction of the floodplain storage area in the Mill Creek subbasin will require excavation of 38,000 cubic yards of material and will encompass 1.88 acres in the floodplain. Construction of this project element will result in the removal of vegetation and the exposure of bare soil. Temporary project effects to floodplains will be an increased potential for erosion and channel sedimentation due to the removal of vegetation or denuding soil. The temporary loss of vegetation may also result in floodwaters to flow with greater velocity through areas previously containing dense vegetation. Excavation will be isolated from surface waters until onsite soils are stabilized with replacement vegetation or other erosion control best management practices (BMPs).

With the implementation of BMPs, any temporary increases in sedimentation in the floodplain are expected to be minimal and of a short duration (e.g. an initial pulse of sediment associated with the first flood event). WSDOT also anticipates that the potential for floodwater velocity effects will be minimal because the site is isolated and disconnected from other portions of the floodplain, and because restored vegetation will become increasingly dense each subsequent growing season.

Surface Water Quality and Quantity

Temporary effects to surface water quality and quantity are also related to the removal of vegetation and exposing bare soil, in addition to the potential for hazardous material contamination. Denuded soils have a greater potential for erosion and sedimentation of downstream receiving waters and increased peak flow volumes. Removal of riparian vegetation can reduce shading of surface waters, potentially increasing temperature. Construction equipment has associated petro-chemicals such as fuels and hydraulic fluids that could enter surface waters if spilled. Introduction of sediments and chemical contaminants can result in a variety of water quality effects, including increased turbidity, increased temperature, alteration of pH, lowered dissolved oxygen, and a general alteration of normal biochemical processes. These water quality effects could in turn have consequences for the organisms reliant upon the surface waters, such as impaired respiration of fish, smothering of aquatic insects, or generally increased toxicity of organisms.

With the implementation of appropriate erosion control BMPs, WSDOT anticipates that any temporary water quality and quantity effects will be minor and of a short duration as discussed above for floodplains. Equipment maintenance and spill response BMPs would also be implemented, and WSDOT expects that the potential for hazardous material contamination effects to be low.

Aquatic Resources

Temporary effects to aquatic resources are related primarily to changes in water quality and quantity (as discussed above), and longer term vegetative impacts due to loss of shade and reduction in general habitat complexity, all of which will be reduced in time. The primary direct construction-related effects on aquatic habitats are related to channel dewatering, or temporary reduction in water quantity. These activities are necessary to make culvert improvements for fish passage and to connect the Site C floodplain storage area to Mill Creek.

Dewatering will be necessary for the retrofit of two culverts, Culvert 65 and Culvert 73. One culvert will have existing baffles retrofitted for better fish passage. The other culvert will have weirs added immediately downstream to improve fish passage in the Milwaukee Ditch subbasin. The connection of the Site C floodplain storage unit in the Mill Creek subbasin may require a coffer dam to isolate construction (i.e. dewater) from the stream flow. Dewatering will occur during the driest time of the year, during summer months, when fish are least likely to be present. In-water construction will be limited to approved work windows, as defined by permit conditions; and in-water work will be completed in the shortest time possible. Channel dewatering can affect benthic macroinvertebrates, which are consumed by salmonids and may represent a substantial portion of their diet at various times of the year. The effect of macroinvertebrate mortality resulting from channel dewatering would generally represent a temporary reduction in potential prey base for fishes (Jones and Stokes, 2008a). However, once flow is returned to the dewatered portion of the channel, benthic macroinvertebrates that drift from unaffected areas upstream and insects from upland sources will begin to re-colonize the dewatered portion of the channel within one month to 45 days (National Marine Fisheries Service [NMFS], 2003). WSDOT anticipates that, because dewatering will be done during the dry period of the year when stream conditions are least favorable to aquatic organisms, dewatering should have only a minor overall effect to macroinvertebrate populations and is not likely to have a negative effect on fish.

Potential erosion due to the repair of culverts and the construction of stormwater facilities could introduce fine sediments into the streams and surface waters of the study area. Excessive fine sediment input into streams has the potential to smother salmon eggs in the gravel, limit available food for fish due to potential damage to micro- and macroinvertebrates, 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. However, it is important to note that existing turbidity levels in Mill Creek are quite high and connection of the floodplain storage area is not expected to result in significant increases to turbidity in the Mill Creek system above background conditions.

The greatest potential for turbidity increases will occur when the connection is made between the floodplain storage area and Mill Creek. To mitigate for that potential impact several BMPs are proposed for the project.

The first BMP relates to timing the project in such a way that fish are least likely to be in the project area. This portion of the project will occur during the approved in-water work window (July 15 through September 15) when fish are least likely to be present in the stream. WSDOT will also limit the amount of time the stream may have elevated amounts of turbidity. This portion of the project will only last one week. Any fish present during the work window will be excluded from the project area using a beach sein. Lastly, sediment will be contained in the project area and allowed to settle out. Silt curtains will be in place to minimize potential increases in turbidity outside the project area. The silt curtain will be in place for an adequate duration to allow suspended sediments to settle out of the water column. These and any other prescribed BMPs will be included as part of the proposed project.

With BMPs in place and fish excluded from the work zones, turbidity levels should not reach levels that might cause any sort of physiological response in fish (coughing, gill flaring, increased blood sugar levels), which would indicate some level of stress (Jones and Stokes, 2008a). As discussed above, with the implementation of appropriate erosion control BMPs, WSDOT anticipates that temporary sedimentation and turbidity effects will be minor and of a short duration.

General construction noise in the vicinity of the study area water bodies could disturb or displace fish. Displacement can

disrupt regular feeding, breeding, or sheltering behaviors of fish. For all in-stream work, the work window specified in various permits and approvals will limit the potential noise effects because these windows are designed to allow work when fish are less likely to be present.

The proposed project has been designed to avoid or minimize direct loss of aquatic resources and their buffers to the extent feasible. However, the project will result in some unavoidable effects to wetlands, streams, and buffers as a result of widening the highway and construction of the associated stormwater facilities, construction of a floodplain storage area, and work on two culverts to improve fish passage. A summary of these effects is listed in Exhibit 16.

Exhibit 16
Temporary Effects of the Project on Wetlands and Streams

Resource	Temporary Effect (acre)
Wetland	2.13
Wetland Buffer	0.95
Stream	0.06
Stream Buffer	2.43

The primary, temporary effects on wetlands will be associated with the construction of the floodplain storage area at Site C. The construction of the floodplain storage area will occur within approximately 1.88 acres of existing Wetland 14.43L. The temporary effects of this construction will result in vegetation removal, which may result in the alteration of some water quality and habitat functions for a period of years. During the period of vegetation re-establishment, a minor reduction to nutrient cycling and plant uptake of materials, soil stability, flow moderation, and habitat value may also occur.

In conclusion, WSDOT expects that effects to soil stability and erosion potential will be avoided or minimized by the use of BMPs, and will no longer be a factor once vegetation becomes established within one or two growing seasons.

Other ecosystem functions such as nutrient cycling and habitat will continually be restored to at least pre-project conditions as vegetation communities mature and soil microorganisms re-colonize the site.

Several other minor temporary effects to wetlands, streams, and their buffers are anticipated in water resource inventory area (WRIA) 10, resulting from roadway widening, the construction of stormwater facilities, and retrofitting culverts to current fish passage standards. Temporary effects are expected to consist only of ground and vegetation disturbance from construction equipment. Again, this type of disturbance can result in increased erosion and sedimentation potential and a reduction in habitat value. However, these resources are generally of low quality, due to low species diversity, lack of buffer vegetative structure, limited connection to adjacent habitats, and a high degree of human disturbance. They also do not represent high risk areas for erosion due to generally level topography.

As such, functional losses to habitat are not anticipated. No loss of wetland or stream area is proposed and only minor temporary reduction in water quality and hydrology functions are expected until groundcover is re-established. All temporarily cleared or disturbed areas will be replanted with appropriate native vegetation. Proper implementation of erosion control BMPs may completely avoid the loss of water quality and hydrology functions in WRIA 10.

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 soil and water bodies in the study area. Control of hazardous materials is a standard provision in construction contracts and permits, and WSDOT will address this with BMPs and standard contract provisions. For instance, where practicable, WSDOT will prohibit the servicing and refueling of vehicles within 200 feet of streams and wetlands to reduce potential spills of petroleum and hydraulic fluids in sensitive areas. Additionally, WSDOT will create a Spill Prevention, Control and Countermeasures (SPCC) plan prior to

commencing work. As discussed earlier, effects from hazardous materials are expected to be unlikely.

Terrestrial Wildlife and Vegetation

Project construction could potentially affect terrestrial wildlife and vegetation in several ways. 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 affect wildlife and fish. Species can be attracted to the light, thereby disrupting feeding and migration patterns. Also, predators may be attracted to lighted areas where the local species may congregate. For the proposed project, direct illumination of the wildlife habitat will be avoided, thus limiting effects on behavior. These measures should minimize any adverse effects to wildlife from project construction.

General construction noise in the vicinity of the study area habitats could disturb or displace wildlife. Displacement can disrupt regular feeding, breeding, or sheltering behaviors of various species. WSDOT does not expect the project to considerably displace or disturb wildlife because wildlife in the area already experience high ambient noise and disturbance levels from SR 167, nearby roads and other human activities. Most construction work would occur during daylight hours and in close proximity of the existing highway so exposure of wildlife to increased noise should be limited.

Construction storage and staging areas will be used to stage all heavy equipment, for storage of construction materials, and to stockpile all construction debris that is not immediately transported from the project action area. Construction storage and staging areas are not available in the WSDOT right-of-way in proximity to the project corridor. The contractor will determine the specific location of construction storage and staging areas during project construction. Construction storage and staging areas will be located in currently developed areas such as parking lots, interchange medians, or other managed areas. Appropriate BMPs will be used to prevent sedimentation and fuel spills from entering ditches, streams, and wetlands. Where

practical, those areas are typically at least 150 feet from surface waters and wetlands. Therefore, no riparian vegetation or wetlands will be affected by the storage of construction materials or debris or staging of construction equipment. Upon completion of project construction, all construction staging areas will be returned to their preconstruction condition and use. As such, negative effects to wildlife or vegetation are not anticipated from construction staging.

As discussed in earlier sections, construction activities will result in temporary removal of upland vegetation and ground disturbance, potentially increasing erosion potential and reducing habitat value. These effects are expected to be minor due to the general lack of habitat structure adjacent to the roadway. They are also expected to be of a short duration and should be returned to a pre-project condition within one growing season.

What permanent direct effects will occur as part of the operation of the project?

Floodplains

In the Mill Creek subbasin, the Site C floodplain storage area is considered to be an innovative stormwater detention/ flood control facility. The design takes into account the increased runoff predicted from new PGIS and proposes to increase the storage volume in the Mill Creek floodplain to offset the project-generated runoff. The resulting effect will be additional floodwaters in the floodplain, but with a commensurate amount of new volume for flood storage. Fluctuations in the water surface elevation at the floodplain storage area between peak flow and low flow is not anticipated to vary widely because of the presence of an earthen sill located downstream approximately 960 feet from the connection point with Mill Creek. Additionally, the modeled increase in peak flow in Mill Creek of 0.1 cubic feet per second (cfs) is insignificant and not expected to have any measurable effect on the floodplain. WSDOT concludes that this project component will not have an adverse effect on flows in the floodplain ecosystem. The effect of directly

connecting the floodplain storage unit to Mill Creek is expected to yield an improvement in movement of energy, materials, and organisms between the floodplain and stream ecosystems.

Exhibits 17 and 18 illustrate the location of the proposed floodplain storage area, Site C, and details of the proposed design.

Exhibit 17

Floodplain Storage Area – Site C

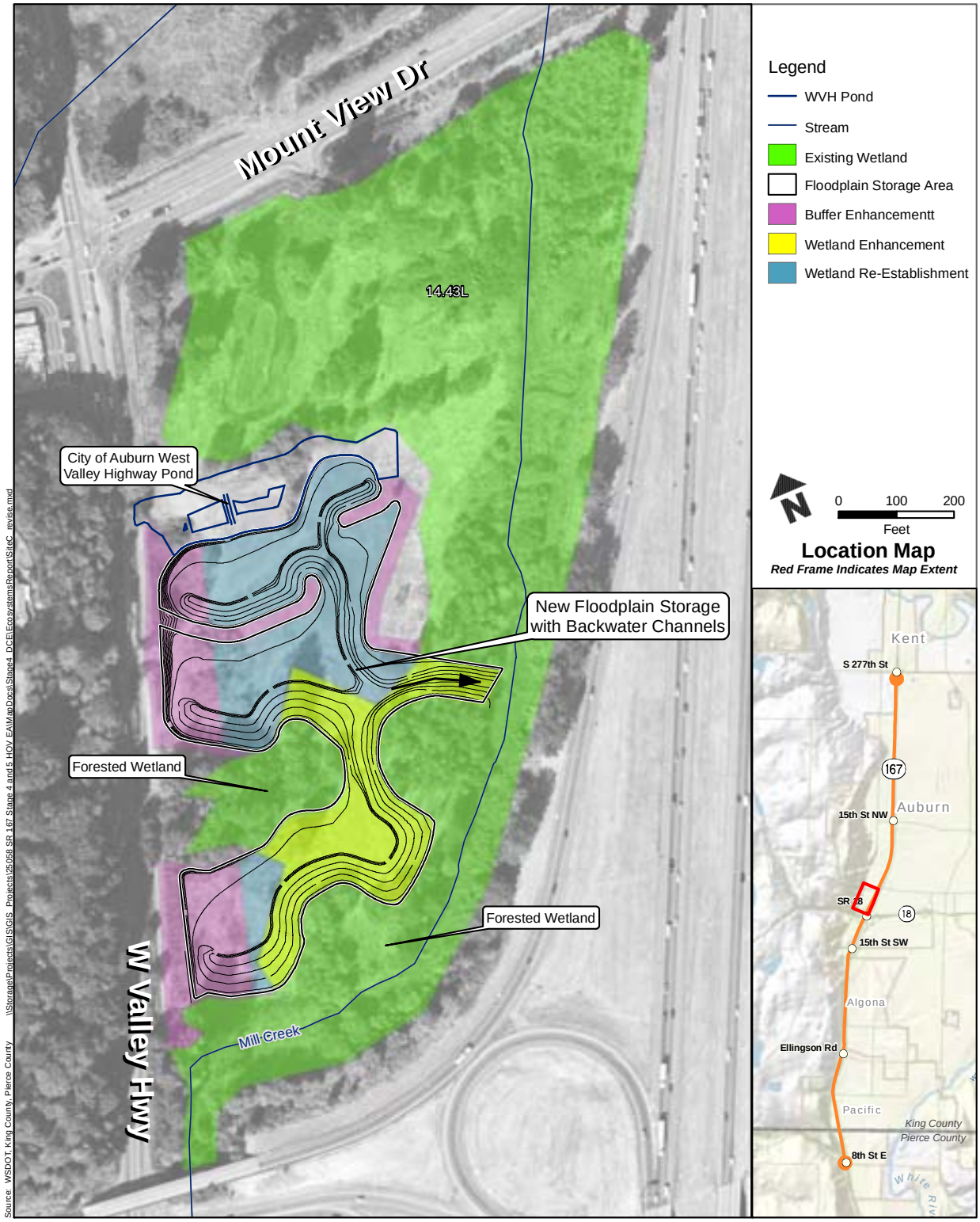
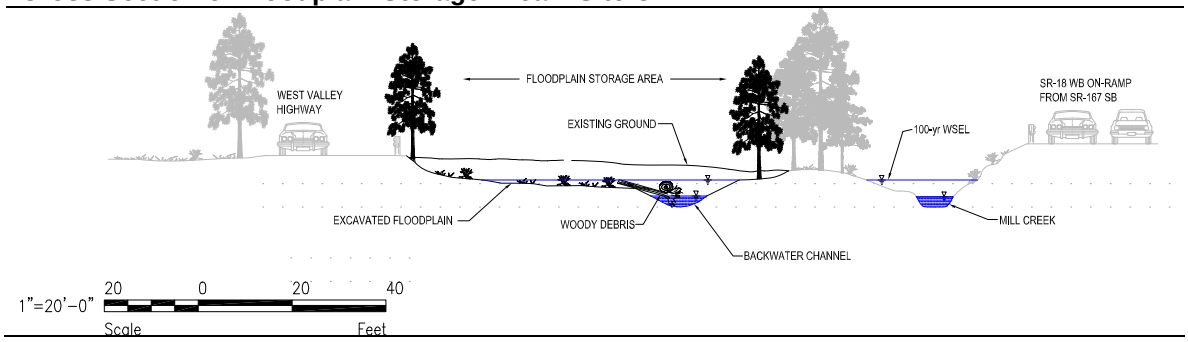


Exhibit 18
Cross Section of Floodplain Storage Area – Site C



Surface Water Quality and Quantity

Currently, 100.95 acres of existing PGIS are present in the project corridor, of which 21.79 acres are treated. This project will add 10.87 acres of new PGIS to the project corridor and provide treatment for an additional 38.20 acres of PGIS. Therefore, the project will provide a direct benefit to the ecosystems in the study area by treating the new impervious surfaces and retrofitting some of the existing impervious surfaces. Stormwater treatment will be provided with a combination of media filter drains, CAVFS and wetland cells. These enhanced treatment BMPs will decrease pollutant loading and concentrations in stormwater discharged from the project corridor, including TSS, total copper, dissolved copper, total zinc, and dissolved zinc. The Site C floodplain storage unit should yield a water quality improvement through increased duration of flood storage and removal of associated constituents in the substrate or plants.

Stormwater detention facilities will ensure that flows in the Mill Creek subbasin and the Milwaukee Ditch subbasin associated with the increased PGIS match predevelopment (forested) conditions and are not likely to negatively affect fish or fish habitat. In the Milwaukee Ditch subbasin, WSDOT anticipates that the three detention ponds will ensure that the existing flow conditions are maintained and negative effects on flow associated with the increased PGIS are avoided. The floodplain storage unit at Site C will offset the runoff generated by the increased PGIS in the Mill Creek basin. In summary, WSDOT anticipates that the permanent

effects to surface water quality and quantity will be either maintained or improved compared to the existing condition.

Aquatic Resources

The proposed project has been designed to avoid or minimize direct loss of aquatic resources and buffers to the extent feasible. However, the project will result in some permanent loss of wetland buffers and stream buffers as a result of widening the highway and constructing the associated stormwater facilities. A summary of wetland, wetland buffer, stream, and stream buffer effects are listed in Exhibit 19.

Exhibit 19
Permanent Effects of the Project on Wetlands and Streams

Resource	Permanent Effect (acre)
Wetland	0.00
Wetland Buffer	0.70
Stream	0.00
Stream Buffer	2.85

The project will also result in long term effects to the onsite Wetland 14.43L at Site C due to the floodplain storage proposal. The effects are primarily related to changing how the wetland performs functions, and is expected to result in ecological benefits, including:

- Re-establishing 2.57 acres of functional wetland area, and enhancing 1.88 acres of existing wetland
- Providing prolonged inundation of wetlands in the area
- Improving plant communities and nutrient cycles, as well as water quality in the associated water bodies

The floodplain storage area will be constructed to enhance ecosystem characteristics by incorporating design features that will prevent fish stranding, optimize shading for cooler water temperatures, avoid or minimize adverse effects to adjacent wetlands, and maintain current flows. To prevent fish stranding, backwater channels will be included to allow fish a path out of the storage area and back into the creek

when high water levels recede. These channels will improve habitat conditions for salmonids by providing important floodplain connectivity and off-channel habitat.

Plantings will be included in the design of the floodplain storage area to provide shade and maintain current temperature levels within Mill Creek. Buffer vegetation will also be enhanced where feasible. As the proposed vegetation communities mature, the habitat functions should eventually surpass that of the existing plant communities.

These improvements will be from the expected increase in community and species diversity, interspersion of habitats, and reduction of invasive species densities. These changes are due to reestablishing some hydrologic and biologic process of the flood plain. The additional flood storage and increase in flooding dynamics leads to a greater diversity of wetland habitats, which increase the number and type of wetland plant species likely to be present. Diverse and dense plant communities influence hydrologic processes, slowing down water flow. Slowing down flows generally improves water quality leading to reductions in downstream flooding, reduction in downstream sediment load, and increase in biological inputs and habitat. Therefore, WSDOT anticipates that the long-term outcome of the floodplain storage proposal will yield a net increase in hydrologic and habitat functions, and that water quality functions will be maintained or improved.

Direct effects to wetland buffers and stream buffers in WRIA 10 are primarily related to the roadway widening and stormwater facilities within the SR 167 right-of-way between MP 12.7 and MP 10.5. The existing ROW contains structurally simple buffer communities that are predominantly made up of either invasive or weedy herbaceous plant species. Permanent effects to buffers will result in a loss of buffer area and a subsequent alteration of vegetation communities.

Permanent buffer effects will be mitigated by enhancing 4.94 acres of remaining upland buffer in the SR 167 right-of-way. The net result will be an overall reduction in the area of low quality buffer and an increase in the quality of the remaining

buffer. The enhanced buffers should positively affect aquatic resources by protecting and improving water quality through stormwater filtration and temperature regulation. Habitat value should also improve by increasing native species diversity, providing complex vegetative structure and cover, and providing more opportunity for organic material to enter the aquatic resources. In summary, WSDOT expects that the permanent effects on aquatics resource from buffer alteration will be beneficial.

The most significant project actions affecting stream functions are the culvert retrofits for fish passage improvement. The culvert retrofits involve structural changes to the culverts or downstream channel that will back up flows allowing deeper water during low flow periods, and will provide roughness slowing flow velocities during high flow periods. The long term effects of this action would yield an improvement in fish migration functions and minor improvements in the structural complexity of the channel.

The information and analysis presented in the Biological Assessment (Jones and Stokes 2008a) for Endangered Species consultation was the basis of the finding of effects determinations for Chinook salmon, steelhead, bull trout and their respective habitats. The construction of Site C will provide off-channel fish habitat benefits. The culvert retrofits to allow for improved fish passage in the Milwaukee Ditch subbasin will provide long-term benefits for fish, as they will be able to navigate upstream of the structure during all flows. Based on the analysis of the potential effects of the proposed project on federally protected species that may occur within the project action area, it was determined that the project ***May Affect, but is Not Likely to Adversely Affect*** the following species:

- Chinook salmon of the Puget Sound Evolutional Significant Unit (ESU)
- Steelhead of the Puget Sound Distinct Population Segment (DPS)
- Bull trout of the Coastal/Puget Sound DPS

It was also determined that the proposed project ***May Affect, but is Not Likely to Adversely Affect*** critical habitat for Chinook salmon of the Puget Sound ESU. The two other federally protected species have not had critical habitat designated within the project action area; therefore, the proposed project will have ***No Effect*** on designated critical habitat for these species.

Terrestrial Wildlife and Vegetation

The project will add 10.87 acres of new impervious surface, which will result in the removal of vegetated habitat adjacent to the existing roadway. The habitat is mainly grasses or other herbaceous plants which has minimal value because it lacks vegetative structure important to wildlife. The habitat value of this area is also low because is isolated from other habitat by the roadway. No direct permanent effects to terrestrial wildlife are anticipated from the road widening.

As described in the previous subsections, proposed mitigation should provide improved wildlife habitat in the form of enhanced vegetation communities, additional wetland and floodplain area, and improved water quality. WSDOT anticipates that the net result of this project will yield an improvement in wildlife habitat and vegetation communities.

What are the indirect effects of the proposed project?

Indirect effects are defined as effects that are "caused by an action and are later in time or farther removed in distance but are still reasonably foreseeable" (Federal Regulation on the Protection of the Environment - 40 CFR 1508.8). These effects, which usually result from the initial action, include potential changes in transportation and land use, modification of habitat and landscape processes.

Transportation and Land Use

Following interviews with lead planners of affected jurisdictions and a comprehensive document review for those local jurisdictions, no associated transportation or land use actions have been identified that are reasonably certain to occur as a result of the proposed project. Therefore, the

potential for the proposed project to cause any indirect effects to local transportation projects or land use changes is highly unlikely. This determination is consistent with the protocol developed by WSDOT for assessing the indirect effects associated with transportation projects (Jones and Stokes, 2008a).

Landscape and Habitat Processes

The primary potential for indirect effects associated with the floodplain storage area relates to the long term dynamics of peak and base flow and flow velocity, and any subsequent alteration of stream or floodplain processes. Hydraulic modeling was conducted to estimate the potential effects of the proposed project on Mill Creek. The results show that Mill Creek will experience a slight change in annual peak flow volumes in the four reaches downstream of the proposed project.

Because only minor changes to flow volumes and velocities are expected, no adverse effects on habitat forming processes or fish movement are anticipated. Due to the low gradient and low velocity nature of Mill Creek, channel migration is not typically a dynamic process. Based on qualitative field observations, the predominant factor in channel forming processes in lower Mill Creek appears to be beaver activity. The floodplain storage area will not result in hardening of any portion of the channel or bank, thus allowing channel deformation pursuant to natural processes to occur. Therefore, the floodplain storage area will have a minor effect on overall landscape processes.

Because vegetation communities would be disturbed or otherwise altered by proposed mitigation plantings, there is a potential that ecological succession and the formation of wildlife habitat could be altered. Particularly, invasive or undesirable plant species could colonize disturbed and/or replanted areas and subsequently alter wildlife species assemblages.

To minimize the potential for adverse effects on ecological succession, native plants were selected based on their normal distribution in the project area and their survivability

qualities. WSDOT proposes to actively monitor and manage vegetation establishment to ensure performance objectives of the planting plans are met. As such, WSDOT expects no adverse effects to the formation of habitat or ecological communities, or changes to wildlife assemblages.

What are cumulative effects and why do we study them?

Cumulative effects measure the incremental impact of all effects of the project including past and present actions in the study area, and the effects of reasonably foreseeable, planned projects in the study area.

How were cumulative effects on ecosystems analyzed?

The procedures for identifying cumulative effects were used from the President's Council on Environmental Quality rules and handbook and the *WSDOT Environmental Procedures Handbook*, Chapter 412. In general, past and present actions within the study area were evaluated to determine how the proposed project will directly or indirectly affect the study area. Then the effects of the future planned, but not yet built, actions were considered. In the end, all of the predicted effects were summarized and the cumulative effects of the project on ecosystems were estimated.

The timeline of past and future actions were established at 1970 to 2030, based on when the past land use growth, as a result of land use actions of local cities and counties, substantially began to rise in the 1970s. Using the Puget Sound Regional Council data, the 1970s were determined to be a point in time, where the growth was noticeable and the starting point of reasonable past actions. The future point in time is 2030, which is the baseline of the traffic analyses conducted for this project.

The past and present actions that affect the study area include:

Past Actions within Study Area
• From 1970 to 2005, the population grew in cities along the SR 167 corridor, by more than 50 percent from approximately 115,000 in 1970 to 225,000 in 2005.[1] Now, between 95,000 and 125,000 vehicles travel on SR 167 each day. In addition, approximately 12,000 freight trucks per day drive on SR 167 just south of South 212th Street, which accounts for 9.7% of all traffic. • Construction of SR 167 and other local and state road facilities from the completion of SR 167 in the 1980s to widening projects as recent as the Stage 3 construction along SR 167 that was completed in 2008. • Relocation of Mill Creek during construction projects in the 1980s.

The past actions, from the 1970s to the present, caused rapid development within the Green River Valley. This growth included the development of the transportation system, residential communities, and commercial and light industrial buildings and centers within the area. Much of this growth has occurred without the benefit of current environmental protection standards.

Continued development within the study area reduced the natural habitat for fish, wildlife, vegetation, and other natural resources and has had direct negative effects on some ecosystem processes. Particularly, increases in impervious surface have resulted in changes to surface water flows, water quality and channel erosion. Habitat fragmentation has inevitably reduced migratory and breeding opportunities for wildlife and species requiring large ranges (i.e. black bears) are likely rare in the study area.

[1] King County, 2005 Annual Growth Report and Washington Office of Financial Management data.

Proposed Project Actions
• Widening the southbound lane from two to three lanes by adding a HOT lane will increase the impervious surface of the roadway and will improve traffic conditions in the project area • Improve water quality through stormwater management improvements within the project area • Improve shoreline and wetland habitat in work areas • Improve floodplain capacity and inter-waterway connections and habitat through the development of a floodplain storage area

The proposed project will cause some temporary and permanent direct and indirect effects to the ecosystems within the study area. However, most of those effects will be mitigated and WSDOT believes that the conditions resulting from those actions will provide benefits to the habitat and species in the area. For example, in-water work is necessary to make improvements to stormwater culverts to allow for better fish passage. While the end result will likely benefit fish and shoreline vegetation will be improved after construction, to improve the habitat, some temporary effects will occur due to the in-water work, such as dewatering the stream and temporarily increasing turbidity in nearby waters.

In addition, the construction of the floodplain storage area is expected to have many long-term benefits including improved habitat for fish, wildlife, and vegetation and improved connectivity between water bodies. However, during construction and shortly thereafter, the habitat may be slightly degraded from current conditions.

Lastly, the project will treat more impervious surface area than it is adding. Therefore, WSDOT believes that, water quality, fish and wildlife habitat, and floodplain storage within the project area will be improved as a result of the proposed project.

Future Planned Actions within Study Area
• The planned residential developments in the area, which will add thousands of new single-family homes and many new trips to SR 167 • The planned completion of SR 167 from Puyallup to Tacoma • The planned Auburn Environmental Park, which will enhance wetlands and natural habitat • Completing the SR 167 HOV/HOT lanes system in both the northbound and southbound directions from I-405 in Renton to SR 512 in Puyallup

New developments and roadways throughout the SR 167 corridor will continue to remove and/or degrade natural habitat from the project. However, mitigation measures will be proposed that will likely create long-term improvements similar to those that are part of this project. The proposed environmental park by the City of Auburn, for example, is a creative way for a local jurisdiction to provide a comprehensive approach to stormwater management, wetland enhancement, and habitat improvement.

To analyze cumulative effects on ecosystems WSDOT examined past and present actions within the study area. WSDOT then considered the effects of the future planned, but not yet built, actions. In summary, the predicted cumulative effects of all past, present and future actions on ecosystems have resulted in loss of habitat area and alteration of ecosystem processes. However, because this project will adhere to current environmental standards, proposes retrofits of stormwater facilities and culverts, and mitigation measures, WSDOT concludes that cumulative effects on ecosystem elements will not be negatively affected by this project.

CHAPTER 4 MITIGATION MEASURES

What measures will be taken to mitigate effects before and during construction?

The measures taken to mitigate construction effects from the project include avoidance and minimization of project effects during the design process, and, where effects are unavoidable, developing compensatory mitigation to offset project effects. Prior to construction, project biologists worked with roadway and drainage engineers to identify portions of the project with the potential to affect ecosystem elements. Where possible, the project design was altered to minimize or eliminate effects to these elements. For example, designers shifted roadway alignments, located drainage features, and altered other project elements. Specifically, the following components were incorporated into the project:

- Roadway alignments were shifted to reduce effects to wetlands throughout the study area.
- All in-water work will be restricted to authorized construction periods when protected fish species will not likely be present in substantial numbers. Adherence to designated work windows, as defined by appropriate permitting agencies (State of Washington Department of Fish and Wildlife [WDFW], the National Marine Fisheries Service [NMFS], and the US Fish and Wildlife Service [USFWS]), will also eliminate or reduce in-water interference during periods when juvenile and adult salmon are likely to be present.
- WSDOT will replant temporarily disturbed areas with appropriate native vegetation.

Additional best management practices (BMPs) that WSDOT could use during construction include:

- Using effective erosion control measures as specified in the TESC plan, such as filter fabric fence, straw mulch, straw bales, and plastic sheeting to prevent silt and soil from entering surface waters (including wetlands)
- Hydroseeding bare soil areas following grading

- Clearly labeling streams and stream buffers on the construction plans and in the field
- Demarcating clearing limits with orange barrier fencing wherever clearing is proposed in or near critical areas
- Locating staging areas and equipment storage areas away from sensitive areas (e.g., streams and wetlands)
- Refraining from vehicle refueling and maintenance activities within 100 feet of streams, rivers, and wetlands
- Minimizing the duration of in-water work (below the ordinary high water mark [OHWM]) and strictly adhering to the appropriate fish work windows, as dictated by applicable permits
- Prohibiting waste and excess materials from being disposed of or allowed to remain below the OHWM of streams and rivers, in critical areas, or in stream or critical area buffers
- Preparing and adhering to a Spill Prevention Control and Countermeasure (SPCC) plan for the project prior to beginning any construction, and maintaining a copy of the plan with any updates at the work site
- Containing excavated sediment in tanks, or other appropriate containers, to avoid discharge to surface water, and transporting the contained sediments to an approved disposal site
- Curing concrete before contact with surface water as required by Washington Administrative Code (WAC) 110-220-070(1)(g) to avoid increased pH that can occur when fresh concrete contacts water
- Regularly checking items such as fuel hoses, oil drums, and oil and fuel transfer valves and fittings for drips or leaks to prevent spills into surface water
- Keeping the illuminated area and intensity of nighttime lighting to the minimum that is necessary for the intended purpose; lights will be directed onto the work areas and away from the water

What measures will be taken to mitigate effects of operation?

Floodplains

This project will increase the impervious surface area and amount of stormwater generated by SR 167. Due to the extensive floodplains in the study area, this project proposes a floodplain storage area as a way to mitigate for the increase in stormwater discharge within the project area and to increase detention in the Mill Creek subbasin. The floodplain storage area will increase floodplain connectivity and provide off-channel habitat that will reduce the negative effects of other modifications that have decreased floodplain connectivity and off-channel habitat. WSDOT has avoided or minimized additional fill in the floodplain, and designed the project to result in a zero net rise in base flood levels.

Surface Water Quality and Quantity

The proposed project has been designed to avoid or minimize adverse effects to water quality and quantity. Mitigation measures to address project effects include:

- WSDOT expects that stormwater treatment BMPS will reduce the pollutant loads and concentrations in receiving waters from the project corridor, even though this project will be increasing the amount of pollutant-generating impervious surface (PGIS). In the end, the proposed project is expected to improve water quality.
- To maintain the existing temperature regime for aquatic resources, the floodplain storage area has been designed to avoid removal of existing large trees that provide shade. Additionally, areas adjacent to the floodplain storage area will be planted with native trees and shrubs, to provide additional shade to the site. WSDOT expects that the high groundwater table will provide cool water to the site that will help to moderate water temperatures in the floodplain storage area.
- Riparian habitat will be improved in areas where in-water work or other construction activities will occur. These areas will be replanted with native riparian

vegetation to improve habitat and provide stream shading where vegetation will be cleared. The extent of riparian planting will be dictated by the extent of the clearing effects.

Aquatic Resources

The proposed project has been designed to avoid or minimize direct loss of aquatic resources to the extent feasible. However, some unavoidable effects to streams and shorelines and buffers will result from the proposed project. Wetland mitigation measures are designed to meet the criteria of *Wetland Mitigation in Washington State* joint agency guidance (Ecology et al., 2006a, 2006b) and local critical area ordinances for the City of Auburn, the City of Algona, and the City of Pacific. The compensatory mitigation for wetland effects resulting from floodplain storage construction will occur at the site of impact in WRIA 09. Compensatory mitigation for wetland and stream buffer effects in WRIA 10 will occur within the SR 167 right-of-way between Milepost (MP) 12.7 and MP 10.5.

The following mitigation measures for aquatic resources and their buffers will be implemented:

- 1.88 acres of wetland enhancement by diversifying wetland processes and native vegetation
- 4.93 acres of upland buffer enhancement, including riparian areas, by diversifying native vegetation.

An additional 2.57 acres of wetland re-establishment would occur at the Site C floodplain storage unit by removing historic fill material and re-establishing wetland processes and native vegetation. This mitigation element goes beyond the compensatory mitigation required for this project.

The proposed mitigation site in WRIA 09 will be monitored for 10 years and the right-of-way mitigation site in WRIA 10 will be monitored for five years. Monitoring, contingency, and site management plans are described in the wetland and stream mitigation report, which will be used to adaptively manage the mitigation sites.

Retrofitting culverts 65 and 73 to provide improved fish passage, and providing water quality and quantity treatment also represents an improvement in aquatic habitat within the project area. Water quality and water bodies will be improved through implementation of stormwater BMPs that will protect aquatic life by limiting pollutants entering water bodies

Terrestrial Wildlife and Vegetation

In all cases where project effects on wildlife, fish, and habitat are unavoidable, mitigation will be implemented to compensate or replace the resources that are lost. Such mitigation will help to offset any negative construction-related or long-term effects. Mitigation measures to offset effects to these ecosystem elements will include:

- Water quality and water bodies will be improved through implementation of stormwater BMPs that will protect wildlife by limiting pollutants entering water bodies
- The creation of the floodplain storage area is expected to enhance wildlife connections to local water bodies and improve habitat
- All temporarily disturbed areas will be revegetated to improve habitat and wildlife, and generally improve the natural vegetation coverage.
- Any permanent effects to wildlife habitat will be mitigated in accordance with applicable laws and regulations.

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